

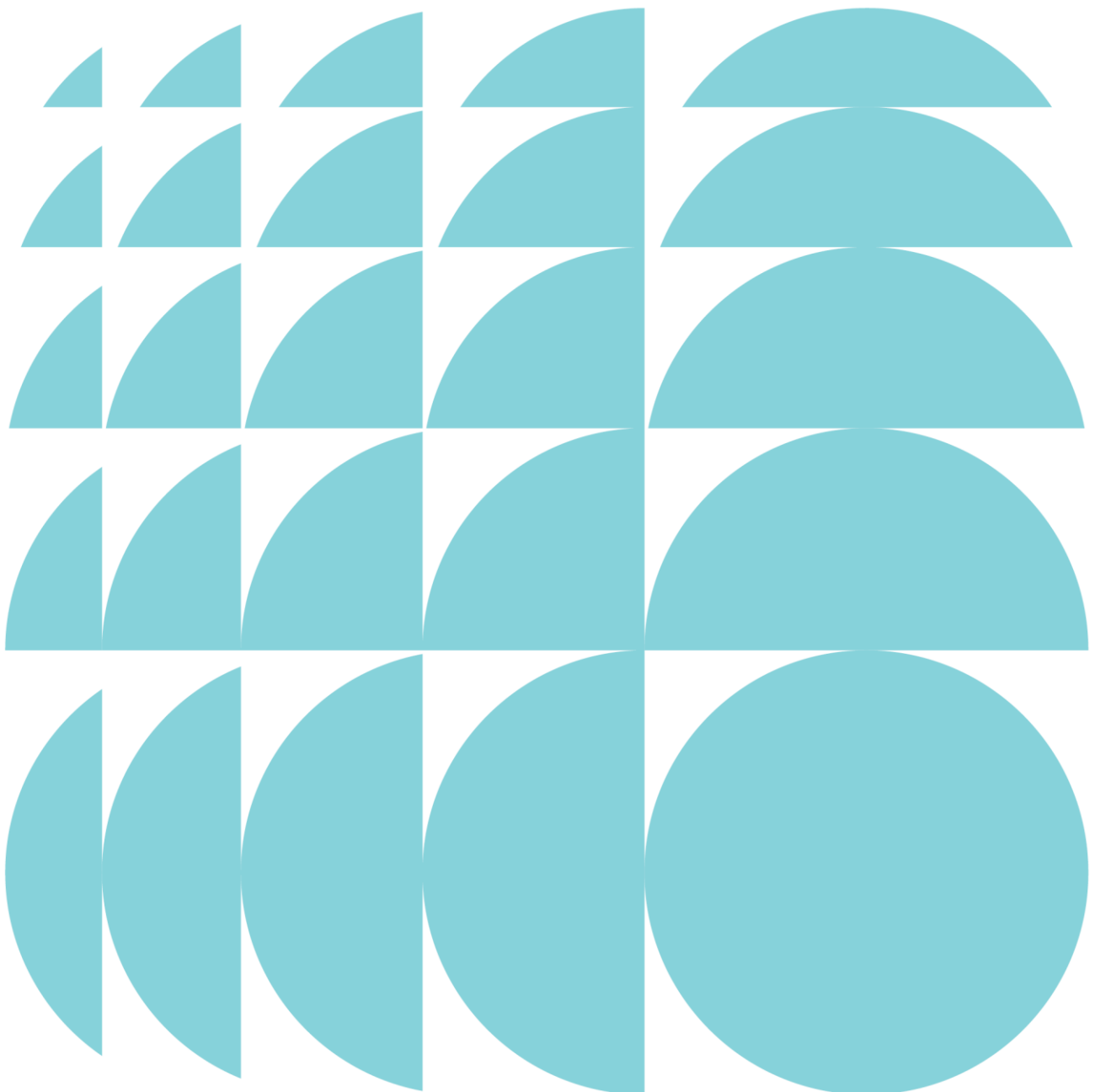
ETHOS URBAN

Environmental Impact Statement

Captain Cook Drive, Kurnell
Breen Resource Management Facility

Submitted to the NSW Department of Planning,
Industry and Environment
On behalf of Breen Resources Limited

8 July 2021 | 2200216



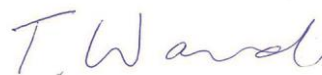
CONTACT

Tim Ward	Director	tward@ethosurban.com	0450133453
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This document has been prepared by:

This document has been reviewed by:



Jethro Yuen and Christopher Curtis

8/07/2021

Tim Ward

8/07/2021

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Ethos Urban Pty Ltd
ABN 13 615 087 931.
www.ethosurban.com
173 Sussex Street, Sydney
NSW 2000 t 61 2 9956 6952

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Statement of Validity

Development Application Details

Applicant name	Breen Resources Pty Ltd
Applicant address	330 Captain Cook Drive, Kurnell NSW 2231
Land to be developed	Lot 1122 in DP794114 (Lot 1122); Lot 1123 in DP794114 (Lot 1123); Lot 5 in DP1158627 (Lot 5); Lot 6 in DP1158627 (Lot 6)
Proposed development	- Construction and operation of a Resource Management Facility, comprising: - A New Resource Recovery Facility on Lot 5 to process up to 650,000 tonnes per year of non-exempt Construction & Demolition (C&D) and non-putrescible Commercial and Industrial (C&I) wastes, including consolidation of existing waste management activities within this part of the Proposal Site. - A Waste Disposal Facility being the continuation of landfilling, land rehabilitation operations and contouring by permanent application of some of the residual waste materials from the New Resource Recovery Facility to land on Lot 5. - Demolition and/or relocation to Lot 5 (as required) of the Existing Breen Resources Facility on Lots 1122, 1123 and 6 (this includes those parts of Lots 1122, 1123 and 6 that will comprise the Playing Fields). - Water usage and management across the entirety of the Proposal Site and adjacent playing fields; - Ongoing long-term monitoring of the Former Landfill Site leveraging the environmental benefits and synergies of utilising the same personnel, plant, material and infrastructure; - Capping, closing and contouring areas within Lots 1122, 1123 and Lot 6 with suitable material recovered from the New Resource Recovery Facility and the material currently stockpiled on site that meets a relevant 2014 resource recovery orders. This includes ensuring a consistent and appropriate land form between the Marang Parklands and Lot 5. Some specific material would be imported to the site for capping and covering, such as low permeability clay. - Delivery of activated community space in the form of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6.

The Proposal is further described in **Section 4** of this Environmental Impact Statement

Prepared by		
Name	Christopher Curtis	Tim Ward
Qualifications	BUrbanEnvPlan(Hons), DipPM	BSc(Hons), MEnvMgt
Address	173 Sussex Street, Sydney	173 Sussex Street, Sydney
In respect of	State Significant Development - Development Application	

Certification

I certify that I have prepared the content of this EIS and to the best of my knowledge:

- it is in accordance with Schedule 2 of the Environmental Planning and Assessment Regulation 2000;
- all available information that is relevant to the environmental assessment of the development to which the statement relates; and
- the information contained in the statement is neither false nor misleading.

Signature




Name

Christopher Curtis

Tim Ward

Date

8/07/2021

Glossary of Terms

Term	Definition
ADC	Alternate Daily Cover
Associated facilities	Features ancillary to the resource recovery facility – including parking, wheel washes, recovered water basins, internal roadways, fencing and visual screening, signage, customer support facilities, storage areas and any other plant equipment or infrastructure that is ancillary to the operation of the Landfill or New Resource Recovery Facility that may need to be updated, replaced or installed from time to time.
Breen	Breen Resources Pty Ltd
CEMP	Construction Environmental Management Plan
C&D	Construction and Demolition Waste including excavated material such as rock and soil, waste asphalt, bricks, concrete, plasterboard, timber and vegetation, asbestos and contaminated soil
C&I	Commercial and Industrial Waste, being mixed waste sourced from manufacturers, shops and businesses.
DA269/90	A consent applying across the land which provides for the establishment of a depot including selected recycling facilities to receive excavated materials and selected demolition materials (including bricks, tiles and concrete spall), and for the restoration of the land by application of the materials to the land.
DA11-0665	A consent applying across part of the land which provides for the construction of playing fields in accordance with VPA. DA11-0665 is a Staged Development Consent, and subsequent detailed approvals are provided under the following related consents: • DA11-0941 for bulk earthworks. • DA12-0083 for Stage 2 playing fields and the roads, services and landscaping for Stage 1B. • DA12-0439 for Stage 3 playing fields. DA12-1066 for Stage 1A skate park.
ENM	Excavated Natural Material
EIS	Environmental Impact Statement
EPL	Environment Protection Licence issued by the Environment Protection Authority under the <i>Protection of the Environment Operations Act 1997</i>
Embellished Marang Parklands	The Marang Parkland as now proposed to be delivered as part of this SSDA, which contain a range of improvements and embellishments over and above the 2010 Voluntary Planning Agreement commitments.
Existing Breen Resources Facility	Existing facility owned by Breen Property Pty Ltd and operated by Breen Resources Pty Ltd at 330 Captain Cook Drive, Kurnell which receives excavated materials and selected C&D waste, and carries out site restoration by application of these materials to land in accordance with DA269/90 on: • Lot 1122 in DP794114 (Lot 1122); • Lot 1123 in DP794114 (Lot 1123); • Lot 5 in DP1158627 (Lot 5); • Lot 6 in DP1158627 (Lot 6)
Former Landfill Area	Parts of the Existing Breen Resources Facility that were historically managed under one licence as one site and used for landfilling pursuant to DA269/90 and EPL 4608, but where landfilling has since ceased, comprising parts of Lots 1122, 1123 and Lot 6 (noting that landfilling remains active on Lot 5).
Landfill	A landfill is an engineered, in-ground facility for the safe and secure disposal of waste by applying the waste to the land.
Landfill Cell B10	The former and existing landfill areas spanning across Lot 6 and the western part of Lot 5.
Landfill Cell B11	The current and future landfill areas on the eastern part of Lot 5 only and located immediately to the east of Landfill Cell B10. Landfill Cell B11 is made up of three stages – Stage A and Stage B are currently operational landfill areas, and Stage C is a future landfill area.
Light residual waste processing	Part of the proposed New Resource Recovery Facility and located within the processing buildings. Includes processing of residual light waste materials and light C&D and C&I waste. Processing would include sorting, shredding and screening of material to extract recyclables.

Term	Definition
Marang Parklands	The regional recreation facilities and parklands proposed under the 2010 Voluntary Planning Agreement (VPA).
New Resource Recovery Facility	Proposed new facility on Lot 5 DP1158627 to receive and process up to 650,000 tonnes per year of non-exempt C&D and non-putrescible C&I wastes. The New Resource Recovery Facility comprises: • Waste processing building – incorporating the Recycling Plant and light residuals processing • Soils processing building – incorporating soil processing plant • Concrete processing building – incorporating processing plant for concrete, aggregate, brick, tiles, rock and other similar materials. • Three weighbridges and an internal weighing zone • Site office and administration building • Workshop • Parking area • Three wheel washes • Two recovered water basins • Internal roadways • Fencing and visual screening • Stockpiles and storage areas • Skip bin storage area
New VPA	A new Voluntary Planning Agreement proposed to be entered into in 2021 by Breen with Sutherland Shire Council in relation to the delivery of the Embellished Marang Parklands. The New VPA will supplement the previously signed VPA specified below.
Playing Fields	The playing fields and associated works approved under: • DA11-0665; • DA11-0941; • DA12-0083; • DA12-0439; and • DA12-1066
Proposal Site	The entirety of the Existing Breen Resources Facility, being Lot 1122 and Lot 1123, and Lot 5 and Lot 6
Recycling plant	Part of the New Resource Recovery Facility and located within the processing building. Includes plant and equipment to pre-process incoming C&D and C&I waste streams and separate waste into various recyclables using size, density and other separation technology.
Resource Management Facility	The New Resource Recovery Facility and Waste Disposal Facility components of the Breen Proposal combined
SEARs	Secretary's Environmental Assessment Requirements. In this case SSD-10412 dated 14 February 2020.
SRF	Solid Recovered Fuel
SSDA	State significant development application
The Proposal	• Construction and operation of a Resource Management Facility, comprising: - A New Resource Recovery Facility on Lot 5 to process up to 650,000 tonnes per year of C&D and non-putrescible C&I wastes, including consolidation of existing waste management activities within this part of the Proposal Site. - A waste disposal facility being the continuation of landfilling, land rehabilitation operations and contouring by permanent application of some of the residual waste materials from the New Resource Recovery Facility to land on Lot 5. • Demolition and/or relocation to Lot 5 (as required) of the Existing Breen Resources Facility on Lots 1122, 1123 and 6 (this includes those parts of Lots 1122, 1123 and 6 that will comprise the Playing Fields). • Water usage and management across the entirety of the Proposal Site and adjacent playing fields; • Ongoing long-term monitoring of the Former Landfill Site leveraging the environmental benefits and synergies of utilising the same personnel, plant, material and infrastructure;

Term	Definition
	- Capping, closing and contouring areas within Lots 1122, 1123 and Lot 6 with suitable material recovered from the New Resource Recovery Facility and the material currently stockpiled on site that meets a relevant 2014 resource recovery orders. This includes ensuring a consistent and appropriate land form between the Marang Parklands and Lot 5. Some specific material would be imported to the site for capping and covering, such as low permeability clay. - Delivery of activated community space in the form of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6.
VENM	Virgin Excavated Natural Material
VPA	The Voluntary Planning Agreement entered into between Breen Holdings Pty Ltd (subsequently novated to Breen Property), Australand Kurnell Pty Ltd (now renamed Frasers Property Australia Limited) and Sutherland Shire Council in June 2010 which requires: - A staged transfer of 91 ha of land to public ownership for the purpose of environmental conservation and public open space. - Construction of regional recreation facilities, including 10 playing fields, a skate park, 3 amenities buildings, walking and cycling tracks, picnic facilities and associated parking for over 400 cars. - Rehabilitation and landscaping of degraded land previously dredged for sand mining to support an ecological 'green corridor' stretching from the Towra Point Nature Reserve to the ocean at Wanda Beach.
DA11-0941	A consent applying across part of Lot 1122 for the development of the Stage 1B playing fields bulk earthworks. DA11-0941 is a Stage 2 consent, related to the partial delivery of the masterplan approved under Staged Development Consent DA11-0665.
DA12-0083	A consent applying across part of Lot 1122 and part of Lot 6 for the development of the Stage 2 playing fields and the roads, services and landscaping for Stage 1B playing fields. DA12-0083 is a Stage 2 consent, related to the partial delivery of the masterplan approved under Staged Development Consent DA11-0665.
DA12-0439	A consent applying across part of Lot 1122 for the development of the Stage 3 playing fields. DA11-0439 is a Stage 2 consent, related to the partial delivery of the masterplan approved under Staged Development Consent DA11-0665.
DA12-1066	A consent applying on Lot 1 DP1101922 for the development of the Stage 1C skate park. DA11-0941 is a Stage 2 consent, related to the partial delivery of the masterplan approved under Staged Development Consent DA11-0665.

Executive Summary

Purpose of this Report

This submission to the Department of Planning and Environment (the Department) comprises an Environmental Impact Statement (EIS) for a Development Application under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). It relates to a (SSDA) located on Lots 1122, Lot 1123, Lot 5 and Lot 6 at Captain Cook Drive, Kurnell (being the Proposal Site). The Proposal comprises a new integrated Resource Management Facility, comprising a New Resource Recovery Facility with associated on-site disposal of residual wastes at a Waste Disposal Facility, and land rehabilitation activities using recovered resources for the delivery of the publicly accessible Embellished Marang Parklands.

Overview of the Proposal

The Proposal will modernise Breen's resource recovery operations through the development of a vertically integrated and purpose-built New Resource Recovery Facility that will enable significant diversion of waste away from landfill and contribute to achieving the NSW Government's resource recovery targets. The Existing Breen Resources Facility currently accepts excavated materials and C&D waste as part of the land restoration activities permitted under DA269/90 from Sutherland Shire Council. To take full advantage of the capabilities of the proposed New Resource Recovery Facility, it is proposed to supplement these waste streams with approximately 50,000t per year of non-putrescible general solid waste from C&I waste sources.

In total, up to 650,000 tonnes of waste per year would be received and processed at the New Resource Recovery Facility.

The Proposal will also deliver high quality activated open space and parklands envisaged in the VPA that will contribute a significant and prominent new regional parkland for the benefit of the entire Sutherland Shire community.

The SSDA specifically seeks approval for the following:

- Construction and operation of a Resource Management Facility, comprising:
 - A New Resource Recovery Facility on the eastern part of the Proposal Site (Lot 5), including consolidation of existing waste management activities within this part of the Proposal Site;
 - A Waste Disposal Facility being for the continuation of current land restoration, landfilling and contouring operations at the Proposal Site by permanent application of some of the residual waste materials from the New Resource Recovery Facility to land on Lot 5;
- Demolition and/or relocation to Lot 5 (as required) of the Existing Breen Resources Facility on Lots 1122, 1123 and 6 (this includes those parts of Lots 1122, 1123 and 6 that will comprise the Playing Fields);
- Water usage and management across the entirety of the Proposal Site and adjacent playing fields;
- Ongoing long-term monitoring of the Former Landfill Site leveraging the environmental benefits and synergies of utilising the same personnel, plant, material and infrastructure;
- Re-profiling of parts of the Proposal Site within Lots 1122, 1123 and 6, with some existing waste materials from those lots. Breen confirms that no new waste is being received on Lots 1122, 1123 and 6 for the purposes of landfilling on these lots so as to facilitate the delivery of the Embellished Marang Parklands and Playing Fields;
- Capping and contouring areas of the Proposal Site within Lots 1122, 1123, and Lot 6, with suitable material recovered from the New Resource Recovery Facility and some existing materials, with some specific material imported to the Proposal Site for capping and covering, such as low permeability clay to enable the delivery of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6; and
- Delivery of activated community space in the form of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6.

The Proposal Site

The Proposal Site is located within the Local Government Area of the Sutherland Shire. Situated on the Kurnell Peninsula, the Proposal Site is positioned between Quibray Bay (within Botany Bay) to the north and Bate Bay (being Cronulla and Wanda beaches) to the south. The Proposal Site comprises Lot 1122, Lot 1123, Lot 5 and Lot

6. It is generally bounded to the north by Captain Cook Drive, providing access from North Cronulla through to the village of Kurnell, as well as the main access to the Existing Breen Resources Facility.

Existing waste management infrastructure on the Proposal Site comprises a weighbridge, site offices, storage yards and workshops, a parking area, a wheel wash, stand pipe and internal roadways. Landfilling on Lots 1122, 1123 and 6 has ceased. The current active landfilling area is limited to the western part of Lot 5. However, the activities associated with the Existing Breen Resources Facility for receipt of the excavation and demolition type materials are still carried out predominantly on Lots 1122 and 1123 and Lot 6, where the Existing Breen Resources Facility's buildings, plant and infrastructure is currently located.

Planning Context

Development for the purpose of resource recovery facilities that handle more than 100,000 tonnes of waste per year is identified as a State Significant Development (SSD) in Clause 23 of Schedule 1 of *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). As the New Resource Recovery Facility will process up to 650,000 tonnes of waste per year, this component of the Proposal is classified as SSD.

Further, clause 8(2) of the SRD SEPP provides that if only part of a proposed development is SSD, the remainder of the development is also SSD unless the Secretary of the Department of Planning, Industry and the Environment determined under clause 8(2) of the SRD SEPP that the non-SSD component is not "sufficiently related" to the SSD component. Accordingly, all of the related components of the Proposal (being the landfilling, as well as the earthworks, site reprofiling, and the development of the Embellished Marang Parklands) may also be declared as SSD so long as they are "sufficiently related". All components of the Proposal (including the SSD and non-SSD components) are highly integrated and are critically reliant on each other to achieve the overall project objectives and to rehabilitate Lots 1122 and 1123 and Lot 6 for public open space and recreational uses to deliver the Embellished Marang Parklands. This is addressed further in **Section 5.2.1** of this EIS.

A request for the issue of Secretary's Environmental Assessment Requirements (SEARs) was submitted on 10 December 2019. Accordingly, the SEARs were issued on 14 February 2020. This submission has been prepared in accordance with the Department's guidelines for SSD applications lodged under Part 4 of the EP&A Act, and addresses the issues raised in the SEARs.

The Proposal is consistent with the requirements of all relevant SEPPs. The Proposal Site is zoned 7(b) Special Development Zone under *State Environmental Planning Policy (Kurnell Peninsula) 1989*. The majority of the Proposal is permissible with consent and meets the objectives of the subject zone, including the extent of the resource recovery facility that treats, stores or disposes of natural excavated material and demolition materials and the proposed parklands that use those materials for land forming. The component of the Proposal which is not permissible is the receipt and disposal of non-natural excavated material and demolition materials (for example, C&I waste) by way of application to land. This is further explained in **Section 5.3**.

Pursuant to Section 4.38 of the EP&A Act, development consent can still be granted for SSD that is partly permissible and partly prohibited. As such, because the Proposal is for SSD and is partly (and in fact largely) permissible, development consent can be granted for the Proposal. This is further explained in **Section 5.3.3**.

Environmental Impacts and Mitigation Measures

This EIS provides an assessment of the environmental impacts of the Proposal in accordance with the SEARs and sets out the undertakings made by Breen to manage and minimise potential impacts arising from the development.

Waste Management

The New Resource Recovery Facility will receive, handle, store, recover, recycle waste for a number of waste streams, and where necessary will dispose of residual waste by landfilling. It will be operated in accordance with the EPA (2018) *Standards for managing construction waste* in NSW. Waste will also be generated during construction, which will either be stored then processed at the New Resource Recovery Facility or disposed of in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014). Any potential waste impacts will be mitigated by mitigation measures that are recommended to ensure that waste will be managed appropriately in accordance with these standards.

Soil and Water

No significant contamination constraints to the Proposal have been identified based on the available data. It is considered that the Proposal Site can be made suitable for its intended uses (including for the purposes of SEPP55) subject to the mitigation measures described in this document being implemented. This will need to include the development and implementation of a Site Closure Plan in accordance with NSW EPA guidelines, which outlines requirements for capping, landfill gas management and long-term environmental monitoring.

Recovered materials produced by the New Resource Recovery Facility will form part of the proposed growing media in the Embellished Marang Parklands and be placed above the low permeability clay capping layer for the Proposal Site. The recovered material proposed to be used for reprofiling the Embellished Marang Parklands is considered unlikely to pose ecological and/or human health risks during future works and during future use of the Embellished Marang Parklands as recreational open space.

The proposed stormwater treatment train would consist of grass swales, bio-retention area and infiltration basins. The infiltration basins will be located at the low points of the catchment, away from the proposed clay capping layer to allow water to infiltrate through the existing sandy soil. A stormwater pit and pipe network would be designed to drain the paved areas at the Playing Fields and New Resource Recovery Facility, then convey the runoff to the infiltration basins. Filter cartridges would also be used as source control to reduce the volume of contaminants into the bio retention basin, further increasing the performance of the treatment train.

Modelling was undertaken to characterise the water quality at discharge locations, with results indicating that the modelled reduction rates exceeded the target reduction requirements for the key pollutants – total suspended solids, total phosphorus, total nitrogen and gross pollutants.

The proposed landform would increase the area discharging surface water to the south towards the Cronulla Sand Dunes and State Park, however, the depth and velocity of peak flows across the boundaries would be less under the proposed developed landform due to surface water runoff being spread across the boundaries, rather than concentrated over a shorter length as would be the result of the currently approved landform. Overland stormwater flows to the north and east towards Captain Cook Drive and the Green Hills Sports Fields would be lower, which would have a positive impact on stormwater drainage within and adjacent to the road reserve.

There will be a large overall reduction in the generation of leachate associated with the Proposal relative to existing conditions, which is expected to result in groundwater of improved quality and lower volume migrating off-site. This effect will be most evident in western areas of the Proposal Site and represents a positive impact of the Proposal. The water quality produced by the growing medium used to create the Marang Parkland is also expected to be markedly better than existing leachate quality. Leachate will continue to be managed in an integrated way across the entire Proposal Site.

The containment of runoff within the Proposal Site (via swales, bunds and infiltration basins) reduces flood levels on Lindum Drive and results in localised areas of Captain Cook Drive being no longer flooded during a 1% Annual Exceedance Probability (AEP) flood event, reducing the potential flood hazard to motorists. The proposed fill in the western parts of the Proposal Site contributes to a minor increase in peak flood levels south west of the site boundary in the 1% AEP event. The impact is less than 0.05 m, does not impact on roads or dwellings, and does not increase the flood hazard. It is therefore proposed that this impact will be mitigated by internal drainage and is to be resolved at the detailed design stage.

Heritage

The Proposal Site does not contain any heritage items and is not located within a heritage conservation area. Further, it is a heavily remodelled and degraded dune-scape, which has been subject of extensive historical sand mining activities and subsequent infilling with various waste materials since the 1960s. Therefore, the Proposal Site is not considered to exhibit any inherent heritage value or historical archaeological potential. As such, the Proposal will not have any direct heritage impact to the Proposal Site.

The Proposal is also unlikely to impact the heritage significance of surrounding heritage items including the Cronulla Sand Dune & Wanda Beach Coastal Landscape, Kamay Botany Bay National Park & Towra point Nature Reserve, and Cronulla Sewage Treatment Plant.

Overall, the Proposal will have a positive impact on the heritage significance of surrounding heritage items as the rehabilitation, renewal and activation of the Embellished Marang Parklands will enhance the area and provide a more appropriate, compatible and sympathetic setting for the adjacent heritage-listed landscape dunes and nature reserves.

Aboriginal Cultural Heritage

The Proposal Site and broader Kurnell Peninsula have been assessed as having a considerable level of Aboriginal heritage significance. However, the historical use of the Proposal Site for sand mining has generally removed the potential for any Aboriginal heritage sensitivity. Moreover, the Proposal largely involves filling above the potential level of any potential Aboriginal heritage remains and thus does not result in any potential impact. The only potential direct impact to Aboriginal heritage on the Proposal Site is the proposed excavation of the new infiltration ponds. The location of those infiltration ponds has been redesigned to avoid any potential impacts to Aboriginal heritage.

As a result, the Proposal will not result in any adverse impacts to Aboriginal cultural heritage. The Proposal will also result in positive Aboriginal heritage impact as the newly created public lands will improve Aboriginal community access to the peninsula and foster a sense of the broader natural and cultural landscape that has been absent from this part of the peninsula for many decades.

Visual Impact

The Proposal involves a change to the existing and approved landform. The majority of the visual impacts as a result of the Proposal are generally moderate to low in scale. At a certain viewpoint, the landform proposed by the Proposal will dominate the view and result in a change that will in part be alleviated by vegetation screening. The degree of all visual impacts can generally be lowered through mitigation measures such as tree and shrub planting.

Air Quality and Odour

Adopting a conservative assessment, the Proposal has the potential to generate minor impacts associated with dust, particulate matter and deposited dust from the construction of the New Resource Recovery Facility and the Embellished Marang Parklands. These impacts will be mitigated through a number of measures related to traffic movements, materials handling, minimisation of exposed areas, visual and climate monitoring and staff training.

Odour impacts associated with the Proposal are largely limited to the Resource Management Facility operations on Lot 5. The impacts have been modelled and the predicted ground level odour concentrations associated with the operation of the Proposal are substantially below the impact assessment criteria at all nearby sensitive receptors.

Greenhouse Gas Emissions

The Proposal will result in a positive impact on overall greenhouse gas emissions by diverting waste from landfill and reducing the need for new raw material generation. While the construction and operation of the Proposal have potential to generate Scope 1 and Scope 2 Greenhouse gas emissions, any emissions will only account for an insignificant 0.04% of current NSW emissions. Energy efficient building design features and renewable energy sources are recommended as mitigation measures to further minimise greenhouse gas emissions.

Noise and Vibration

Noise impacts from the construction and operation of the Proposal have been assessed. The predicted cumulative noise impacts will remain below the project noise trigger levels and construction noise management levels for the most sensitive residential receivers. Therefore, the Proposal does not result in an unacceptable acoustic impact to surrounding sensitive receivers.

Traffic and Transport

The New Resource Recovery Facility will result in an increase in the number of vehicles transporting materials to and from the Proposal Site. However, an analysis of all potential transport related impacts shows that the traffic generated by the Proposal is expected to have a minimal impact to the surrounding road network in terms of traffic flow efficiency and road safety.

Fire and Incident Management

The Proposal Site is classified as bushfire prone land due to the presence within parts of the Proposal Site of bushfire-prone Vegetation Category 2, and also the proximity of the Proposal Site to bushfire-prone Vegetation

Category 2 on adjacent land. The Proposal will meet the aims and objectives of the Planning for Bushfire Protection guidelines. The requirements of, and the acceptable solutions identified in, the guidelines in relation to asset protection zones, public roads and accessibility, provision of services can be met in full for the proposed development, with the recommended design requirements.

The storage and processing of waste has the potential to generate fire safety impacts. The Proposal will include a Fire Safety System, fire protection equipment, and achieve compliance with the FRNSW Fire Safety in Waste Facilities Guidelines and fire safety requirements of the Building Code of Australia.

Hazards

The volumes to be stored at the New Resource Recovery Facility will be managed to be substantially less than the relevant minimum threshold set out in Applying SEPP 33. As such, the facility would not be classified as potentially hazardous, and no further assessment under SEPP 33 (such as a Preliminary Hazard Analysis) is required.

The New Resource Recovery Facility will continue to utilise the existing EPLs applicable to the Proposal Site, noting these relate to the acceptance of waste material. While the New Resource Recovery Facility is, under SEPP33, considered to be potentially offensive, the assessments prepared as part of this EIS indicate that the discharges from Lot 5 would not be considered to be potentially offensive and it is expected that the facility would continue to be able to obtain the necessary EPLs.

Coastal Management

The Proposal Site includes land mapped as Littoral Rainforest Proximity Area, Coastal Wetland Proximity area, Coastal Use Area, and Coastal Environment Area under the Land Application Map of the *State Environmental Planning Policy (Coastal Management) 2018* (Coastal Management SEPP). The Proposal achieves compliance with all the relevant clauses of the Coastal Management SEPP and does not cause any material impact to the nearby littoral rainforest and coastal wetland.

Biodiversity

The Proposal Site consists mostly of cleared land or exotic vegetation cover. However, native vegetation on the Proposal Site is present in scattered areas of regeneration comprised of opportunistic species, including two Plant Community Types (PCTs).

The proposed removal of the PCTs do not meet thresholds that require offsets for their removal. However, 11 species credits are required to offset the proposed removal of 7.53ha of potential Green and Golden Bell Frog stepping-stone dispersal habitat.

No Matters of National Environmental Significance under the EPBC Act are significantly impacted as a result of the Proposal.

Mitigation measures are proposed to minimise impacts to existing biodiversity on the Proposal Site during construction.

Social and Economic Impact

The Proposal will provide a social benefit to the community through the creation of jobs, and increased capacity for recycling, enhanced sustainability initiatives, and provision of expanded open space delivering benefits to health and wellbeing.

The Proposal is also likely to result in significant positive economic benefits including the provision of additional employment opportunities at the Proposal Site, and generate benefits to the local and regional population through improved recycling and waste management practices, but also via the resulting creation of a regional park and associated outdoor facilities that will have a broad appeal to the community.

Conclusion and Justification

The EIS addresses the SEARs, and the Proposal provides for a Resource Management Facility across the Proposal Site, with the co-location of a New Resource Recovery Facility, with a Waste Disposal Facility (i.e. landfill), and the Embellished Marang Parklands

Best practice resource recovery will be achieved through a purpose-built New Resource Recovery Facility that will enable significant diversion of waste away from landfill and contribute to achieving the NSW Government's resource recovery targets.

Through the Embellished Marang Parklands, the Proposal will also deliver high quality activated open space and parklands envisaged in the VPA that will contribute a significant and prominent new regional parkland for the benefit of the entire Sutherland Shire community.

The Proposal promotes the orderly and economic use of the Proposal Site as it caters to and supports the ongoing and planned development of the Embellished Marang Parklands, while ensuring a modern and efficient Resource Management Facility continues to operate on the Proposal Site. The Proposal will improve the management and recovery of the State's resources. The Proposal will also improve the conservation of threatened and other species of native flora and fauna and ecological communities and their habitats by virtue of the VPA landscape and revegetation works enabled by the Proposal.

The potential impacts of the Proposal are acceptable and are able to be managed. Given the planning merits of the Proposal, the Proposal warrants approval.

1.0 Introduction

This Environmental Impact Statement (EIS) is submitted to the Department of Planning, Industry and Environment (DPIE) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in support of an application for State Significant Development (SSD) located on Lot 1122, Lot 1123, Lot 5 and Lot 6 at Captain Cook Drive, Kurnell (being the Proposal Site).

The Proposal comprises a new integrated Resource Management Facility, being the New Resource Recovery Facility, with associated on-site disposal of residual wastes, and land rehabilitation activities using recovered resources for the delivery of the publicly accessible Embellished Marang Parklands.

The EIS has been prepared by Ethos Urban on behalf of Breen Resources Limited, and is based on the Architectural plans prepared by Ahrens (**Appendix A**), the Landscape Plan prepared by Clouston Associates (**Appendix C**) and other supporting technical information appended to the EIS (see Table of Contents). This EIS should be read in conjunction with the supporting information and plans appended to and accompanying this report.

1.1 Overview of the Proposal

The Proposal Site, which is the subject of the Proposal, currently contains the Existing Breen Resources Facility. The Existing Breen Resources Facility receives excavated materials and selected building and demolition type materials, and carries out the restoration of the Proposal Site by application of these materials to the land pursuant to an existing development consent, being DA/269/90.

Parts of the Proposal Site, including Lot 1122 and Lot 1123, and Lot 6, are also subject to a Voluntary Planning Agreement (VPA), which, in part, requires the provision of regional recreational facilities and parklands (named by Sutherland Shire Council (Council) as the Marang Parklands) on those parcels of land. Under the VPA, once completed, the Marang Parklands and associated Playing Fields will be transferred to Council for ongoing use and management. The Proposal includes further improvements and embellishments to the future Marang Parklands, if this SSDA is approved, to provide a superior parkland to that proposed under the VPA, referred to as the **Embellished Marang Parklands**.

The Proposal involves the construction and operation of a new integrated Resource Management Facility that will facilitate the consolidation of all functional waste management activities within the eastern part of the Proposal Site (being Lot 5). To facilitate delivery of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6, parts of the Existing Breen Resources Facility will need to be demolished and further capping and profiling will need to be undertaken. The existing facility's infrastructure is also located on land that, subject to approval of this Proposal, will become part of the Embellished Marang Parklands. Separate consents provide approval for delivery of Stages 2 and 3 of the Playing Fields on a portion of this land as well.

Consolidation of waste management activities within the eastern part of the Proposal Site (being Lot 5 which is not subject to the VPA), coupled with the development of the New Resource Recovery Facility, would allow Breen to deliver this activated recreational space and other publicly accessible parklands (being the Embellished Marang Parklands) in the western part of the Proposal Site to the community. This would enable Breen to exceed the commitments made in the VPA.

The Proposal therefore involves the following key integrated components, being:

- Construction and operation of a Resource Management Facility, comprising:
 - A New Resource Recovery Facility on the eastern part of the Proposal Site (Lot 5), including consolidation of existing waste management activities within this part of the Proposal Site;
 - A Waste Disposal Facility being for the continuation of current land restoration, landfilling and contouring operations at the Proposal Site by permanent application of some of the residual waste materials from the New Resource Recovery Facility to land on Lot 5;
- Demolition and/or relocation to Lot 5 (as required) of the Existing Breen Resources Facility on Lots 1122, 1123 and 6 (this includes those parts of Lots 1122, 1123 and 6 that will comprise the Playing Fields);
- Water usage and management across the entirety of the Proposal Site and adjacent playing fields;

- Ongoing long-term monitoring of the Former Landfill Site leveraging the environmental benefits and synergies of utilising the same personnel, plant, material and infrastructure;
- Re-profiling of parts of the Proposal Site within Lots 1122, 1123 and 6, with some existing waste materials from those lots. Breen confirms that no new waste is being received on Lots 1122, 1123 and 6 for the purposes of landfilling on these lots so as to facilitate the delivery of the Embellished Marang Parklands and Playing Fields;
- Capping and contouring areas of the Proposal Site within Lots 1122, 1123, and Lot 6, with suitable material recovered from the New Resource Recovery Facility and some existing materials, with some specific material imported to the Proposal Site for capping and covering, such as low permeability clay to enable the delivery of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6; and
- Delivery of activated community space in the form of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6.

1.2 Background to the Proposal

1.2.1 Introduction to Breen

Breen Group is an Australian entity, owned and operated by the Breen family for seventy years with around fifty employees. The group comprises two distinct businesses; Breen Property (a property development business) and Breen Resources (a waste management business). The company connects the knowledge, skill, and experience of its people with innovative practices, technical capabilities, and robust systems to create outstanding results for the community and environment.

Breen Resources is based at Kurnell and specialises in processing Construction and Demolition waste, and producing a range of soils, crushed aggregates, timber and metals as recycled products. These products are substitutes for materials that would otherwise be cut or dug from our environment or disposed at a landfill.

Currently, Breen Resources is recovering over 80% of the waste stream, with an unblemished record with the NSW EPA. Breen Resources is committed to providing cost-effective, convenient, and sustainable waste management solutions to its customers and the community in which it operates. Breen Resources is contributing to the reprocessing of waste material from a large number of Sydney's major infrastructure projects. These include: WestConnex, Sydney Metro Rail, Central Station redevelopment, Kingsford Smith Airport roadworks, North Sydney bus lane development, RMS Interchange at St Peters, M4 Link roads, RMS Northern Corridor works at Chatswood.

1.2.2 DA/269/90

On 6 September 1990, Sutherland Shire Council (Council) granted consent to DA/269/90, which provides for the establishment of a depot to receive excavated materials and selected demolition materials (including bricks, tiles and concrete spall), and for the restoration of the land by application of the materials to the land. The 'depot' and land restoration activities together comprise the Existing Breen Resources Facility, which is located on the Proposal Site. Breen has been continuously operating the Existing Breen Resources Facility since its commencement, and the facility remains fully operational. Prior to the current use, the Proposal Site was subject to extensive sand mining by Breen.

Whilst the DA/269/90 development consent did not condition any specific requirements for the final landform, it required the subsequent preparation of a final landform plan which was to be achieved by the Breen landfilling and restoration activities. In accordance with those conditions, Hassell Pty Ltd prepared the 'Kurnell Landfill Landscape Master Plan' in May 1997 (the Hassell Plan), which has formed the basis for the final contouring of the Proposal Site which is currently ongoing. The Hassell Plan documented a landform that was intended to replicate the pre-existing landform that was expected to have existed prior to sand mining at the Proposal Site, but was not based on any detailed understanding of the future development outcome for the Proposal Site (including the works required by the VPA). A copy of the development consent DA/269/90 and the approved Hassell Plan are provided at **Appendix Z**.

1.2.3 Rezoning

In September 2008, a joint rezoning proposal was submitted to Council by two of Breen's related entities, (Breen Holdings Pty Ltd and Consolidated Development Pty Ltd (now renamed Breen Property Pty Ltd (Breen Property)) and Australand Kurnell Pty Ltd (now renamed Frasers Property Australia Limited ('Frasers')) to rezone 124 hectares of industrial and open space land as follows:

- 40ha to E2 Environmental Conservation zone (32%);
- 51ha to RE1 Public Recreation zone (41%); and
- 33ha to E4 Environmental Living zone (27%).

The rezoning was approved by the Minister for Planning in August 2010. However, this rezoning was a delayed rezoning, which has not yet been completed, and so the Proposal Site is currently zoned 7(b) Special Development Zone under the *State Environmental Planning Policy (Kurnell Peninsula) 1989* (NSW) (Kurnell SEPP). The Kurnell SEPP continues to apply to the Proposal Site.

1.2.4 Voluntary Planning Agreement

In June 2010, a VPA was entered into between Breen Holdings Pty Ltd (subsequently novated to Breen Property) and Australand Kurnell Pty Ltd (now renamed Frasers Property Australia Limited) and Council. At no cost to the community, the legally binding VPA required Breen Property and Frasers to deliver the following:

- A staged transfer of 91ha of land to public ownership for the purpose of environmental conservation and public open space;
- Construction of regional recreation facilities, including 10 playing fields, a skate park, 3 amenities buildings, walking and cycling tracks, picnic facilities and associated parking for over 400 cars; and
- Rehabilitation and landscaping of degraded land previously dredged for sand mining to support an ecological 'green corridor' stretching from the Towra Point Nature Reserve to the ocean at Wanda Beach.

The delivery of the land to public ownership and associated works is currently being undertaken in accordance with the VPA. Development Application DA11-0665, which was approved by Council on 23 April 2012, provides for the first three stages of the works required by the VPA, including a concept masterplan for ten sporting fields, skate park, and associated parking, lighting, amenities building; habitat rehabilitation, and stormwater treatment facilities.

The first stage of the recreational facilities approved under DA11-0665 has already been developed. This comprises Sporting Field No. 1, two hockey fields, the skate park, car parking, and associated amenities and landscaping. Subsequent stages of the concept masterplan for DA11-0665 are located on parts of Lots 1122 and 1123, and part of Lot 6, and include seven more playing fields, as well as additional car parking and amenities, for which detailed development consent has already been obtained.

The concept masterplan approved under DA11-0665 does not include the Marang Parklands area which are now subject of this SSDA. Further, Breen's proposed Embellished Marang Parkland delivers a range of embellishments significantly over and above the 2010 VPA commitments. As such, a new VPA is proposed to be entered into by Breen in order to reflect the Embellished Marang Parklands design that is subject of this SSDA. The proposed New VPA will reflect the inter-connectedness between the delivery and ongoing operation of the Embellished Marang Parklands with the New Resource Recovery Facility and waste disposal facility in terms of sustainability, delivery timeframes and the supply of materials and services which make both the proposed Resource Management Facility and the proposed Embellished Marang Parklands viable (see also **Section 4.11** below).

1.3 Approvals Process

The SSDA for the Proposal has been submitted pursuant to Part 4 of the EP&A Act, with the public exhibition of the EIS pursuant to Section 4.39 of the EP&A Act and Division 5 and 6 of the EP&A Regulation. The Consent Authority for the SSDA will be:

- The Independent Planning Commission if Council objects to the Proposal or if there are more than 10 objections from other stakeholders, or;
- A delegate of the Minister for Planning, being a senior officer of the Department of Planning, Industry and Environment.

The appropriate delegated determining authority will be established after the public exhibition period.

1.4 Secretary's Environmental Assessment Requirements

This EIS assesses the environmental impacts of the Proposal. The EIS has been prepared in accordance with the requirements of Part 4 of the EP&A Act, Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), and the Secretary's Environmental Assessment Requirements (SEARs) for the preparation of the EIS.

In accordance with Section 4.39 of the EP&A Act, the Secretary of the Department of Planning, Industry and Environment issued the requirements for the preparation of the EIS on 14 February 2020. A copy of the SEARs is included at **Appendix D**.

Table 1 provides a detailed summary of the individual matters listed in the SEARs and identifies where each of these requirements has been addressed in this EIS and the accompanying technical studies.

The relevant strategies, environmental planning instruments, policies and guidelines as set out in the SEARs are addressed in **Section 5.0** of the EIS.

Sections 7.0 to 20.0 set out the technical environmental assessments drawn from the relevant specialist investigations appended to the EIS.

A consolidated schedule of mitigation measures is provided at **Section 21.0**.

Table 1 Secretary's Environmental Assessment Requirements

Requirement	Location in Environmental Assessment
General	
The Environmental Impact Statement (EIS) must address the <i>Environmental Planning and Assessment Act 1979</i> and meet the minimum form and content requirements in clauses 6 and 7 of Schedule 2 the Environmental Planning and Assessment Regulation 2000.	Environmental Impact Statement
In addition, the EIS must include a:	
- detailed description of the development, including: - accurate history of the site, including development consents; - need for the proposed development; - justification for the proposed development; - staging of the development; - interactions between the development and existing, approved and proposed operations in the vicinity of the site; - interactions between the development and the existing Voluntary Planning Agreement (VPA) - plans of any proposed building works; and - contributions required to offset the proposal. - consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments; - consideration of issues discussed in Attachment 2 (public authority responses to key issues); - risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment; - detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes: - a description of the existing environment, using sufficient baseline data; - an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and - a description of the measures that would be implemented to avoid, minimise, mitigate and if necessary, offset the potential impacts of the	Section 1.2 Section 3.0 Section 22.0 Section 4.8 Section 4.2, 4.9 Section 1.2.4, 4.4 Appendix A – Architectural Plans (Ahrens) Section 4.11 Section 5.0 Section 6.0 Section 22.1 Section 7.0 to Section 20.0

Requirement	Location in Environmental Assessment	
development, including proposals for adaptive management and/or contingency plans to manage significant risks to the environment. a consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS.	Section 21.0	
The EIS must also be accompanied by a report from a qualified quantity surveyor providing: - a detailed calculation of the capital investment value (CIV) of the proposal as defined in clause 3 of the Environmental Planning and Assessment Regulation 2000, including details of all components of the CIV; - a close estimate of the jobs that will be created by the development during the construction and operational phases of the development; and - certification that the information provided is accurate at the date of preparation.	Appendix W – Quantity Surveyors Report (Vasey Consulting)	
	Section 20.3	
	Appendix W – Quantity Surveyors Report (Vasey Consulting)	
Key Issues	Report / EIS	Technical Study
Suitability of the Site - details of all development consents and approved plans previously and/or currently applicable to the site, including for the current waste management operations; - details of all legal requirements to deliver the recreation facilities and parklands, including any current Voluntary Planning Agreement (VPA); - details of phasing or staging of the development in order to deliver the proposed recreation facilities and parklands including relocating the existing waste management facility; and - a detailed justification that the site can accommodate the proposed resource recovery facility, having regard to the scope of the proposed operation, its environmental impacts and relevant mitigation measures.	Section 1.2 and Section 2.4 Section 1.2.3 and Section 2.4.4 Section 4.8 Section 22.0	
Community and Stakeholder Engagement - a detailed community and stakeholder participation strategy which identifies who in the community has been consulted and a justification for their selection, other stakeholders consulted and the form(s) of the consultation, including a justification for this approach; - a report on the results of the implementation of the strategy including issues raised by the community and surrounding landowners and occupiers that may be impacted by the proposal; - details of how issues raised during community and stakeholder consultation have been addressed and whether they have resulted in changes to the proposal; - details of consultation regarding the approach to the provision of recreation facilities and parklands and the need for any variation to the VPA, including evidence of consultation with Council; and - details of the proposed approach to future community and stakeholder engagement based on the results of the consultation.	Section 6.0	Appendix E – Community and Stakeholder Participation Strategy (KJA)
Waste Management - details of the source of the waste streams to justify the need for the proposed processing capacity; - a description of each of the waste streams that would be accepted at the site including maximum daily, weekly and annual throughputs and the maximum size for stockpiles; - a description of waste processing operations (including flow diagrams for each waste stream), including a description of the technology to be installed, resource outputs and the quality control measures that would be implemented; - details of how waste would be stored (including the maximum daily storage capacity of the site) and handled on site, and transported to and from the site including details of how the receipt of non-conforming waste would be dealt with;	Section 7.0 Section 7.2.1, 7.3.1 Section 7.3.2 Section 7.3.4, 7.3.5, 7.3.6, 7.3.7 Section 7.3.3	

Requirement	Location in Environmental Assessment	
- details of the development's waste tracking system for incoming and outgoing waste; - details of the quality of separated material produced and final dispatch locations; - details of the waste management strategy for construction and ongoing operational waste generated; - the measures that would be implemented to ensure that the development is consistent with the aims, objectives and guidance in the NSW Waste Avoidance and Resource Recovery Strategy 2014-2021; and - details of consistency with the EPA's Standards for Managing Construction Waste in NSW (November 2018).	Section 7.3.7 Section 7.3.7 Section 7.3.2 Section 7.4 Section 7.4	
Soil and Water - characterisation of the nature and extent of any contamination of the site based on the historic use as a landfill and a description of proposed measures; - an assessment of potential impacts to soil and water resources, topography, hydrology, groundwater, drainage lines, watercourses and riparian lands on or nearby the site, including mapping and description of existing background conditions and cumulative impacts; - a detailed site water balance including identification of water requirements for the life of the project, measures that would be implemented to ensure an adequate and secure water supply is available for the proposal and a detailed description of the measures to minimise the water use at the site; - characterisation of water quality at the point of discharge to surface and/or groundwater against the relevant water quality criteria (including details of the contaminants of concern that may leach from the waste into the wastewater and proposed mitigation measures to manage any impacts to receiving waters and monitoring activities and methodologies); - details of stormwater/wastewater management system including the capacity of onsite detention system(s), onsite sewage management and measures to treat, reuse or dispose of water; - a description of erosion and sediment controls; and - a detailed flooding assessment.	Section 8.0. Section 8.1 Section 8.3, 8.4 Section 8.2 Section 8.3, 8.4 Section 8.3 Section 8.3, 8.6 Section 8.5	Appendix G – Contamination Status Report (GHD) Appendix H Section 4.1 – Surface Water Management Assessment (Cardno) Appendix I Section 5 – Groundwater Report (GHD) Appendix T Section 5.2 – Biodiversity Development Assessment Report (Eco Logical) Appendix H Section 5.5 – Surface Water Management Assessment (Cardno) Appendix H Section 6 – Surface Water Management Assessment (Cardno) Appendix I Section 5 – Groundwater Report (GHD) Appendix H Section 5 – Surface Water Management Assessment (Cardno) Appendix H Section 7 – Surface Water Management Assessment (Cardno) Appendix H Section 8 – Surface Water Management Assessment (Cardno)
Heritage and Aboriginal Cultural Heritage - identification and description of the relevant non-Aboriginal heritage items, including built heritage, landscapes and archaeology, that exist across the development - documented in a Statement of Heritage Impact (SOHI); - a description and assessment of potential impacts on non-Aboriginal heritage item(s) such as Cronulla sand dune and Wanda Beach coastal landscape, Towra Point Nature Reserve and Quibray Bay;	Section 9.0, 10.0 Section 9.1 Section 9.3	Appendix J Section 3 – Statement of Heritage Impact (Coast) Appendix J Section 7 – Statement of Heritage Impact (Coast)

Requirement	Location in Environmental Assessment	
- measures to avoid and/or mitigate the impact on the heritage significance or cultural heritage values of the site and the surrounding heritage item(s); - identification and description of the Aboriginal cultural heritage values that exist across the development - documented in an Aboriginal Cultural Heritage Assessment Report (ACHAR); - consultation with Aboriginal people must be undertaken and documented in the ACHAR; and - a description and assessment of potential impacts on Aboriginal cultural heritage values such as Cronulla Sand Dune and Wanda Beach Coastal Landscape.	Section 9.4 Section 10.2 Section 10.1 Section 10.3	Appendix J Section 8 – Statement of Heritage Impact (Coast) Appendix K Section 3, 4, 5 – Aboriginal Cultural Heritage Assessment (Coast) Appendix K Section 2 – Aboriginal Cultural Heritage Assessment (Coast) Appendix K Section 6 – Statement of Heritage Impact (Coast)
Visual - a detailed design analysis of the proposed development with reference to the building form, height, setbacks, bulk and scale in the context of the immediate locality, the wider area and the desired future character of the area, including views, vistas, open space and the public domain - a detailed assessment (including photomontages and perspectives) of the facility (buildings and storage areas) including height, colour, scale, building materials and finishes, signage and lighting, particularly from nearby public receivers and significant or important vantage points of the broader public domain - consideration of the layout and design of the development having regard to the surrounding vehicular, pedestrian and cycling networks	Section 11.0	Appendix L – Visual Impact Assessment (Clouston Associates)
Air Quality and Odour - a quantitative assessment of the potential air quality, dust and odour impacts of the development in accordance with relevant Environment Protection Authority guidelines; - the details of buildings and air handling systems and strong justification for any material handling, processing or stockpiling external to buildings; - a greenhouse gas assessment; and - details of proposed mitigation, management and monitoring measures.	Section 12.0, 13.0 Section 12.3 Section 12.3 Section 13.0 Section 12.4, 13.4	Appendix M Section 5, 6 – Air Quality Assessment (Wilkinson Murray) Appendix M Section 6, 8 – Air Quality Assessment (Wilkinson Murray) Appendix M Section 9 – Air Quality Assessment (Wilkinson Murray) Appendix M Section 8 – Air Quality Assessment (Wilkinson Murray)
Noise and Vibration - a quantitative assessment of potential construction, operational and transport noise and vibration impacts in accordance with relevant Environment Protection Authority guidelines and undertaken by a suitably qualified and experienced person(s); and - details and justification of the proposed noise mitigation and monitoring measures.	Section 14.0 Section 14.3 Section 14.4	Appendix N Section 4, 5 – Noise and Vibration Impact Assessment (Wilkinson Murray) Appendix N Section 6 – Noise and Vibration Impact Assessment (Wilkinson Murray)
Traffic and Transport - details of all traffic types and volumes likely to be generated during construction and operation, including a description of haul routes. Traffic flows are to be shown diagrammatically to a level of detail sufficient for easy interpretation; - plans demonstrating how all vehicles likely to be generated during construction and operation and awaiting loading, unloading or servicing can be accommodated on the site to avoid queuing in the street network; - an assessment of the predicted impacts of this traffic on road safety and the capacity of the road network, including consideration of cumulative traffic impacts at key intersections using SIDRA or similar traffic model;	Section 15.0 Section 15.3	Appendix O Section 7 – Traffic and Transport Technical Study (Cardno) Appendix O Section 7.8 – Traffic and Transport Technical Study (Cardno) Appendix O Section 7.9 – Traffic and Transport Technical Study (Cardno)

Requirement	Location in Environmental Assessment	
- swept path diagrams depicting vehicles entering, exiting and manoeuvring throughout the site; - plans of any proposed road upgrades, infrastructure works or new roads required for the development; and - an assessment of potential impacts on local road pavement lifespan.	Section 4.7 Section 15.3	Appendix O (Appendix D) – Traffic and Transport Technical Study (Cardno) Appendix O (Appendix D) – Traffic and Transport Technical Study (Cardno) Appendix O Section 7.10 – Traffic and Transport Technical Study (Cardno)
Fire and Incident Management - identification of the aggregate quantities of combustible waste products to be stockpiled at any one time; - technical information on the environmental protection equipment to be installed on the premises such as air, water and noise controls, spill clean-up equipment and fire (including location of fire hydrants and water flow rates at the hydrant) management and containment measures; - details regarding the fire hydrant system and its minimum water supply capabilities appropriate to the site's largest stockpile fire load; - details of size and volume of stockpiles and their management and separation to minimise fire spread and facilitate emergency vehicle access; - consideration of consistency with NSW Fire & Rescue Fire Safety Guideline – Fire Safety in Waste Facilities (October 2019); and - detailed information relating to the proposed structures addressing relevant levels of compliance with Volume One of the National Construction Code (NCC).	Section 16.0 Section 16.2.1 Section 16.2.2 Section 16.2.2 Section 16.2.1 Section 16.2.3 Section 16.2.4	Appendix Q – Fire Safety Review (GHD) Appendix R – Building Code of Australia Assessment Statement of Compliance (DPC)
Hazard a preliminary risk screening completed in accordance with <i>State Environmental Planning Policy No. 33 – Hazardous and Offensive Development</i> and Applying SEPP 33 (DoP, 2011), with a clear indication of class, quantity and location of all dangerous goods and hazardous materials associated with the development. Should preliminary screening indicate that the project is "potentially hazardous" a Preliminary Hazard Analysis (PHA) must be prepared in accordance with <i>Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis</i> (DoP, 2011) and <i>Multi-Level Risk Assessment</i> (DoP, 2011).	Section 17.0	
Coastal Management an assessment of the potential impacts on coastal wetlands and littoral rainforests in accordance with the <i>Coastal Management Act 2016</i>.	Section 18.0	Appendix S Section 6.2 – Biodiversity Development Assessment Report (Eco Logical)
Biodiversity an assessment of the biodiversity impacts in accordance with the Biodiversity Assessment Method and documented in a <i>Biodiversity Development Assessment Report</i> (BDAR).	Section 19.0	Appendix S – Biodiversity Development Assessment Report (Eco Logical)
Plans and Documents	Report	Technical Study
The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the Environmental Planning and Assessment Regulation 2000. Provide these as part of the EIS rather than as separate documents. In addition, the EIS must include the following: - An existing site survey plan drawn at an appropriate scale illustrating: - the location of the land, boundary measurements, area (sqm) and north point - the existing levels of the land in relation to buildings and roads - location and height of existing structures on the site	The relevant plans, architectural drawings, diagrams and relevant documentation, are attached to the EIS as appendices.	Appendix F – Site Survey Plan (Cooper & Richards)

Requirement	Location in Environmental Assessment	
- location and height of adjacent buildings and private open space - all levels to be to Australian Height Datum (AHD) 2. Locality/context plan drawn at an appropriate scale should be submitted indicating: - significant local features such as heritage items - the location and uses of existing buildings, shopping and employment areas - traffic and road patterns, pedestrian routes and public transport nodes 3. Drawings at an appropriate scale illustrating: - detailed plans, sections and elevations of the existing building, which clearly show all proposed internal and external alterations and additions		Appendix A – Architectural Plans (Ahrens) Appendix A – Architectural Plans (Ahrens)
Consultation		
During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners. In particular you must consult with: - NSW Environment Protection Authority - Climate Change and Sustainability Division of the Department of Planning, Industry and Environment (formerly Office of Environment and Heritage) - Department of Industry - Transport for NSW - NSW Roads and Maritime Services - NSW Fire and Rescue - Sutherland Shire Council - Local community and other stakeholders. The EIS must describe the consultation process and the issues raised and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided. If you do not lodge a Development Application and EIS for the development within 2 years of the issue date of these SEARs, you must consult further with the Secretary in relation to the preparation of the EIS.	Section 6.0	Appendix E – Community and Stakeholder Participation Strategy (KJA)



Figure 2 Proposal Site Context Plan

Source: Nearmap edited by Ethos Urban

The Proposal Site is generally bounded to the north by Captain Cook Drive, providing access from North Cronulla through to the village of Kurnell, as well as the main access to the Existing Breen Resources Facility. Further to the north of Captain Cook Drive are the foreshores and waters of Botany Bay, including the Towra Point Nature Reserve.

New playing fields and recreational facilities the subject of DA11-0665 (and other associated development consents) have been delivered along the Captain Cook Drive frontage of the Proposal Site, in accordance with the VPA.



Figure 3 The Proposal Site sits to the south of Captain Cook Drive

Source: Nearmap and Ethos Urban

The Kurnell Peninsula is characterised by large-scale established industrial land uses, such as the Sydney Desalination Plant and former Caltex Refinery to the east of the Proposal Site, as well as smaller industrial warehouses. The former Caltex Refinery has recently been demolished and converted into Australia's largest import fuel terminal.

2.2 Site Description

As described above, the Proposal Site, which is the subject of the Proposal, comprises Lot 1122, Lot 1123, Lot 5 and Lot 6. Details of the Proposal Site's context are provided in the following **Section 2.3**.

2.3 Proposal Site Context

The Proposal Site is generally bounded to the north by Captain Cook Drive, which provides access from North Cronulla through to the village of Kurnell, as well as the main access to the Existing Breen Resources Facility. Further to the north of Captain Cook Drive are the foreshores and waters of Botany Bay, including the Towra Point Nature Reserve. **Figure 4** below provides a location of key site photo views with **Figure 5** showing a view across the Proposal Site towards the Sydney CBD and Towra Point Nature Reserve.



Figure 4 The Proposal Site and surrounds – photo locations

Source: Nearmap and Ethos Urban



Figure 5 View 1: Looking north-east across Lot 5 in the foreground with the Towra Point Nature Reserve in the mid-ground and Botany Bay in the background

Source: Clouston Associates

Near the eastern end of the Proposal Site, Sporting Field No. 1 and the Skate Park have recently been constructed on Lot 1 DP 1101922 in accordance with the VPA, and are now operational. This new recreational area represents the closest existing sensitive receptor to the eastern part of the Proposal Site, where the New Resource Recovery Facility is proposed to be located.



Figure 6 View 2: Looking west from Captain Cook Drive along Lindum Road, with Playing Field No.1 in the background beyond the fence

Source: Clouston Associates



Figure 7 View 3: Looking south from Playing Fields No.1 across to the location of the New Resource Recovery Facility

Source: Clouston Associates

An electricity transmission line easement runs along the northern boundary of the Proposal Site, between the Proposal Site and the Sporting Field No. 1 and Skate Park recreational area, before traversing across the centre of the western part of the Proposal Site. The easement contains Ausgrid 132kV overhead electricity transmission lines. Further to the west, Hockey Fields No. 2 and No. 3 have also already been constructed on Lot 111 DP777967 and part of Lot 1123 DP794114, in accordance with the VPA and are now operational.



Figure 8 View 4: Looking east across the Existing Breen Resources Facility with Playing Fields No.2 and 3 in the mid-ground

Source: Coast Heritage (D Tuck)



Figure 9 View 5: Looking south from Hockey Fields No.2 and 3 across Lot 1123 and Lot 6

Source: Clouston Associates

To the south, the Proposal Site adjoins the Heritage Sand Dune and Cronulla State Park, which leads to Wanda Beach, fronting onto Bate Bay.



Figure 10 View 6: Looking north-east across the future playing fields on Lot 6, with the Heritage Dune behind

Source: Clouston Associates



Figure 11 View 7: Looking north-east across the Heritage Dune with the Proposal Site beyond

Source: Coast Heritage (D Tuck)

To the east, the Proposal Site is bounded by an unconstructed extension of Lindum Road, within which a pedestrian footpath has been constructed for beach and foreshore access. Beyond Lindum Road is a sand mining site (the Besmaw land) that is being progressively mined for building sand and backfilled with virgin excavated natural materials.

Beyond the sand mining site is the industrial area of Kurnell which contains a range of industrial facilities including the Desalination Plant and the Caltex Fuel Terminal. In addition to the village of Kurnell, there are a small number of residential dwellings located at Boat Harbour Park approximately 1.7km south-east of the Site.



Figure 12 View 8: View looking west across Lindum Road which sits behind the soil batter

Source: Clouston Associates

To the west, the Proposal Site adjoins the Charlotte Breen Memorial Reserve and the Sydney Water Cronulla wastewater treatment plant. Beyond Charlotte Breen Memorial Reserve to the south west is the new residential suburb of Greenhills Beach, comprising low density residential housing. The closest residences to the Proposal Site are located within Greenhills Beach, approximately 1.5km south-west of the New Resource Recovery Facility site (these residences are approximately 1km south-west of the landfill area and approximately 500 metres south-west of the proposed Embellish Marang Parklands).

2.4 Existing Breen Resources Facility Operations

2.4.1 Approvals

On 6 September 1990, Council granted consent to DA/269/90, which provides for the establishment of a depot to receive excavated materials and selected demolition type materials, and for the restoration of the land by application of the materials to the site. The 'depot' and land restoration activities together comprise the Existing Breen Resources Facility.

The DA/269/90 development consent did not condition any specific requirements for the final landform. However, condition 3c of the consent did require the preparation of a final landform plan, including an indication of the total volumes of material required to attain the final landform (the Hassell Plan).

The Existing Breen Resources Facility is the subject of two existing Environment Protection Licences (EPLs) in relation to the existing waste management activities (EPL 4608 and EPL 20697) issued by the Environment Protection Authority (EPA) under the *Protection of the Environment Operations Act 1997* (POEO Act). The Existing Breen Resources Facility is licensed to accept a range of waste materials, including natural and excavated materials and demolition type materials.



Figure 13 Context of the VPA

Source: Nearmap and Ethos Urban

2.4.2 Existing Site Access

Site access to the Existing Breen Resources Facility is via the existing driveway on Captain Cook Drive. The Existing Breen Resources Facility is currently open to the public from 6am to 4pm Monday to Friday, and 6am to 1.30pm on Saturday. The facility occasionally operates during evening and night-time periods when it is necessary to receive waste materials from 24-hour work sites.



Figure 14 Existing site access arrangements with Captain Cook Drive, looking north-west

Source: Clouston Associates

2.4.3 Waste Management Infrastructure

Landfilling on Lots 1122, 1123 and Lot 6 has ceased. The current active landfilling area is limited to the western part of Lot 5. However, the activities associated with the Existing Breen Resources Facility for receipt of the excavation and demolition type materials are still carried out on Lots 1122 and 1123 and Lot 5, where the Existing Breen Resources Facility's buildings, plant and infrastructure is currently located.

The activities at the Existing Breen Resources Facility include sorting, screening, and crushing the excavation and demolition materials to ensure they are suitable for land restoration and will be capable of achieving appropriate compaction requirements, and to achieve the EPA's resource recovery objectives. In particular, the activities carried out on the Existing Breen Resources Facility enable selected soil, gypsum, concrete and bricks to be recovered for beneficial reuse.

The key existing site infrastructure associated with the Existing Breen Resources Facility include:

- Weighbridge: Access to the Proposal Site for material drop off is gained via the weighbridge. The weighbridge is elevated allowing for both the weighing of vehicles/loads and as a material inspection point. Once loads have been inspected and weighed, they are directed to the relevant area prior to land restoration.
- Site office and storage area comprising:
 - Site office: Formed from two prefabricated structures, the site office is approximately 15 x 20 m (300 m²) and includes a lunch room, office, and bathrooms. The site office is serviced by a septic system.
 - Workshops: The workshops of approximately 15 x 20 m (300 m²) and 15 x 10 m (150m²) consisting of covered steel structures are used for various site maintenance activities and storing plant and equipment.
 - Storage yard: secure areas located around the workshops that provide for external storage and parking of heavy plant, equipment and site vehicles.
- Parking area: Approximately 25 x 65 m (1,625 m²) is available for informal parking by site personnel and visitors.

- **Wheel wash and stand pipe:** The wheel wash is used for removing soil/dust from public and commercial vehicles prior to departure from Proposal Site. A sedimentation, infiltration, and recovered water basin is used to manage wheel wash water, and for supply of the site water cart used for dust suppression.
- **Internal roadways:** The Proposal Site includes multiple internal roadways established for traffic to and from the site operations. Signage is erected to direct onsite traffic to/from relevant operational areas.

2.4.4 Voluntary Planning Agreement and Marang Parklands and Playing Fields

Part of the Proposal Site, including some of the land occupied by the Existing Breen Resources Facility, is subject to the VPA. The VPA requires the development of the Marang Parklands and Playing Fields on parts of the Proposal Site, including Playing Fields already approved under DA11-0665 (and other related development consents).

DA11-0665 is a Staged Development Consent from Sutherland Shire Council that applies across part of the Proposal Site (i.e. parts of Lot 1122, Lot 11223, Lot 5 and Lot 6) as well as adjacent land, which provides a masterplan for the construction of playing fields in accordance with VPA. Subsequent detailed consents are provided under the following related consents:

- DA11-0941 for Stage 1B playing fields bulk earthworks.
- DA12-0083 for Stage 2 playing fields and the roads, services and landscaping for Stage 1B.
- DA12-0439 for Stage 3 playing fields.
- DA12-1066 for Stage 1C skate park.

Breen is committed to delivering the community benefits set out in the VPA, and has already built the Stage 1 playing fields (under DA11-0665) and the skate park (under DA12-1066). Breen is currently planning for both the additional Playing Fields approved under DA11-0665 (and other related development consents), as well the delivery of public open space and the Marang Parklands on the western part of the Proposal Site (the delivery of the Embellished Marang Parklands now forms part of this Proposal), both of which require the demolition and removal of plant and infrastructure associated with the Existing Breen Resources Facility.

DA11-0665 (and other related development consents) will remain in place until such time as Breen demolishes and removes the relevant plant and infrastructure. Once the demolition and removal of plant and infrastructure associated with the Existing Breen Resources Facility has occurred and Breen will deliver the playing fields in accordance with, and pursuant to the conditions of consent, under DA11-0665, DA11-0941, DA12-0083, and DA12-0439 as appropriate.

Figure 15 shows the land subject of the VPA, as well as the parts of the Proposal Site where the VPA requires the delivery of parklands, public open space and playing fields.

Breen has offered to enter into a New VPA with Council, as detailed in **Section 4.11**.

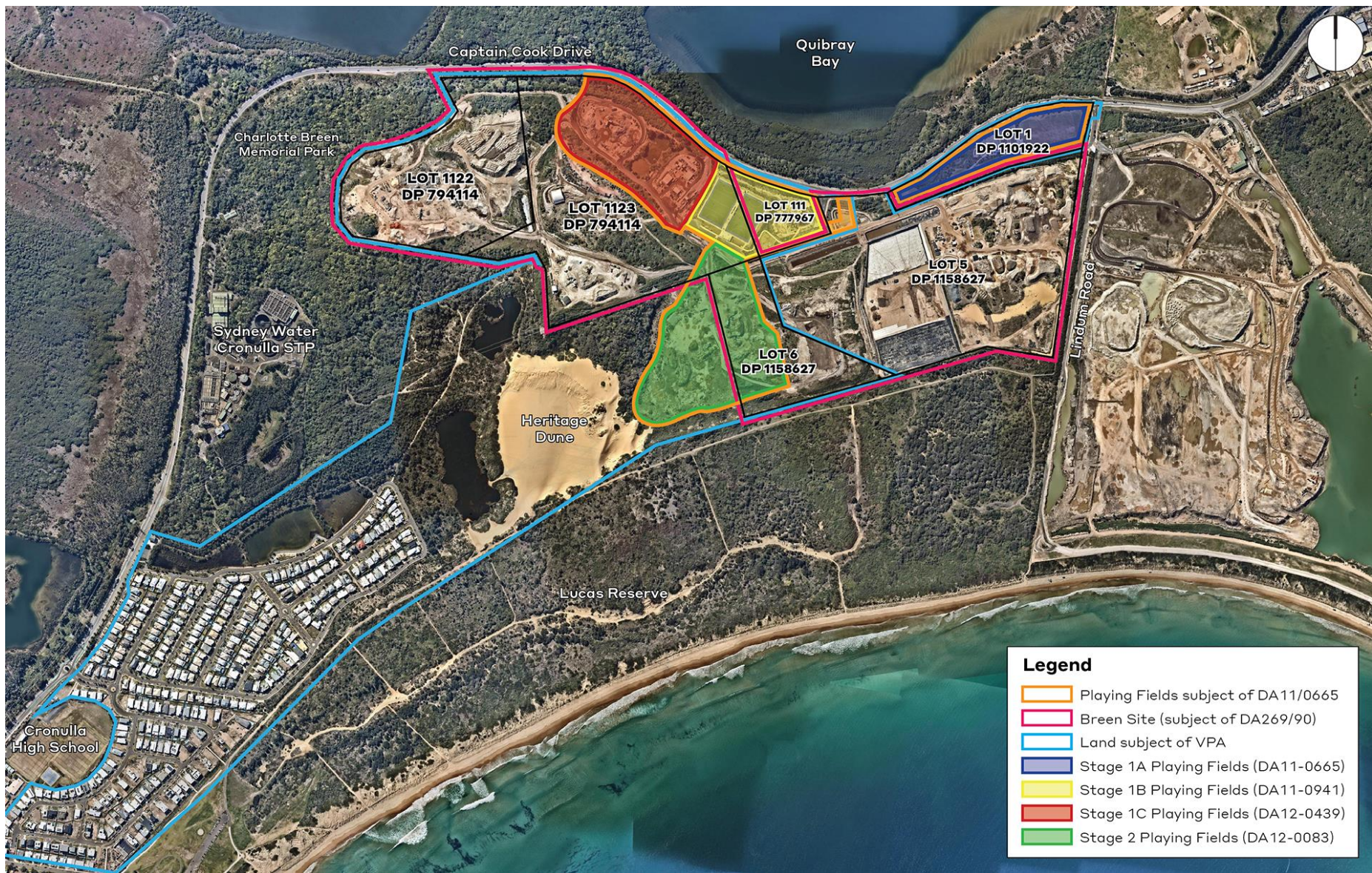


Figure 15 The existing approvals and VPA affected land

Source: Nearmap and Ethos Urban

2.5 Site Characteristics

2.5.1 Topography

The Proposal Site is generally undulating with areas of hills and troughs and can be separated into three distinct topographical areas from west to east including:

- A western elevated area located within Lots 1122 and 1123;
- A central elevated area associated with the landfill and spanning across parts of Lots 5 and 6 (this area is identified as the location for Landfill Cell B10 under EPL 4608); and
- An eastern lower lying area on Lot 5 only (this area is identified as the location for new Landfill Cell B11 under EPL 4608) and the area to the east of this cell.

Based on the 2m contours of the Proposal Site, the area of highest elevation is located at the western end of the Proposal Site where the maximum elevation is 36 m relative to Australian Height Datum (AHD). An area of increased elevation is also present on the southern boundary of the Proposal Site with elevations up to 18 m AHD. To the north and south the land slopes away to 0 m AHD at Quibray Bay and Cronulla Beach respectively. To the east the land is of similarly low elevation, predominantly less than 4 m AHD. To the west the land is of higher elevation with elevations up to 38 m AHD.

Figure 16 shows the current landform and resulting catchments, and also shows the location of Landfill Cell B11.

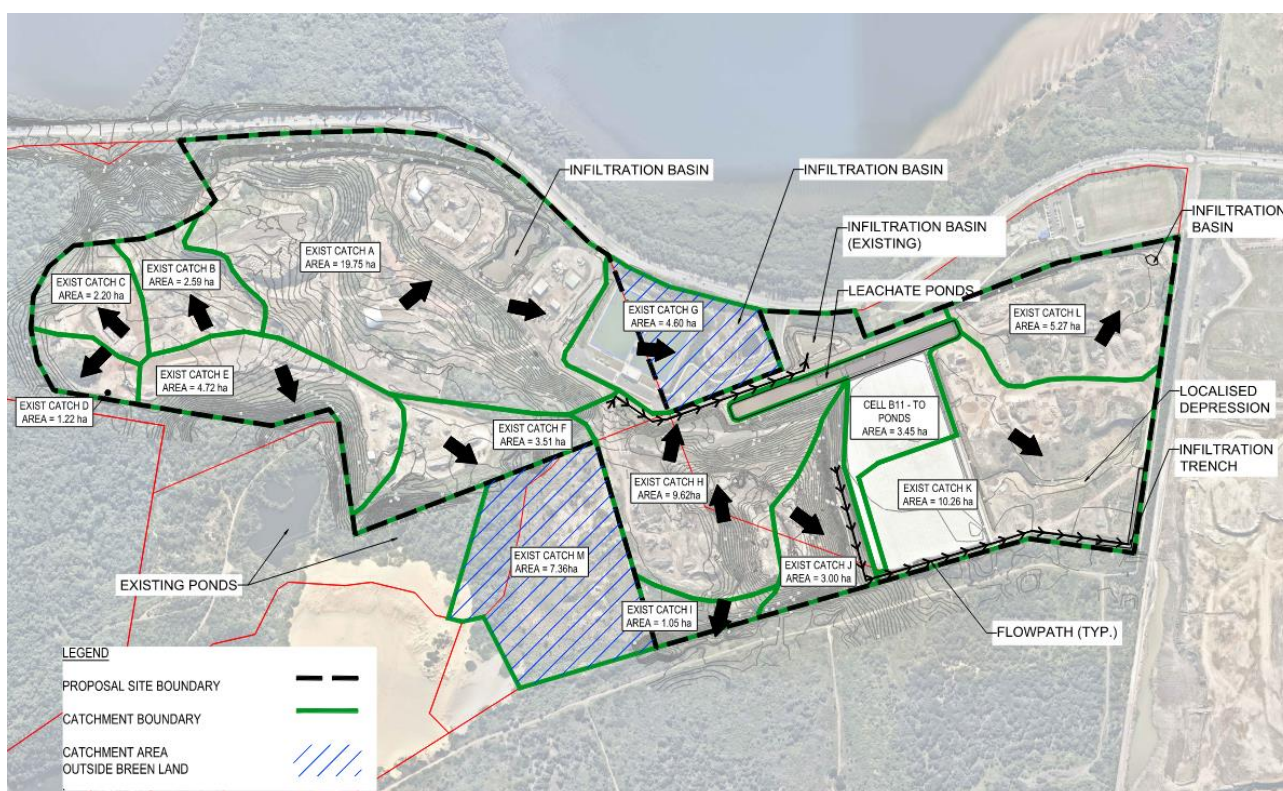


Figure 16 Current landform catchment plan

Source: Surface Water Management Assessment, Cardno (Appendix H)

2.5.2 Soils and Ground Condition

Based on the Soil Landscapes of Sydney, the Proposal Site is characterised by coastal sand plains and dunes, lagoons and swampy areas and the main soils are leached sands. Associated with these areas are dunes of siliceous sands and/or calcareous sands fringing the coastline; and swampy areas of soils and soils with peaty surfaces.

Based on known pond excavation depths, fill depths on the Proposal Site range from 26m below ground level in the dredged areas to 0.3m below ground level adjacent to site boundaries. The fill is generally comprised of sand, clay, clayey sand and gravelly sand with landfill materials including concrete, tiles and brick.

Quaternary sediments underly the fill, and primarily consist of unconsolidated to semi-unconsolidated permeable sands. These are interspersed with lenses and layers of peat, peaty sands, silts and clays (low permeability). These sediments are identified as medium to fine marine quartz sand and podsols (Qbd) and marine quartz sand (Qmd).

The alluvium, marine deposits and residual soils overlie Hawkesbury Sandstone. The Hawkesbury Sandstone is composed of medium to coarse-grained quartz sandstone, with very minor shale and laminate lenses. The Hawkesbury Sandstone outcrops at the eastern end of the Kurnell peninsula.

Acid sulfate soils

There is potential for acid sulfate soils (ASS) to be present within the Proposal Site and surrounding area. **Table 2** presents the acid sulfate classification of locations within the Proposal Site.

Table 2 Acid sulfate soil classifications

Location	Class
Lot 1122 DP 794114	2, 3, 4 and 5
Lot 1123 DP 794114	2, 3, 4 and 5
Lot 6 DP 1158627	3 and 5
Lot 5 DP 1158627	3 and 4

2.5.3 Groundwater

Groundwater and leachate levels are at depth (> 10 m below ground level) in central and western areas of the Proposal Site, and sit at elevations of approximately 4 to 6 m AHD beneath Landfill Cell B10 and the Former Landfill Areas located in the western part of the Proposal Site. In eastern areas, groundwater is close to ground surface and has minimal mounding with groundwater sitting at elevations of approximately 1 to 1.5 m AHD.

Groundwater appears to flow off site to the north and south at velocities approximating 0.3 m/day, with approximate migration times from central areas of the Proposal Site to down-gradient receptors of between approximately 3 and 6 years. Migration times from the site boundary are expected to be less than one year.

Registered Groundwater Users

Review of available data from the Lotsearch report identified 11 registered groundwater wells used for water supply purposes within a one kilometre radius of the Proposal Site. The majority of the wells are shallow (<20 metres in depth) and expected to be screened within the Botany Sands Groundwater Source and alluvial sediments.

Groundwater Dependent Environments (GDEs)

There are two potential Groundwater Dependent Environments (GDEs) surrounding the Proposal Site in the Kurnell area based on a review of the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources (2011) and the Bureau of Meteorology Groundwater Dependent Ecosystems Atlas. They are the Towra Point Estuarine Wetlands and the Kurnell Dune Forest in the Sutherland Shire and City of Rockdale which are identified in **Figure 17**.

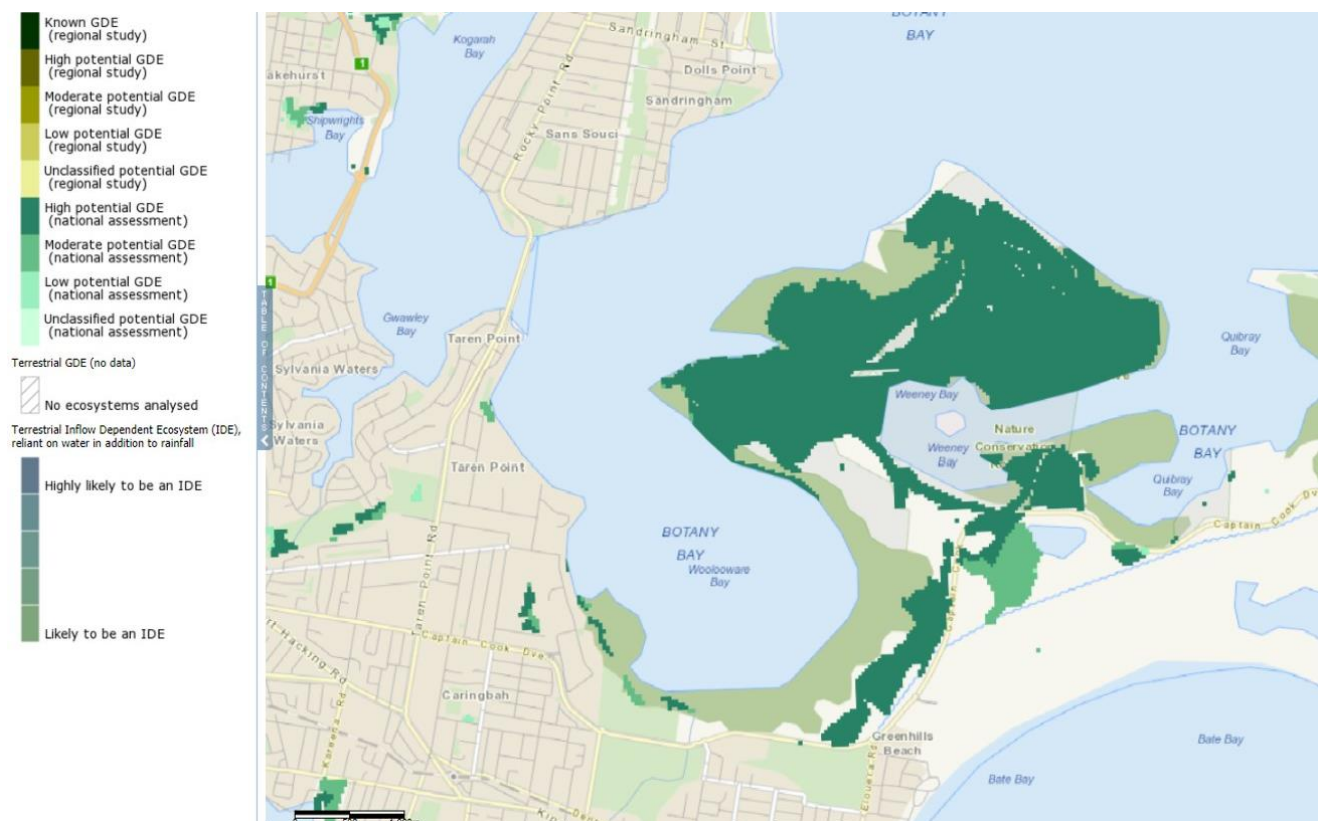


Figure 17 Groundwater Dependent Ecosystems in Kurnell Area

Source: BOM Web Atlas. 2020

2.5.4 Surface Water

The eastern part of Lot 5 DP1158627 is generally pervious in its current state. Apart from some isolated material stockpiles, this part of the Proposal Site is generally situated lower than the ground levels around the boundary. As a result, and due to the pervious nature of the Proposal Site, rainfall does not currently generate surface water runoff across the boundary. Rather, it ponds on the Proposal Site and either evaporates or infiltrates through the underlying material, which is typically sandy.

The remainder of the Proposal Site is mostly pervious, except for an interim clay cap that has been applied to the former landfill cells within Lots 1122 and 1123 and other various impervious surfaces such as temporary site sheds.

The Proposal Site generally consists of two primary catchments divided by a ridge running from the north-west to the south-east of the site with levels ranging from approximately RL 36m to RL 4m. Site runoff discharges north towards the existing Playing Fields and Captain Cook Drive or south into Cronulla State Park and some existing ponds built in the 1970s and 1980s. The existing catchment plan is shown in **Figure 16** above.

An existing infiltration basin with a capacity up to the 5% AEP storm event is located at the Playing Fields.

Two leachate ponds are located at the eastern portion of the future Embellished Marang Parklands to control seepage from the adjacent landfill cell. There are no existing surface water bodies located on the western portion of the future Embellished Marang Parklands area.

2.5.5 Vegetation

Given the Proposal Site's historical use as a sand mine, landfill site and waste management facility, the soil landscape has a long history of disturbance. The majority of the Proposal Site (88.72% or 60.63ha) is comprised of cleared areas or exotic vegetation which does not conform to a native Pant Community Type (PCT). Native vegetation within the Proposal Site is limited to scattered areas of regeneration comprised of opportunistic species.

This limited native vegetation may provide stepping stone habitat within the broader surrounding area, linking remnant areas of native vegetation present on the Kurnell Peninsula.

The two PCTs present, that best fit the vegetation contained within the Proposal Site are PCT 661 known as *Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion* classed as North Coast Wet Sclerophyll Forests (6.06ha of which 68% has been cleared), and PCT 772 known as *Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion* classed as Sydney Coastal Heaths (1.65ha of which 65% has been cleared).

2.5.6 Wetlands

The Proposal Site contains dams created as part of the existing operations of the Existing Breen Resources Recovery Facility. These dams may provide connectivity between Towra Point to the north and Bate Bay to the south. An artificial pond created as Green and Golden Bell Frog habitat by a previous development is present to the north of the Proposal Site boundary.

The Proposal Site is located directly south of the Towra Point Nature Reserve, a Nationally Important Wetland listed as Australian Ramsar site number 23 under the Ramsar Convention of Wetlands 1971. As such, the Ramsar site is a Matter of National Environmental Significance (MNES) under the *Environmental Protection Biodiversity Conservation Act* (EPBC Act).

2.5.7 Heritage and Archaeology

The Proposal Site does not contain any heritage items and is not located within a heritage conservation area. Further, it is a heavily remodelled and degraded dune-scape, which has been subject of extensive historical sand mining activities and subsequent infilling with acquired waste since the 1960s. As such, the pre-mining land surfaces and features have been removed and local stratigraphy has been reconstituted and remodelled. The Proposal Site does not contain any items or features of particular historic or heritage interest, nor areas of historical archaeological potential-sensitivity.

However, the searches of the Australian Heritage Database, State Heritage Register, State Heritage Inventory, and SLEP identify that the Proposal Site is located in close proximity to a number of significant heritage items, as follows (**Figure 18**):

- The 'Cronulla sand dune and Wanda Beach coastal landscape' (SLEP Item No. 2502) which is also listed on the State Heritage Register (SHR No: 01668);
- The 'Towra Point Nature Reserve and Quibray Bay' (SLEP Item No. 2509) which is also listed on the State Heritage Register (SHR No: 1918);
- Cronulla Sewage Treatment Plant, located to the west of the Proposal Site, is listed on the State Heritage Inventory (Database number 4573705); and
- A former 'Four wheel drive track' that follows the Captain Cook Drive alignment, which is listed as an archaeological site of local significance (A2523).

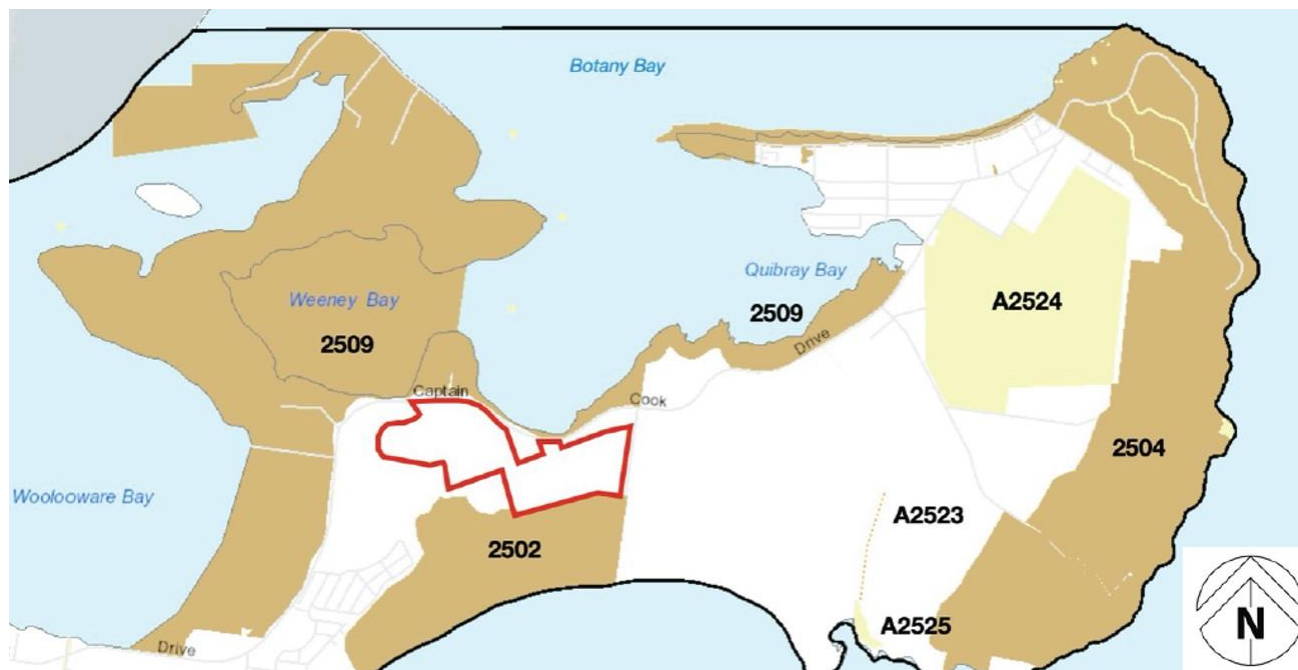


Figure 18 Heritage Mapping from Sutherland Shire LEP 2015 Heritage Map

Source: Coast History and Heritage

3.0 Project Objectives and Alternatives

3.1 Objectives of the Proposal

The objectives of the Proposal are to:

- Provide an integrated redevelopment of the Proposal Site;
- Facilitate investment in site infrastructure that will support the demolition and removal of existing site buildings and facilities currently located on Lots 1122 and 1123 and Lot 6 being the land identified in the VPA for the Marang Parklands and Playing Fields;
- Modernise Breen's resource recovery operations through the development of a purpose-built New Resource Recovery Facility that will enable significant diversion of waste away from landfill in accordance with the EPA's resource recovery objectives, including through utilising materials recovered from the New Resource Recovery Facility in the contouring and profiling of Lots 1122, 1123 and 6;
- Demolish and relocate the existing site infrastructure currently located on Lots 1122, 1123 and 6, coupled with the development of the New Resource Recovery Facility, to allow Breen to deliver an activated recreational space and other publicly accessible parklands (being the Embellished Marang Parklands) in the western part of the Proposal Site to the community;
- Facilitate a vertically integrated resource recovery outcome that enables integration of resource recovery and reuse, maximises the opportunities for beneficial reuse of recovered materials in the construction and ongoing maintenance of the Embellished Marang Parklands, and minimises the landfilling of materials; and
- Ensure that the Embellished Marang Parklands delivered on Lots 1122 and 1123 and Lot 6 are high quality activated open space and parklands that will contribute a significant and prominent new regional parkland for the benefit of the entire Sutherland Shire community.
- Establish an efficient long term water monitoring and management regime across the entirety of the Proposal Site, including the Former Landfill Site, and adjacent playing fields;

3.2 Relevant Strategic Plans and Policies

3.2.1 Premier's Priorities

The Proposal would contribute to the delivery of quality green, open and public space at Kurnell, supporting the Premier's priority to "increase the tree canopy and green cover across Greater Sydney by planting one million trees by 2022".

3.2.2 Greater Sydney Region Plan – A Metropolis of Three Cities and South District Plan

No strategic plan sets out a long-term vision for the Proposal Site, and the Site is not referred to in the Greater Sydney Commission's (GSC) Greater Sydney Region Plan (GSRP) – A Metropolis of Three Cities. However, the GSC plan identifies that preventing inappropriate development within the high noise corridor on the Kurnell Peninsula is important to managing the interface of Sydney Airport and protect its ongoing operation. This objective is supported by actions in the South District Plan, which include:

- Action 41 – Prohibit new residential development on the Kurnell Peninsula where there is potential to interfere with the operation of Sydney Airport or where the ANEF contours and prescribed airspace requirements exclude residential development.
- Action 55 – Manage the interface of Sydney Airport by preventing inappropriate development within the high-noise corridor on the Kurnell Peninsula.

On a broader level, the Proposal for a modern and efficient resource recovery facility meets Objective 35 of the GSRP 'More waste is re-used and recycled to support the development of a circular economy' and Planning priority S17 of the South District Plan 'Reducing carbon emissions and managing energy, water and waste efficiently'. This will be achieved through the recovery of naturally excavated material and demolition materials and the soil and materials subsequently derived from those materials for landfilling.

The Proposal enables rehabilitation works for public open space, parklands and playing fields, which meets Objective 31 of the GSRP 'Public open space is accessible, protected and enhanced, and Planning Priority S16 of

the South District Plan 'Delivering high quality open space'. The provision of public open space, enabled by the relocation of the Existing Breen Resources Facility to Lot 5 and provided through the VPA, will contribute to meeting the demand for increased public open space in the South District.

3.2.3 Sutherland Shire Local Strategic Planning Statement

The Sutherland Shire Local Strategic Planning Statement (SLSPS) is the main strategic planning document that applies to the Sutherland Shire LGA. Planning priority 20 is centred on improving efficiency and exploring new approaches to improve energy, water and waste efficiencies. It makes specific mention of the Besmaw land at Kurnell which is adjacent to the Proposal Site to the east, as a land development opportunity for waste recycling facilities. Taken more broadly, Council envisages Kurnell as containing large strategic sites that are suitable for locating new integrated waste management technologies. As such, the Proposal Site aligns with Council's vision to improve the waste efficiencies of the Sutherland Shire through new waste management developments. The proposed New Resource Recovery Facility will contribute to the ongoing servicing of excavation and demolition waste generated as a result of the many ongoing developments in the Sutherland Shire.

The Proposal enables rehabilitation works for public open space, parklands and playing fields, which meets Planning priority 19 'Green Grid Connections' of the SLSPS. The rehabilitation of the Proposal Site will contribute towards key linkages in Sutherland's Green Grid between Kurnell and the remainder of the LGA.

3.2.4 Waste Avoidance and Resource Recovery Strategy

The Proposal would contribute to achieving the NSW Government's resource recovery targets as outlined in both the National Waste Policy: Less waste more resources and the NSW "Waste and Resource Recovery Strategy 2014-2021" (WARR Strategy). Modern waste processing and handling equipment would ensure that best practice in resource recovery is demonstrated at the Proposal Site, a key priority for the NSW EPA.

The WARR Strategy sets the following targets for 2021–22:

- avoiding and reducing the amount of waste generated per person in NSW;
- increasing recycling rates to;
 - 70% for municipal solid waste
 - 70% for commercial and industrial waste
 - 80% for construction and demolition waste
- increasing waste diverted from landfill to 75%
- managing problem wastes better, establishing 86 drop-off facilities and services across NSW;
- reducing litter, with 40% fewer items (compared to 2012) by 2017;
- combatting illegal dumping, with 30% fewer incidents (compared to 2011) by 2017.

The Proposal would contribute towards NSW meeting the 70% target for recycling of commercial and industrial waste, as well as the 80% target for recycling construction and demolition wastes. It would also assist NSW in increasing waste diverted from landfill towards the target of 75%.

3.3 Strategic need for the Proposal

In order to meet the objectives for the development, the Proposal comprises several integrated components, and the integration of these key components of the Proposal are critical to maximising resource recovery rates at the facility, delivering the Embellished Marang Parklands, ensuring an efficient use of the limited landfill capacity at the Proposal Site, and enabling an integrated site-wide regime for the monitoring and management of leachate and landfill gas emissions.

A key feature of the Proposal is a state of the art resource recovery facility with the capacity to receive and process up to 650,000 tonnes of material per annum, and divert the majority of this material away from landfill. Through significant reductions in on-site landfilling, the facility would contribute to achieving the NSW Government's resource

recovery targets, and the use of modern waste processing and handling equipment can demonstrate how best practice can be achieved in waste management and resource recovery through an integrated site-wide approach.

There are very few such facilities of this type and scale in NSW at present. Private investment in such infrastructure needs to be encouraged and facilitated, especially in this case, where a facility is already established, is well located to waste generating markets, and has suitable buffers and zoning.

This facility would continue to provide much needed competition in the waste processing and resource recovery market, which would prevent concentration of market power in larger companies. The ACCC Public Competition Assessment for the Bingo – Proposed Acquisition of Dial a Dump (11 April 2019) identified Breen as one of four competitors in the B&D waste processing market. It is therefore important that the facility continues to operate without unnecessary restrictions on its further development and modernisation.

Another key feature of the Proposal is the delivery of the Embellished Marang Parklands, being a superior parkland to that envisaged under the VPA. The combination of throughput and processing capabilities, modern resource recovery facilities, and the continuation of approved landfilling and land restoration activities on the Proposal Site using material produced on-site is a unique feature of this Proposal. The circular nature of material, being produced on the Proposal Site and then restored to the site, contributes to minimising off-site impacts and ensures, in essence, a closed system of operation and on-site landfilling and restoration activities.

With careful selection of suitable waste streams, and careful design of the screening, sorting and processing activities, Breen can ensure that the opportunities for beneficial reuse of waste material on the Proposal Site are maximised. The design of the New Resource Recovery Facility therefore responds to Breen's own resource recovery objectives for the Proposal Site, being the development of high quality activated open space and parklands.

In this way Breen proposes to maximise the efficiency of the New Resource Recovery Facility, enabling high levels of beneficial reuse of waste materials and minimising the need to dispose of residual materials that would otherwise require the use of scarce landfill capacity. With residual materials that are unable to be recovered for beneficial reuse being disposed of within the landfill area, the Proposal Site will become a single facility combining resource recovery, on-site beneficial reuse of suitable recovered materials from the New Resource Recovery Facility in the construction and ongoing maintenance of the parklands, and disposal of residual waste, as part of single integrated operation. The key components of the Proposal are therefore necessarily interconnected at an operational and commercial level, being the:

- Construction and operation of a Resource Management Facility, comprising:
 - A New Resource Recovery Facility on the eastern part of the Proposal Site (Lot 5), including consolidation of existing waste management activities within this part of the Proposal Site;
 - A Waste Disposal Facility being the continuation of current land restoration, landfilling and contouring operations at the Proposal Site by permanent application of some of the residual waste materials from the New Resource Recovery Facility to land on Lot 5;
- Demolition and/or relocation to Lot 5 (as required) of the Existing Breen Resources Facility on Lots 1122, 1123 and 6 (this includes those parts of Lots 1122, 1123 and 6 that will comprise the Playing Fields);
- Water usage and management across the entirety of the Proposal Site and adjacent playing fields;
- Ongoing long-term monitoring of the Former Landfill Site leveraging the environmental benefits and synergies of utilising the same personnel, plant, material and infrastructure;
- Re-profiling of parts of the Proposal Site within Lots 1122, 1123 and 6, with some existing waste materials from those lots. Breen confirms that no new waste is being received on Lots 1122, 1123 and 6 for the purposes of landfilling on these lots so as to facilitate the delivery of the Embellished Marang Parklands and Playing Fields;
- Capping and contouring areas of the Proposal Site within Lots 1122, 1123, and Lot 6, with suitable material recovered from the New Resource Recovery Facility and some existing materials, with some specific material imported to the Proposal Site for capping and covering, such as low permeability clay to enable the delivery of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6; and
- Delivery of activated community space in the form of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6.

The above components of the Proposal are also necessarily connected in relation to achieving the strategic land use outcomes for the Proposal Site, being the timely delivery of high quality activated recreational space and publicly accessible parklands, as well as enabling an integrated site-wide regime for the monitoring and management of leachate and landfill gas emissions.

The Proposal promotes the orderly and economic use of the Proposal Site as it caters to and supports the ongoing and planned development of the Embellished Marang Parklands in an efficient and cost effective way (by using recovered materials from the New Resource Recovery Facility in the construction and ongoing maintenance phases), while ensuring a modern and efficient Resource Management Facility continues to operate on the Proposal Site.

In particular, the Embellished Marang Parklands will provide a once-in-a-generation opportunity to provide the growing community of Kurnell access to a new network of open space recreational facilities that have not previously existed in this locality which is limited in its range of recreational opportunities on the Kurnell Peninsula (**Figure 19**). The development of the Embellished Marang Parklands offers a rare opportunity to return a post-industrial landscape to a remediated parkland destination; one that is unique in the Sydney landscape by offering a coastal dune heath and forest park experience. The benefits of the parklands to environmental remediation and enhanced cultural heritage values of the locality as well as extending the recreational offer of the district include:

- integration of the parklands into the surrounding dune nature reserves re-establishing a critical ecological link from Bate Bay to Towra Point;
- restoration of endemic dune vegetation on the Proposal Site through the selection of indigenous plant species, set in a dune-like landform;
- a place to reflect and interpret the rich Aboriginal and Non-Aboriginal heritage of the local landscape;
- the creation of key pedestrian and cycle links between Quibray Bay and Cronulla Beach;
- creation of a network of accessible paths to allow visitors to easily access the parklands for pedestrians and cycling, reinforcing the Sydney Green Grid;
- provision of new passive and active recreation opportunities for all members of the local and wider community to use and enjoy;
- a place for the community to hold events and celebrations in a semi natural setting; and
- an elevated landscape that offers spectacular all-round regional views that will assist in a better understanding of the varied landscapes of this part of Sydney.

The Parklands will provide an exciting and memorable experience for the many local and regional visitors and in so doing will create an opportunity to reconnect people, nature, heritage and place.

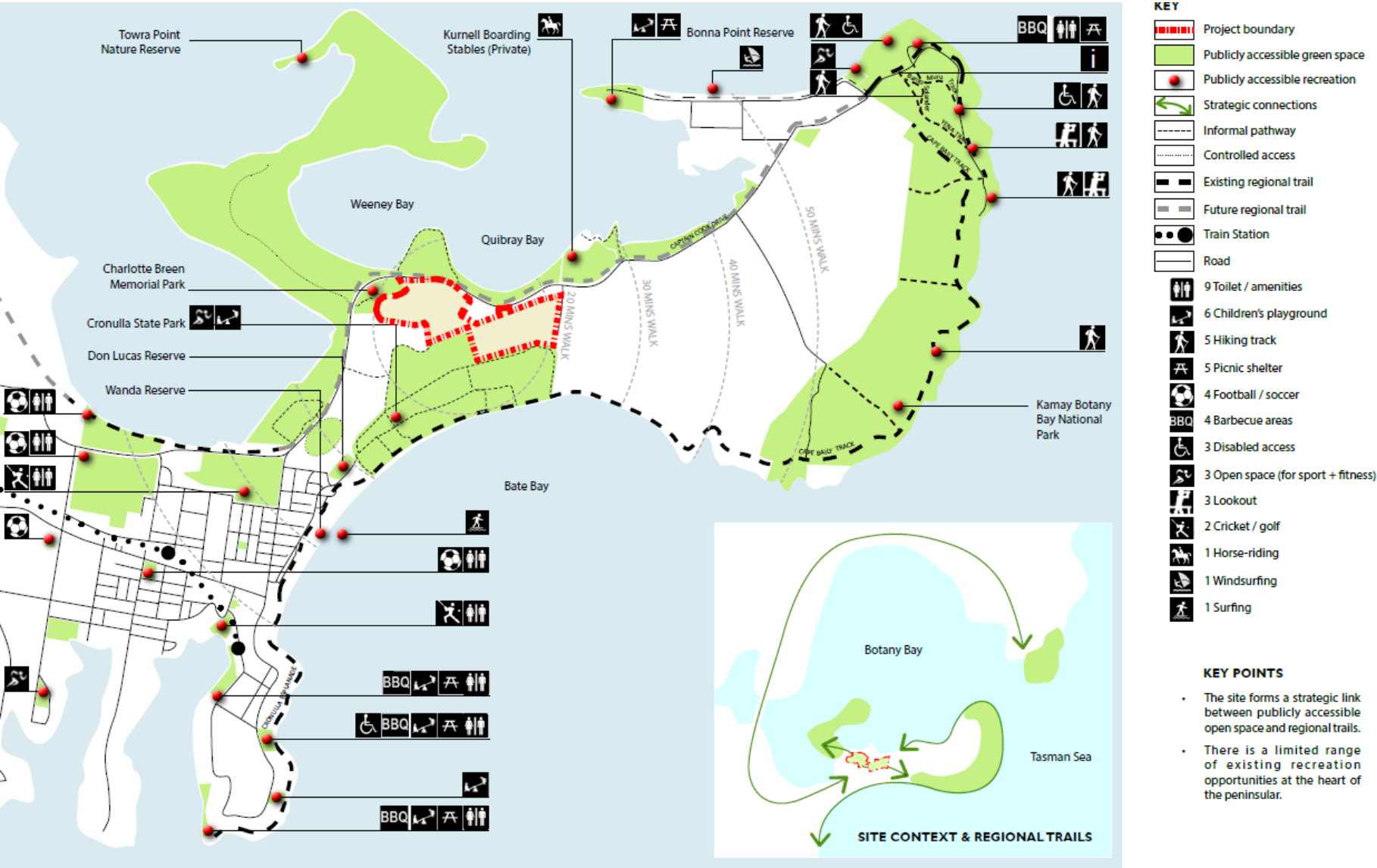


Figure 19 Existing recreational context surrounding the Proposal Site

Source: Clouston Associates



Figure 20 The Embellished Marang Parklands will provide a place for recreation for the Sutherland Shire community

Source: Clouston Associates

3.4 Analysis of Alternatives

Alternate options to the Proposal above are discussed in this section below. The options are a do-nothing scenario, development of the Proposal Site for alternative uses, or delaying the Proposal.

Do Nothing

Leaving the current status of the Proposal Site unchanged would result in an inability for Breen to deliver the Embellished Marang Parklands or the Stage 2 and 3 Playing Fields approved under DA11-0665 (and other associated development consents) in a timely fashion in accordance with the VPA.

Whilst landfilling on Lots 1122, 1123 and 6 has ceased, the re-shaping, capping and closing activities to deliver the Embellished Marang Parklands on these lots can only be delivered with consent.

The 'do nothing' option would also miss the opportunity for:

- Investment in new modern waste processing and handling equipment that would significantly improve resource recovery rates and divert waste away from landfill;
- Additional improvements, embellishments and community facilities that Breen is proposing to deliver on Lots 1122 and 1123 over and above what is specified in the VPA, including, but not limited to, picnic areas and facilities, playgrounds, an amphitheatre, and lookouts (refer to the Landscape Plan at **Appendix C**);
- The security of a consent to enable the delivery of the Embellished Marang Parklands.

Alternative Use

There are no realistic alternative uses for Lots 1122 and 1123, and Lot 6, as these lots are the subject of the VPA, with the intended final use as the Marang Parklands and Playing Fields.

For Lot 5, DA/269/90 currently authorises the filling of the entirety of Lot 5. If the proposed New Resource Recovery Facility does not proceed on this eastern part of Lot 5, then the land will be subject of filling pursuant to DA/269/90. If this filling takes place as approved, it will essentially make the whole of Lot 5 less able to be developed in future for beneficial re-use. This is not considered to be the most economic use of the land in the current land use context.

Delaying the Proposal

There is no benefit to Breen, Council or the Sutherland Shire Community to delay the Proposal. Breen is committed to delivering the community benefits set out in the VPA, which includes the delivery of public open space, Marang Parklands and Playing Fields on the western part of the Proposal Site. In order for the timely provision of this public open space for the Sutherland Community, the demolition and removal of infrastructure associated with the Existing Breen Resources Facility is required. Moreover, the Proposal Site is the subject of a delayed rezoning which is subject to the completion of rehabilitation works to land at Lots 1122 and 1123 and Lot 6 in the form of public open space, parklands and playing fields. Therefore, there is no benefit to Breen, Council or the Sutherland Community to delay the Proposal.

Relocation of the Waste Management Facilities

Breen has previously sought to relocate the waste management facilities currently on Lots 1122, 1123 and 6 to the eastern part of Lot 5 by way of a modification of DA/269/90. The Modification Application (MA 19/0026) was lodged with Sutherland Shire Council in 2018. However, after extensive consultation in relation its scope and assessment requirements the application was not accepted, and was re-lodged in February 2019 to address further information requirements.

Whilst the relocation of the existing waste management facilities would not enable Breen to achieve the higher resource recovery outcomes sought by the EPA, this approach was envisaged as an opportunity to quickly relocate the Breen Resources Facility's waste receiving and handling infrastructure to make Lots 1122 and 1123 and Lot 6 available for the Playing Fields and Marang Parklands development.

However, in light of the age of the 1990 consent that was the subject of the modification application, it was difficult to reach a shared understanding of the modification's objectives between Breen and Council, despite ongoing discussions.

Given the lapsed timeframe of over 12 months, and ongoing discussions relating to the proposed modification, Breen decided to withdraw the application in March 2020, as it was clear an outcome was not likely to be obtained in a timely manner.

The Proposal

The Proposal is the most appropriate option at this time given the existing nature of the Proposal Site and the shared vision of its redevelopment for playing fields and parklands, while ensuring the landfilling and resource recovery activities continue in the most environmentally sustainable and efficient way. The Proposal supports the future redevelopment of Lots 1122 and 1123 and Lot 6 as the Embellished Marang Parklands, facilitates the construction of part of the Playing Fields (by demolishing and relocating the Existing Breen Resources Facility from this land), and enables the completion of their rezoning.

It will also provide for the redevelopment of the Proposal Site in a way that facilitates a vertically integrated resource recovery outcome that enables integration of resource recovery and reuse, maximises the opportunities for beneficial reuse of recovered materials of recovered materials in the construction and ongoing maintenance of the Embellished Marang Parklands, and minimises landfilling of materials.

The Proposal will also establish an efficient long term water monitoring and management regime across the entirety of the Proposal Site, including the Former Landfill Site, and adjacent playing fields;

4.0 Description of the Proposal

This chapter of the report provides a detailed description of the Proposal. Architectural design drawings are included at **Appendix A** and the landscape design drawings at **Appendix C**.

The existing recycling infrastructure is located on land that will become the Embellished Marang Parklands. To deliver the Embellished Marang Parklands on Lots 1122 and 1123 and Lot 6, this existing infrastructure needs to be demolished and/or relocated.

Breen is therefore proposing to construct and operate a new integrated Resource Management Facility to consolidate all recycling activities within the eastern part of the Proposal Site. This will allow Breen to deliver the recreational space and other publicly accessible parklands in the western part of the Proposal Site to the community. It will also provide improved recycling capability in line with NSW Government priorities and targets to increase resource recovery from the C&D and C&I sectors.

The Proposal is comprised of the delivery of a Resource Management Facility, comprising the continuation of landfilling on the residual parts of Lot 5 and the construction of the New Resource Recovery Facility, and the Embellished Marang Parklands.

Specifically, the Proposal involves the following key integrated components:

- Construction and operation of a Resource Management Facility, comprising:
 - A New Resource Recovery Facility on the eastern part of the Proposal Site (Lot 5), including consolidation of existing waste management activities within this part of the Proposal Site;
 - A Waste Disposal Facility, being the continuation of land restoration, landfilling and contouring operations at the Proposal Site by permanent application of some of the residual waste materials from the New Resource Recovery Facility to land on Lot 5;
- Demolition and/or relocation to Lot 5 (as required) of the Existing Breen Resources Facility on Lots 1122, 1123 and 6 (this includes those parts of Lots 1122, 1123 and 6 that will comprise the Playing Fields);
- Re-profiling of parts of the Proposal Site within Lots 1122, 1123 and 6, with some existing waste materials from those lots. Breen confirms that no new waste is being received on Lots 1122, 1123 and 6 for the purposes of landfilling on these lots so as to facilitate the delivery of the Embellished Marang Parklands and Playing Fields;
- Water usage and management across the entirety of the Proposal Site and adjacent playing fields;
- Ongoing long-term monitoring of the Former Landfill Site leveraging the environmental benefits and synergies of utilising the same personnel, plant, material and infrastructure;
- Capping and contouring areas of the Proposal Site within Lots 1122, 1123, and Lot 6, with suitable material recovered from the New Resource Recovery Facility and some existing materials, with some specific material imported to the Proposal Site for capping and covering, such as low permeability clay to enable the delivery of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6; and
- Delivery of activated community space in the form of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6, being parkland that Breen proposes to improve and embellish, if this SSDA is approved, to provide a superior parkland to that proposed under the VPA as detailed in **Section 4.4.3** of this EIS (referred to as the **Embellished Marang Parklands**).

The proposed Embellished Marang Parklands include the following improvements and benefits to the community over and above those contemplated by the 2010 VPA:

- A cleared 'Village Green' area in the middle of the parklands with amphitheatre, providing a place for the community to hold events and celebrations in a semi natural setting; and
- Associated picnic areas for all members of the local and wider community to use and enjoy; and
- A playground; and
- A network of accessible paths, including key pedestrian and cycle links between Quibray Bay and Cronulla Beach, to allow visitors to easily access the parklands for pedestrians and cycling, reinforcing the Sydney Green Grid; and

- An elevated landscape, including a panoramic look out in the western part of the parklands, that offers spectacular all-round regional views that will assist in a better understanding of the varied landscapes of this part of Sydney.

The New Resource Recovery Facility has been specifically designed, through the selected input waste streams identified in this application, and the processing plant and equipment selected, to produce the required landscaping products to both construct and service the Embellished Marang Parklands. The Embellished Marang Parklands therefore contribute to the viability of the New Resource Recovery Facility. Further, the viability of the proposed embellishments to the Marang Parklands depends on the production of landscaping products from the proposed New Resource Recovery Facility that are required to deliver the superior landform proposed, including soils, aggregates and mulches. **Section 4.4.3** of this EIS sets out examples of where material required to deliver the Embellished Marang Parklands is proposed to be directly produced from the New Resource Recovery Facility, being the only way to obtain these materials in a commercially viable manner to deliver the Proposal as proposed by this EIS.

To maintain ongoing operational activities at the Existing Breen Resources Facility, the Proposal would be carried out in the following sequence:

- Reprofilling of Lots 1122, 1123 and Lot 6 concurrent with the construction of the New Resource Recovery Facility on Lot 5. This will allow the continued operation of the Existing Breen Resources Facility on parts of Lots 1122, 1123 and 6 until the New Resource Recovery Facility is fully operational.
- Revegetation of Lots 1122, 1123 and Lot 6 and installation of parklands landscaping, infrastructure and facilities concurrent with the demolition of existing waste management infrastructure and processing areas on Lots 1122 and 1123 and Lot 6

Landfilling on Lot 5 would continue whilst the above sequence of works is completed.

The Proposal is anticipated to take approximately 5 years to fully deliver, and would provide some 80 direct and indirect jobs across the construction phases, and employment of some 80 people is also expected for the ongoing operation of the New Resource Recovery Facility.

The key components of the Proposal are shown in **Figure 21**.



Figure 21 The proposed development of the Embellished Marang Parklands with the landfill area shown on Lot 5 and the New Resource Recovery Facility in the east

Source: Clouston Associates

4.1 Key Components

The key integrated components of the Proposal are critical to maximising resource recovery rates and ensuring efficient use of the limited landfill capacity at the Proposal Site. The relationship between the four components of the Proposal is shown in **Figure 22**, which maps the flow of material through the integrated Resource Management Facility. These integrated components include:

- The New Resource Recovery Facility (see **Section 4.2**);
- Continuation of landfilling and rehabilitation operations (**Section 4.3**);
- Demolition and relocation of the Existing Breen Resources Facility to Lot 5 (**Section 4.4.1**);
- Capping and contouring of parts of the Proposal Site to enable delivery of the Embellished Marang Parklands (**Section 4.4.1**); and
- Delivery of community parklands (**Section 4.4**).

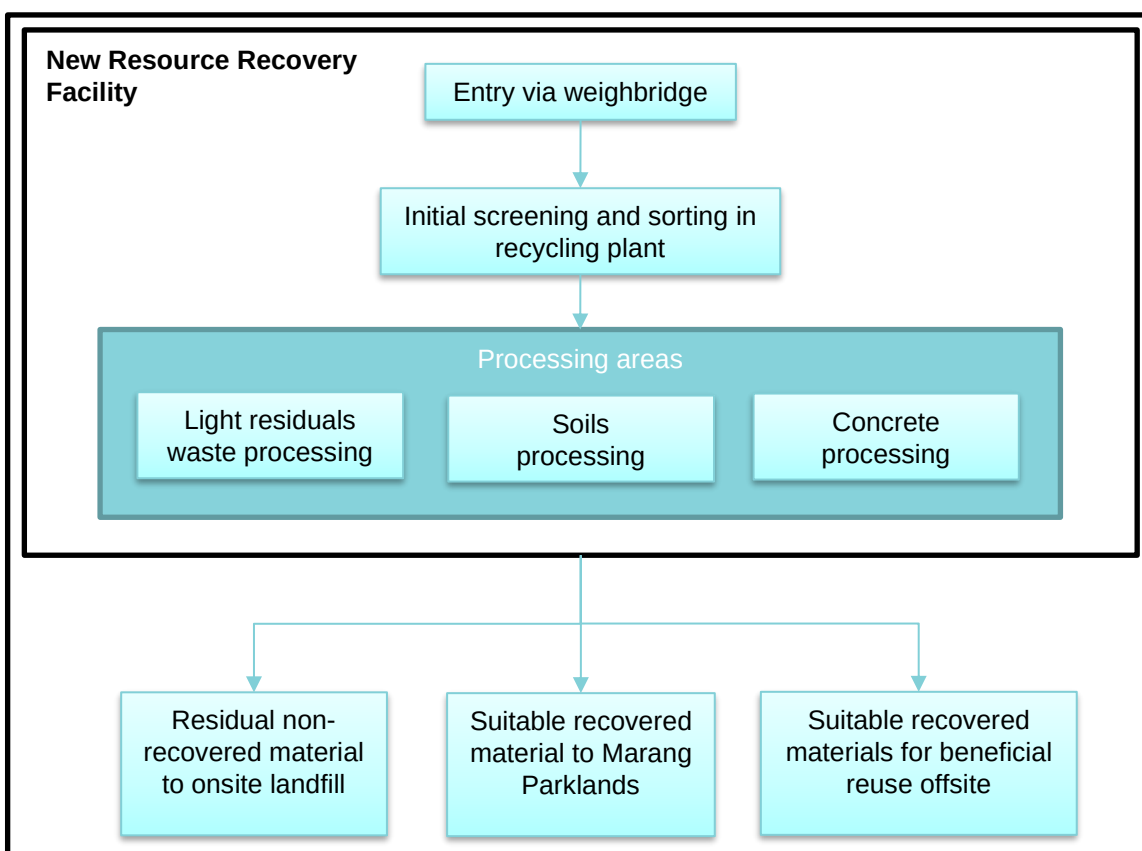


Figure 22 Flow chart of material flow through the Proposal Site

4.1.1 Waste input and processing rates

The Existing Breen Resources Facility currently accepts excavated materials and C&D waste as part of the land restoration activities permitted under DA269/90. To take full advantage of the capabilities of the New Resource Recovery Facility, it is proposed to supplement these waste streams with:

- Non-putrescible general solid waste from C&I waste sources, and
- Non-putrescible general solid waste comprising garden and landscaping organics, untreated timber and natural organic fibrous materials.

In total, up to 650,000 tonnes of waste per year would be received and processed at the New Resource Recovery Facility. Note that this proposed 650,000 tonnes per annum does not include material sourced exclusive for the purposes of constructing the Embellished Marang Parklands that does not require treatment or processing (i.e.

drive-through material as described in more detail in **Section 4.4.1**, generally comprising VENM or excavated natural materials that meet the requirements of a Resource Recovery Exemption). It is also highlighted that the 650,000 tonnes per annum capacity does include loads of waste that are identified as containing only non-recoverable and/or residual waste materials (for example, contaminated soils that can be accepted by the facility under its EPL, but contain contaminants that prohibit the material from being recycled), which would bypass processing activities in the New Resource Recovery Facility – noting that loads of this nature are expected to comprise only a very small proportion of incoming loads.

The expected types of waste to be received at the New Resource Recovery Facility are summarised in **Table 3**. It is highlighted that the New Resource Recovery Facility has been specifically designed, through the selected input waste streams identified in this application, and the processing plant and equipment selected, to produce the required landscaping products to both construct and service the Embellished Marang Parklands.

Table 3 Proposed New Resource Recovery Facility capacity

Description	Proposed (tonnes per year)
Soils	300,000
Heavy C&D waste (brick and concrete)	150,000
Light C&D waste	150,000
Light C&I waste and non-putrescible organic waste	50,000
Total	650,000

Source: GHD

The processing capacity of the Existing Breen Resource Facility is uncapped and has accepted up to 1,900,000 tonnes per year in the past. The incoming waste in this Proposal would be capped at 650,000 tonnes per year. Once the proposed New Resource Recovery Facility is fully operational, it is expected that approximately 90,000 tonnes per year of residual waste would be produced. Of this 90,000 tonnes, it is expected that up to 65,000 tonnes per year will potentially be compressed, baled and exported from the facility as Solid Recovered Fuel (SRF) for off-site energy recovery. This represents a reduction in residual waste requiring landfill disposal, which could be as low as 25,000 tonnes per year.

4.1.2 Operating hours

Currently the Existing Breen Resources Facility is typically open to the public from 6 am to 4 pm Monday to Friday, and 6 am to 1.30 pm on Saturdays. It is licenced to operate during the evening and night-time period and does so when necessary to receive or process waste materials.

The proposed operating hours for the Proposal are:

- 24 hours for resource recovery operations and waste acceptance to the New Resource Recovery Facility and associated waste disposal facility, and
- For construction activities, standard construction hours of Monday to Friday 7am to 6pm, Saturday 8am to 1pm and no work on Sundays or Public Holidays.

4.2 New Resource Recovery Facility

4.2.1 Proposed facilities and infrastructure

Layout

Key infrastructure components of the New Resource Recovery Facility would include:

- A waste processing building for the recycling plant and light residual waste processing
- A concrete processing building
- A soil processing building

- Three **weighbridges** (2 in and 1 out) to ensure secure access to the New Resource Recovery Facility and Landfill for all commercial vehicles and public drop-off/small vehicles bringing material to the New Resource Recovery Facility and Landfill or taking material off site
- A separate **internal weighing zone** for tracking internal movements
- **Site office and administration building** and **workshop**
- A **waste operations area** provides for a public/light vehicle drop-off area as well as stockpile and storage areas for stockpiling of recovered materials and temporary storage of skip bins
- **Associated facilities** including a parking area, wheel washes, recovered water basins for management of stormwater and to allow for water recovery and reuse, internal roadways, fencing, visual screening and other facilities ancillary to the operations.

Access to the New Resource Recovery Facility would be via a new access from Lindum Road, along the eastern boundary of the Proposal Site. Current access to Lindum Road is via an existing roundabout at the intersection of Captain Cook Drive and Lindum Road.

The New Resource Recovery Facility infrastructure and works that would be located at the eastern part of the Proposal Site (Lot 5) are shown in **Figure 23**. Architectural concepts are provided in **Appendix A**.

The New Resource Recovery Facility has been specifically designed, through the selected input waste streams, and the operational plant and equipment for processing the waste streams, to accommodate the servicing of the Embellished Marang Parklands with soils, aggregates and mulches, both during construction and for ongoing parkland maintenance.

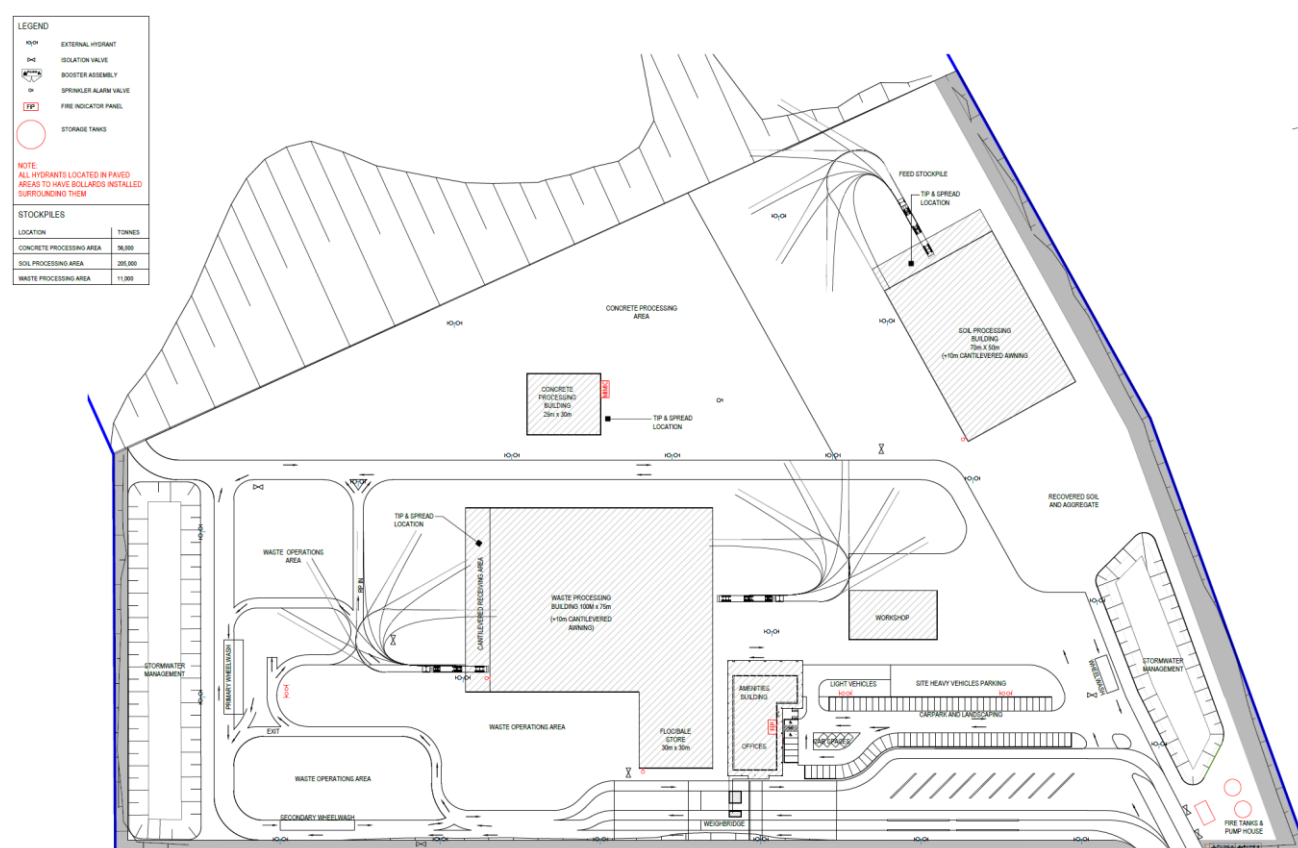


Figure 23 Resource recovery facility – layout

Source: Ahrens

Waste processing building

The waste processing building would comprise an enclosed building approximately 100 m x 75 m in area containing a variety of sorting and processing equipment. A 30 m x 30 m floc/bale store would be located at the north east of the building. The building would be a steel-framed structure with concrete floors. The main rafters and columns would be constructed from universal or welded beams. Roof and wall cladding would be constructed using colourbond steel wall sheeting with some concrete sections.

Incoming C&D and C&I waste would be received at the waste processing building with loads being dropped onto concrete inspection slabs under the cantilevered roof.

The building would be fitted with roller doors and dust suppression sprays in the receival area.

Concrete processing building

The concrete processing building would comprise a fully covered and partially enclosed building approximately 25 m x 30 m in area containing a variety of crushing and screening equipment. The building would be a portal-framed structure with concrete floors. The main rafters and columns would be constructed from universal or welded beams. Roof and wall cladding would be colourbond steel wall sheeting with some concrete wall sections.

Soil processing building

The soil processing building would comprise a fully covered and partially enclosed building approximately 70 m x 50 m in area containing a variety of screening equipment. The building would be a steel framed structure with concrete floors. The main rafters and columns would be constructed from universal or welded beams. Roof and wall cladding would be colourbond steel wall sheeting.

Public/light vehicle drop-off area

A public/light vehicle drop-off area intended to serve the local residential community is proposed towards the southern portion of the New Resource Recovery Facility. This area would comprise an inspection zone, tipping and sorting pads and a sorting zone.

Weighbridges

All vehicles disposing waste or collecting materials at the New Resource Recovery Facility would pass through the main weighbridge precinct. The main weighbridge precinct would contain two 'in' weighbridges and one 'out' weighbridge as well as two weighbridge rooms, which would be staffed.

The weighbridges would be elevated which would allow for both the weighing of vehicles/loads and a first material inspection point. Once loads have been inspected and weighed, they would be directed to one of the following areas:

- Public/light vehicle drop off area within the waste operations area
- Concrete processing area
- Soil processing area.

Loads of unrecoverable and/or residual waste products may also be directed to the Landfill as applicable for permitted waste materials.

The weighbridges would be used for external and internal materials weighing and tracking. An internal weighing zone with a weighbridge would be located between the concrete recycling area and the soil recycling operations area for internal materials weighing and tracking – including any residual waste that is landfilled and recovered aggregates and fines for parkland shaping and profiling.

Site office, worker lunch and amenities and toolbox training area

A new site office would be constructed on Lot 5. A lunch room and ablutions for workers would be located adjacent to the site office.

Workshop

A new workshop would be constructed on Lot 5.

Waste operations area

Various materials would be stockpiled on the Proposal Site, including VENM, ENM, brick, concrete, tiles, rocks, asphalt, soil, road base, bedding sand, recovered fines, timber, aggregate and other products. These materials and products would be stockpiled or stored in the external waste operations areas. No processing would occur outside in the waste operations area.

Recovered fines and aggregate from the New Resource Recovery Facility would be stockpiled at the New Resource Recovery Facility for use as part of the Embellished Marang Parklands and external offtake customers. During the construction period for the Embellished Marang Parklands these materials will be relocated on a regular basis onto the Embellished Marang Parklands area of the Proposal Site for stockpiling prior to their use for capping and contouring. Stockpile sizes for the recovered fines and recovered aggregate retained for external offtake customers would vary from time to time depending upon the demand for this material from external customers, and the rate at which it is required for contouring of the parkland areas. Maximum stockpile sizes would comply with health and safety and environmental requirements. This material would not pose a fire hazard, being non-combustible.

Due to the size of the facility it is not feasible to provide enclosures for all stockpiles. All stockpiles would be managed with water sprays to minimise dust emissions, and subject to the implementation of dust monitoring and reactive management system to ensure dust impacts associated with the Proposal would be acceptable.

Waste and recovered fines and aggregate stockpiles are discussed further in **Section 7.0**. Stockpiles which are subject to fire safety requirements are discussed in **Section 16.0**.

A skip bin storage area would also be provided for customers to store empty skip bins in the waste operations area.

Associated Facilities

Parking area and truck de-tarpping area

A parking area for 88 spaces (including two disabled spaces) is proposed for both site personnel and visitors to the New Resource Recovery Facility.

The parking area surface is proposed to be hardstand with defined spacing, segregated also for site personnel and visitors.

A separate truck de-tarpping area would be provided near the site entrance, before the weighbridge.

Sedimentation, infiltration, and recovered water basins

Two sedimentation, infiltration, and recovered water basins would be provided at the New Resource Recovery Facility to be used for a variety of purposes, including:

- To receive site stormwater runoff for sedimentation and infiltration, and
- To allow for water recovery and reuse, primarily via the primary and secondary wheel washes/stand pipe and site operations.

One basin would be located on the south-eastern boundary of the Proposal Site and the other located on the north eastern-boundary, near the site entrance/exit. A third basin is currently located in a dedicated area bounded to the south by the Landfill and to the north by Captain Cook Drive. This basin would also be available for water recovery and reuse associated with the New Resource Recovery Facility operations. The locations of the basins are shown on **Figure 23**.

Wheel washes

A primary wheel wash would be used for removing soil/dust from commercial vehicles prior to departure from New Resource Recovery Facility and may include a stand pipe to be used by the site water cart for water transport to and for various site operations.

A secondary wheel wash would be used for light vehicles or vehicles only picking up/dropping off empty skip bins (or which have inadvertently accessed the facility).

The third wheel wash would service internal movements of site based light vehicles and equipment deliveries. The locations of the wheel washes are shown on **Figure 23**.

Internal roadways

Internal roadways would allow vehicles to access the various areas of the New Resource Recovery Facility.

Routes would be provided to allow for transfer of material between the waste processing building, concrete processing, soil processing, and stockpile and storage areas.

The internal roadways would also allow authorised traffic to access the Landfill at various points along the western side of the New Resource Recovery Facility. Once operational, all vehicles accessing the Landfill would enter the site from Lindum Road via the New Resource Recovery Facility and use internal access roads to access the Landfill.

Fencing and visual screening

The New Resource Recovery Facility would be secured with fencing and the only unsecured access would be to the truck de-tarpping area, carpark and site offices. Secure access would be via the weighbridge for all commercial vehicles and public drop-off/small vehicles that are bringing material to the New Resource Recovery Facility or Landfill or taking material off site.

A five metre wide visual vegetated screen is proposed along the eastern and southern boundaries of the New Resource Recovery Facility and a 10 m wide, 4 m high bund and visual vegetated screen is proposed along the northern boundary. These bunds/vegetation plantings would serve to both visually screen the Proposal Site and also provide noise mitigation.

Ancillary plant, equipment and infrastructure

Any other plant equipment or infrastructure that is ancillary to the operation of the Landfill or New Resource Recovery Facility that may need to be updated replaced or installed from time to time.



Figure 24 New Resource Recovery Facility design viewed from the adjacent site looking west

Source: Clouston Associates



Figure 25 New Resource Recovery Facility viewed from the Lindum Road / Captain Cook Drive intersection

Source: Clouston Associates

4.2.2 Construction

Construction of the New Resource Recovery Facility

Construction of the New Resource Recovery Facility would require:

- Installation of sediment and erosion control measures as required.
- Filling with VENM, ENM or material that meets a resource recovery order and reprofiling of the eastern part of Lot 5 to create a construction level at approximately RL 5 m, and visual screening around the eastern and southern boundaries and visual and acoustic screening on the northern boundary.
- Road works to connect the eastern part of the Proposal Site to Lindum Road.
- Construction of internal civil works including roads, utilities and stormwater infrastructure and recovered water basins to manage stormwater across the whole of the Proposal Site.
- Construction of new buildings and enclosures.
- Installation of plant and equipment including weighbridges, wheel washes, and waste processing equipment.

Construction equipment

Plant and equipment expected to be used for construction of the New Resource Recovery Facility includes:

- | | | |
|--------------------|------------------------------|----------------|
| • Dozer | • Trucks | • Concrete saw |
| • Roller/compactor | • Forklift | • Mobile crane |
| • Backhoe | • Water cart | • Welder |
| • Excavator | • Compressor | |
| • Generator | • Concrete pump and agitator | |

Construction employment

It is estimated that the Proposal would support some 30 direct jobs in the construction industry and support a further 50 jobs in related (supplier) industries over the development period. As such, total employment generated during the construction phase is estimated at 80 jobs.

Construction timeframe

The construction of the New Resource Recovery Facility is expected to take approximately 18 months.

Construction hours

Subject to approval, the construction hours are expected to be in accordance with the NSW Interim Construction Noise Guideline, with construction between 7am and 6pm weekdays and 8am to 1pm on Saturdays.

4.2.3 Operation

Process

The New Resource Recovery Facility would enable recovery of material that is currently landfilled, including soils, mulches and crushed aggregates that will be used in the development and ongoing maintenance of the Embellished Marang Parklands. The key processing activities to be undertaken at the proposed New Resource Recovery Facility include the following:

- **Pre-processing:** incoming C&D and C&I waste and 'heavy' materials would be pre-processed at the recycling plant (within the waste processing building) to separate various recyclables using size, density and other separation technology. The pre-processing area would be located partially under cover. Staff would separate the material into bins and bays to be transferred either to other parts of the Resource Management Facility or off-site for further processing.
- **Waste processing:** processing of up to 200,000 tonnes per year of 'light' C&D waste and 'light' C&I waste would also be carried out within the enclosed processing building. Processing would include size reduction, density and visual separation to extract recyclables including clean timber, plastics, recovered aggregates and recovered fines (soils). Selected residual materials, including selected timber, contaminated plastics, fibre, rubber and contaminated paper materials, would be landfilled at the on-site Waste Disposal Facility, or size reduced, compressed, baled and exported from the facility as SRF for off-site energy recovery. Up to 65,000 tonnes of SRF is estimated to be generated per year.
- **Concrete processing:** recovered concrete, brick and sandstone would be processed by size reduction, separation and washing to produce a variety of reusable aggregate products (concrete and brick drainage aggregate, crushed concrete, crushed brick, crushed tiles, crushed sandstone or blocks and bedding sand). This material will then be sold to customers. All processing, including mechanical size reduction and sorting, would take place within the concrete processing building. The concrete processing building is within the 'concrete processing area' where pre and post processing activities would be carried out including deliveries, pre-acceptance inspection, loading and some stockpiling.
- **Soil processing:** soil material and smaller aggregate materials would be size reduced, separated and washed to produce soils, recovered fines and recovered aggregate. This material would initially be used in the construction of the Embellished Marang Parklands. Once the Embellished Marang Parklands has completed construction, this material would be on sold or used to rehabilitate the Waste Disposal Facility area on Lot 5 at the completion of waste emplacement activities, subject to compliance with a Resource Recovery Order and Exemption under the *Protection of the Environment Operations (Waste) Regulation 2014*.

Further detail is provided in **Section 7.0**. Recovered materials produced by the RRF may be blended with non-waste derived materials to ensure the recovery process is consistent and recovered materials meet the required specifications.

It is highlighted that all material processing is proposed to be undertaken internal to buildings. Selected materials, including uncrushed brick and concrete, and moisture conditioned crushed brick and concrete products, may be handled or stockpiled external to buildings and where possible these stockpiles will be sheltered from prevailing wind conditions. Only materials that have acceptably low dust emitting potential are proposed to be stored external to a building. These materials are proposed to be further controlled with the use of water-based dust suppression.

All dust emissions have been modelled as part of this assessment, and the off-site air quality impacts associated with the Proposal are acceptable (see **Section 12.0**). Therefore, the construction of additional sheltered areas is not warranted.

Plant and equipment

The New Resource Recovery Facility plant would include a variety of sorting and processing equipment such as:

- Loaders
- Excavators
- Material handlers
- Shredders
- Soil washing
- Separators e.g. screens, sorters, magnets
- Conveyors
- Balers and wrappers

Workforce

Once fully operational, the Proposal would generate 80 full time equivalent (FTE) jobs, supported by 10 FTE administrative jobs that would exist to support the operation of the New Resource Recovery Facility (located at the Breen head office). 5 FTE jobs would be required for the landfill operation (these are included in the above 80 FTE operational roles), and up to 2 FTE jobs would be required for the ongoing site-wide monitoring and management of leachate and land gas emissions across the Former Landfill Area and the entire Proposal Site.

4.2.4 Landscaping

The New Resource Recovery Facility would incorporate landscaping along its northern, eastern and southern boundaries, and through the car parking area, as illustrated in **Appendix C** and shown in **Figure 26**.

The landscaped buffer would be 10 metres wide along the northern frontage, to screen the New Resource Recovery Facility from the Playing Fields. The landscaped buffer would be 5 metres wide along the southern and eastern frontages which are areas of the public domain subject to lower intensity of use.

Vegetation that would be planted in the landscaped buffer includes ground cover, shrubs and large trees. The selected vegetation would continue the themes established for the Embellished Marang Parklands, which is documented in detail in the Landscape Master Plan at **Appendix C**.

Source: Clouston Associates



Figure 27 Landfill Cells

Source: Cardno

4.3.1 Landform profile and fill volume

Once the proposed New Resource Recovery Facility is fully operational, and based on presently expected recovery rates, it is expected that approximately 90,000 tonnes per year of residual waste would be produced by the facility. The further processing of these 90,000 tonnes per year would be expected to yield 65,000 tonnes of material that may be suitable for export from the Proposal Site as a Solid Recovered Fuel (SRF) or further recycled as technology advances; and 25,000 tonnes of this material is not expected to be recyclable, and therefore would need to be landfilled. Residual and/or unrecoverable waste requiring landfilling is therefore predicted to occur at between 25,000 tonnes per annum and 90,000 tonnes per annum, subject to the suitability of residual materials for export as SRF.

As an integral part of the operation of the New Resource Recovery Facility, the Landfill component of the Proposal will provide an appropriate avenue to dispose of residual material or other material that cannot be recycled at the New Resource Recovery Facility. It will also involve continuation of the current waste disposal and land rehabilitation operations, which comprise filling, capping and contouring with residual and recovered materials which will originate from the New Resource Recovery Facility.

This application seeks approval for landfilling comprising a total waste volume on Lot 5 of 2,349,041 m³. Previously approved waste capacity allocated to Lot 5 under DA/269/90 was 1,962,874 m³ (with reference back to RL 0m and not including materials required for capping and covering). The proposal therefore represents an increase of approximately 20% compared to the filling volume on Lot 5 approved under DA/269/90.

For context, it should be noted that there has been a reduction in landfill capacity in other parts of the Proposal Site. At a whole of Proposal Site level, the net change in landfill capacity, when compared to the capacity defined by DA/269/90, is calculated to be an increase of approximately 5,500 m³ or 0.05%.

This would involve landfilling to a level of approximately RL 30 m in the southern part of the Landfill area on Lot 5, and approximately RL 10 m along the northern and eastern edges of the Landfill area on Lot 5 to create an undulating final landform similar in nature to the undulating sand dunes that would have existed prior to sand mining. It is noted that under DA/269/90 the Breen Resources Facility is currently authorised to fill Lots 5 and 6 to levels up to approximately RL 25 m.

The proposed final landfill landform of the landfill area is shown on **Figure 28**.

The Landfill areas on Lot 5 would be capped and stabilised in accordance with EPA requirements, including providing a stabilised grassed surface upon closure, comprising grasslands and dune heath as generally envisaged under the DA/269/90. An indicative final landscaping arrangement for the final landform on the Lot 5 Landfill area is provided in **Appendix C** and shown in **Figure 21** above.

Lot 6 would also be capped, closed and contoured with suitable material from the New Resource Recovery Facility. Some specific material would be imported for capping, such as low permeability clay. Lot 6, along with Lots 1122 and 1123 would be delivered as activated community space in the form of the Embellished Marang Parklands in accordance with the VPA (however, noting that the Embellished Marang Parklands are proposed to be embellished over and above the requirements of the VPA as discussed throughout this EIS).

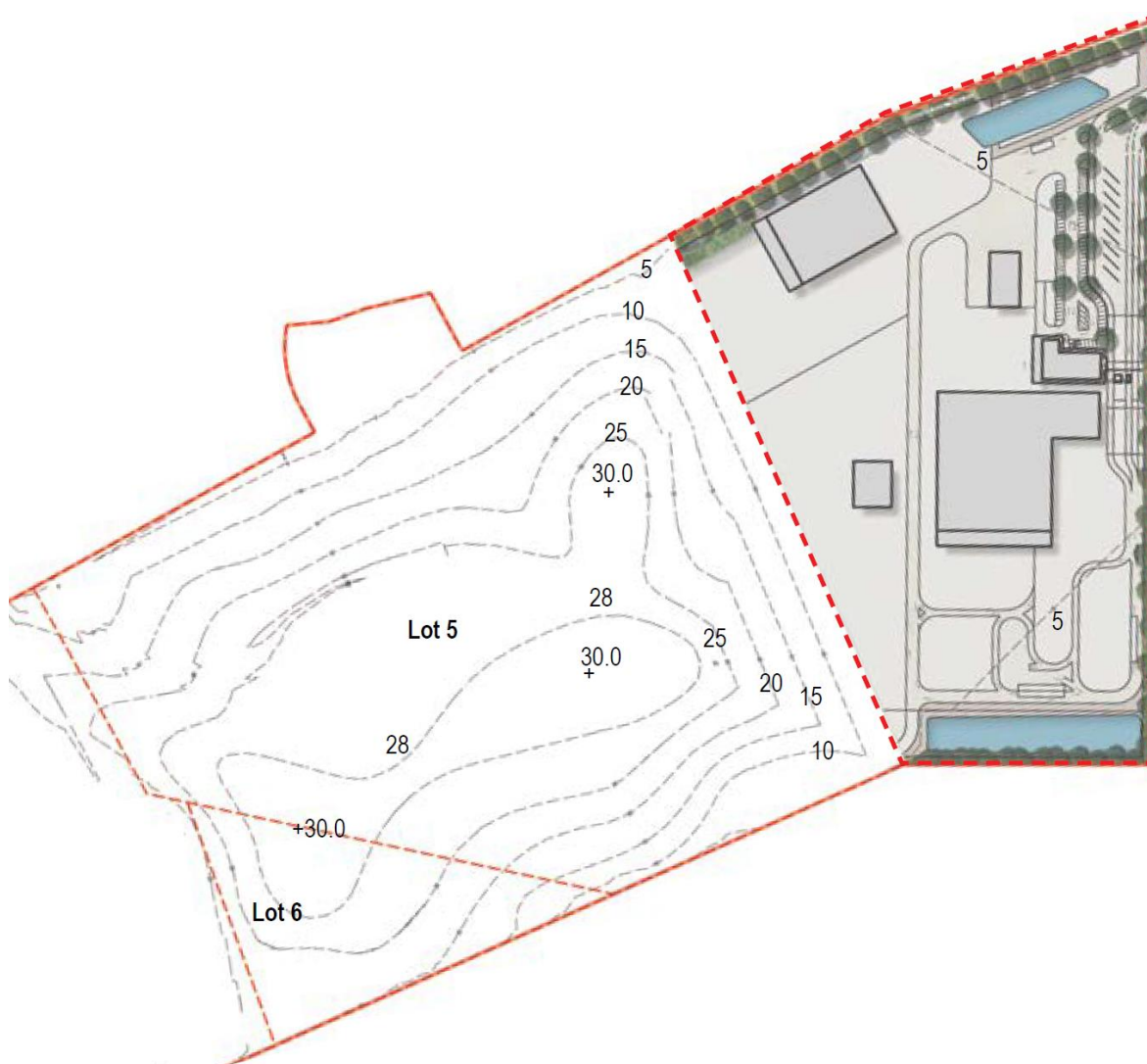


Figure 28 The proposed landform of Lot 5 and Lot 6

Source: Clouston Associates

4.3.2 Construction

General construction process, staging and capping

Landfilling would be undertaken in a staged manner that would minimise the environmental impacts of the works. The new landfill cap would be progressively constructed after reaching final landform levels.

Current landfilling on the western part of Lot 5 is occurring in existing Landfill Cell B10 and B11 Stages A and B (as shown in **Figure 27**). A new Landfill Cell B11 Stage C is proposed to be constructed on the western part of the Lot 5 landfill area. These landfill cells on Lot 5 are consistent with DA/269/90 and have already been approved by the EPA in accordance with EPL 4608. Copies of the approved Lot 5 landfill cell plans are provided in **Appendix Y** for completeness.

A construction quality assurance plan would be prepared as part of the detailed design of the cap to provide a framework to confirm that the works are undertaken in a way that is consistent with the design and meet the requirements of the NSW EPA. The assurance works would include testing of source and installed materials, observation of construction processes by a suitably qualified engineer and surveying to confirm layer thicknesses.

Section 7.0 provides further detail on the proposed landfill staging plan, capping and construction materials.

Plant and equipment

Existing landfill (operational) equipment would also be used for ongoing landfill construction/operations for the Proposal. This includes compacting equipment and dump trucks.

Workforce

It is estimated that the Proposal (as a whole) would support some 30 direct jobs in the construction industry and support a further 50 jobs in related (supplier) industries over the development period. As such, total employment generated during the construction phase is estimated at 80 jobs.

Construction hours

Subject to approval, the construction hours are expected to be in accordance with the NSW Interim Construction Noise Guideline, with construction between 7am and 6pm weekdays and 8am to 1pm on Saturdays.

4.3.3 Operation

Once operational, all vehicles accessing the Landfill would enter the site from Lindum Road via the New Resource Recovery Facility and use internal access roads to access the Landfill. Waste materials disposed to landfill comprise residual material that is a by-product of the resource recovery facility, that is not able to be recycled, or material that is otherwise unrecoverable. Unrecoverable material may be accepted directly from customers (for example, contaminated soils that can be accepted by the facility under its EPL, but contain contaminants that prohibit the material from being recycled). All waste received at the Landfill for landfilling would arrive via the New Resource Recovery Facility. Unless a waste delivery is known to contain no recyclable content, all waste being delivered to the Landfill will be subject to processing in order to extract recyclable and recoverable materials prior to landfilling.

Subject to the recycling and recovery rates achieved at the New Resource Recovery Facility, and the ability of Breen to be able to produce SRF suitable for off-site energy recovery, landfilling is predicted to occur at a rate of between 25,000 and 90,000 tonnes per year.

Over the anticipated 15 year life of the Landfill this would require landfilling of between 375,000 tonnes and 1,350,000 tonnes, depending on whether there is a viable SRF market for the life of the operation. Residual waste of non-SRF recoverable material would be at a density of around 0.7 tonnes per m³ resulting in a minimum required volume of over 530,000 m³. If there is no ability to export SRF then these materials would become residual waste with a density closer to 0.85 tonnes per m³. This would result in a total landfill volume required for disposal of residual wastes of approximately 1.1 million m³.

Whilst landfilling of Lot 5 is already well progressed, it still has sufficient remaining void capacity to receive the maximum projected residual waste volumes. If Breen is able to produce SRF suitable for off-site energy recovery then this would have the effect of reducing the rate of landfilling, ultimately extending the life of the landfill.

The Landfill would continue to be operated in accordance with an existing Environment Protection Licence. Further detail is provided in Chapter **Section 7.0**.

4.4 Embellished Marang Parklands

4.4.1 Construction

Demolition of existing facilities and infrastructure

As part of the Proposal, in order to facilitate the delivery of the Embellished Marang Parklands, the Existing Breen Resources Facility infrastructure and facilities located on Lots 1122, 1123 and 6 would be demolished and removed from this part of the Proposal Site, including the existing:

- Weighbridge and wheel wash;
- Site office and storage area comprising:
 - Site office, lunchroom, office, and amenities;

- Two workshops which consist of covered steel structures are used for various site maintenance activities and storing plant and equipment;
- Storage yard used for external storage and parking of heavy plant, equipment and site vehicles;
- Parking area;
- Stockpiles;
- Sedimentation, infiltration, and recovered water basin; and
- Internal roadways and signage.

Demolition of existing waste management infrastructure on Lot 6 would also be required, including internal stockpile areas. Stockpiled materials would be relocated to the relevant processing area at the New Resource Recovery Facility on Lot 5 as part of the Proposal.

Embellished Marang Parklands landform reprofiling and landscaping

Receipt of waste to Lots 1122, 1123 and Lot 6 under DA/269/90 for the purposes of landfilling on those lots has ceased in order to facilitate the delivery of the Embellished Marang Parklands and Playing Fields. Under this SSDA, the parkland area would be reprofiled to near the final levels, as illustrated in **Figure 29** with suitable recovered material produced by the New Resource Recovery Facility for this specific purpose, and some existing materials, including soils, aggregates and mulches. In particular, approximately 1,500,000 cubic metres of additional growing medium is required to deliver the desired landscaping for the Embellished Marang Parklands. This material will be produced from selected input waste streams of the proposed New Resource Recovery Facility over a 2-3 year period. In particular, approximately 500,000 cubic metres is already available at the Proposal Site for reuse, and the New Resource Recovery Facility is expected to be able to provide up to approximately 200,000 cubic metres of growing medium (soils) per annum.

In addition to the above materials, additional materials are required to deliver specific components of the Embellished Marang Parklands. This includes approximately 15,000 cubic meters of mulch for rehabilitation of the Kurnell dune forest and coastal heath, and over 8,500 tonnes of aggregates for carparking and pathways. This material would also be directly produced from the New Resource Recovery Facility, where possible.

As such, over the 3 year construction period for the Embellished Marang Parklands, in addition to the material supplied by the New Resource Recovery Facility, Breen may need to import up to approximately 500,000 cubic metres of material, which would include engineered products (such as a specified clay), or it would be VENM or excavated natural materials that meet the requirements of a Resource Recovery Exemption.

The Existing Breen Resources Facility site access on Captain Cook Drive will be retained for use during construction, however once the new Lindum Road access is constructed it could be used as the main access for construction of the Embellished Marang Parklands. Site access arrangements would be varied through the life of the construction program in order to ensure the most efficient construction process is implemented and traffic impacts are minimised.

In addition to the supply of landscaping materials for the construction of the Embellished Marang Parklands as described above, the close proximity and direct connectivity of the Resource Management Facility to the Embellished Marang Parklands site will therefore ensure that the construction of the Embellished Marang Parklands is timely and efficient. In particular, Breen will have plant and equipment, as well as personnel with relevant expertise, available at the Resource Management Facility to support the construction of the Embellished Marang Parklands.

Filling would be undertaken in a staged manner for logistical reasons and to minimise the environmental impacts of the works.

The first step would be the capping and closure process which would include the placement of the protective seal bearing layer, bridging layers, and placement of impervious layers (clay or geosynthetic membranes). These impervious layers would be placed, compacted and tested to ensure the Landfill is capped appropriately. **Section 7.0** provides further detail on the proposed capping method.

Following capping, recovered materials from the New Resource Recovery Facility would be used to deliver the final Parklands landform finished levels. This would also involve construction of a vegetation layer to allow growing space for deep rooted trees and ensuring plant health and placing the top soil layer for shallow rooted vegetation.

The landscaping phase would include:

- Planting of trees, bushes and grasses;
- Hard landscaping – carparking, footpaths, roads and other improvements; and
- Parklands establishment – vegetation maintenance, sedimentation monitoring and control.

Recovered materials from the New Resource Recovery Facility would be used in accordance with applicable EPA resource recovery exemptions. This material would be supplemented by existing material that is currently stockpiled on the Proposal Site and which meets the requirements of the relevant 2014 resource recovery orders.

Plant and equipment

Equipment expected to be used for the landscaping and parkland creation includes:

- Excavators
- Dump trucks;
- Compactor;
- Dozers;
- Rollers; and
- Water carts.

Workforce

It is estimated that the Proposal would support some 30 direct jobs in the construction industry and support a further 50 jobs in related (supplier) industries over the construction period. As such, total employment generated during the construction phase is estimated at 80 jobs. Breen's construction workforce will be integrated across all components of the Proposal.

Construction hours

Subject to approval, filling and landform reprofiling construction hours are expected to be in accordance with the NSW Interim Construction Noise Guideline, with construction between 7am and 6pm weekdays and 8am to 1pm on Saturdays.



Figure 29 Embellished Marang Parklands Landform

Source: Clouston Associates

4.4.2 Landform profile

Although no new waste is being received on Lots 1122 and 1123 and Lot 6 for the purpose of landfilling on those lots, these areas need to be re-profiled, contoured and capped to enable delivery of the proposed Embellished Marang Parklands. Further site re-profiling of existing waste materials is needed to create a landform that will provide high quality activated open space and parklands for the Sutherland Shire community.

The proposed landform for the Embellished Marang Parklands (**Figure 29**) has been designed to create a variety of spaces, grades and profiles to achieve specific recreation and environmental objectives. Recreation objectives include pathways and tracks that are wheelchair accessible, steeper tracks for more challenging walks and hikes, as well as an open amphitheatre, lawns and lookouts to connect the community to the surrounding wetlands, parks and ocean.

The environmental objectives include creating both sheltered and more open landscapes creating the right environment for forest and heath landscapes that replicate the former sand dune profiles.

The proposed landform also modifies the currently approved levels to provide for a smooth transition to VPA playing field levels.

To create the proposed parkland landform for the Embellished Marang Parklands, approximately 1,500,000 m³ of material is required in addition to the volumes approved by DA269/90. This material includes soils and aggregates that are currently stockpiled on the Proposal Site and which meet the requirements of the relevant 2014 resource recovery orders, Virgin Excavated Natural Material, clay material for capping purposes and, additional growing medium as referred to in **Section 4.4.1** above. Soil to be placed as part of this proposed parkland development would comprise suitable recovered material produced by the New Resource Recovery Facility for this specific purpose.

4.4.3 Embellished Marang Parklands landscape design, facilities and infrastructure

Once reprofiled, the Embellished Marang Parklands would be established to provide for activated community space on the rehabilitated land within these lots (Lots 1122 and 1123 and Lot 6). The Embellished Marang Parklands will provide a once-in-a-generation opportunity to provide the growing community of Kurnell access to a new network of open space recreational facilities; one that is unique in the Sydney landscape by offering a coastal dune heath and forest park experience. The Embellished Marang Parklands will provide an exciting and memorable experience for the many local and regional visitors through provision of the following landscape design, facilities, and infrastructure (see **Figure 30**):

- revegetation with Dune Forest and Heath, as well as informal native grass areas and managed native grass areas, with a number of informal picnic zones;
- a cleared 'Village Green' area in the middle of the parklands with amphitheatre and a panoramic look out to the west, and
- internal access road and parking areas, as well as pervious pathways for access throughout the parklands.
- integration of the parklands into the surrounding dune nature reserves re-establishing a critical ecological link from Bate Bay to Towra Point;
- restoration of endemic dune vegetation on the Proposal Site through the selection of indigenous plant species, set in a dune-like landform;
- a place to reflect and interpret the rich Aboriginal and Non-Aboriginal heritage of the local landscape;
- the creation of key pedestrian and cycle links between Quibray Bay and Cronulla Beach;
- creation of a network of accessible paths to allow visitors to easily access the parklands for pedestrians and cycling, reinforcing the Sydney Green Grid;
- provision of new passive and active recreation opportunities for all members of the local and wider community to use and enjoy;
- a place for the community to hold events and celebrations in a semi natural setting; and
- an elevated landscape that offers spectacular all-round regional views that will assist in a better understanding of the varied landscapes of this part of Sydney.

The Embellished Marang Parkland depends on the production of landscaping products from the proposed New Resource Recovery Facility that are required to deliver the superior landform proposed, including soils, aggregates and mulches, as described in **Section 4.4.1** above.

Further, Breen has commenced discussions to enter into a supply agreement with Council to, on an ongoing basis, supply landscaping materials for the Embellished Marang Parklands. These materials will include soils, mulches and crushed aggregates, to ensure the ongoing sustainable operation of the Embellished Marang Parklands. The New Resource Recovery Facility has been specifically designed, through the selected input waste streams identified in this application, and the processing plant and equipment selected, to produce the required landscaping products to both construct and service the Embellished Marang Parklands.

The inter-connectedness between the Embellished Marang Parklands with the New Resource Recovery Facility and landfill is embedded in relation to both the delivery and ongoing operational aspects of the Embellished Marang Parklands. In particular, the delivery timeframes and the supply of materials to construct and operate the Embellished Marang Parklands in a sustainable way is dependent on the materials produced from the New Resource Recovery Facility, and the ongoing monitoring and management of leachate and land gas emissions across the Former Landfill Area would be carried out by employees based at the New Resource Recovery Facility.

The relevant areas would be transferred to Council when the Embellished Marang Parkland and open space works have been completed in accordance with a New VPA.



Figure 30 Landscape design for the proposed Embellished Marang Parklands

Source: Clouston

4.5 Ongoing environmental management and maintenance

Breen has a long term interest in ensuring the successful delivery of the Embellished Marang Parklands, and will be intimately involved in not only the initial construction of the parklands, but also in relation to the ongoing maintenance and operation of the parklands. In particular, Breen has commenced discussions to enter into a supply agreement with Sutherland Council to, on an ongoing basis, supply landscaping materials for the Embellished Marang Parklands. These materials will include soils, mulches and crushed aggregates, to ensure the ongoing sustainable operation of the Embellished Marang Parklands and can only be supplied by Breen at the proposed reduced sell rates as a result of the co-location of the New Resource Recovery Facility.

The co-location of the Resource Management Facility and the Embellish Marang Parklands will therefore ensure that the construction and ongoing maintenance of the parklands is timely and efficient. Further, Breen will have plant and equipment, as well as personnel with relevant expertise, available at the resource management facility to support the construction and ongoing maintenance of the Embellish Marang Parklands, including the environmental management and monitoring requirements for the Former Landfill Area. This is particularly so for the ongoing management of leachate and landfill gas emissions, which are described in more detail below.

4.5.1 Water and leachate management

Surface water management for the New Resource Recovery Facility would include provision of infiltration basins and vegetated swales/buffer strips, proprietary stormwater treatment devices to remove oils and grease, suspended solids, gross pollutants and some nutrients.

Drainage in the New Resource Recovery Facility would include table drains adjacent to internal haul roads, pit and pipe drainage in the proposed car parks and hardstands areas which would discharge to the infiltration basins, and roof drainage (guttering and downpipes) to connect to either subsurface pipes, table drains or infiltration pits.

Surface water management for the Embellished Marang Parklands would include a combination of measures across the various portions of the Proposal Site including provision of an infiltration trench, vegetated swales, an on-site stormwater detention basin, pit and pipe drainage and a level spreader and scour protection.

Surface water and leachate management for the Landfill would continue in accordance with current practices with particular emphasis on separation between surface water, waste materials and leachate.

It is also highlighted that the management of groundwater remains inextricably linked across the entire Proposal Site, being the Former Landfill Area on Lots 1122, 1123 and 6 (which will comprise the Embellished Marang Parklands and be transferred to Council) and Lot 5 (which will comprise the New Resource Recovery Facility and which is to stay in Breen ownership). These areas have been historically operated, managed and regulated as a single landfill operation under DA269/90 and a single Environment Protection Licence since 1990, including for the management and regulation of groundwater and leachate. In particular, the assessment of groundwater discharge to the Towra Point Reserve is based on a site-wide management regime, and the proposed leachate management system for the Embellished Marang Parklands requires ongoing collection with treatment occurring on Lot 5 as part of the Lot 5 leachate treatment system that will be detailed in the landfill closure plan under the relevant Environment Protection Licence.

Details on the proposed surface water and leachate management regime for the entire Proposal Site is provided in **Section 8.0**.

4.5.2 Landfill gas management

Landfill gas monitoring at the Proposal Site includes quarterly monitoring of subsurface landfill gas (measured from 5 monitoring wells installed around the perimeter of the Proposal Site) and building gas accumulation (monitored at 5 locations within the Proposal Site boundaries).

A gas mitigation system may be required as a component of the landfill capping system to be installed, subject to review by the EPA. The spacing of the gas collection trenches and venting points would be determined following field testing, with gas mitigation measures proposed to be omitted in areas where methane levels are less than 500 parts per million (v/v).

As with the management of leachate, any landfill gas monitoring and mitigation systems would be based on an integrated site-wide regime that would cover all of the Former Landfill Area as well as active landfill areas on Lot 5, and would be managed from the New Resource Recovery Facility.

4.6 Utilities and services

4.6.1 Electricity

Most stationery processing equipment would be electrically powered. Electricity would also be needed for lighting and the operation of separation and processing plant at the New Resource Recovery Facility. Site office, weighbridges and worker lunch room and amenities would also require electricity.

It is expected that the New Resource Recovery Facility would have an electricity demand of approximately 7 million kWh per year. The use of renewable energy sources, particularly solar, would be explored in the detailed design stage to determine feasibility.

4.6.2 Communications

The site office at the New Resource Recovery Facility would be provided with communications, computer and data cable access. Standard communications cabling and two-way radio / mobile telephones would provide the required telecommunication services. Internet access would be provided via NBN.

4.6.3 Water supply

Water supply would be drawn from local reticulated main supplies and the on-site recovered water basins and rainwater tanks.

Potable water would be used for showering, drinking purposes and dust suppression in areas that personnel work. Water collected from the on-site recovered water basins or rainwater tanks would be used to clean equipment and floors, toilet flushing, or for other industrial purposes. It would also be used for watering any landscaped areas.

4.6.4 Wastewater management

Both the site office and worker lunchroom and amenities would be served by connection to sewer.

4.6.5 Fire services

Fire safety including fire services is addressed in **Section 16.0**.

4.7 New site access

The new site access is proposed via Lindum Road along the eastern boundary of the Proposal Site. The new site access would require the extension of Lindum Road for a short distance beyond the extent of the currently formed road which provides access to Sporting Field No. 1 and the Skate Park, as well as to the adjoining sand mining site.

The extension of Lindum Road would require alteration of the pedestrian access arrangement along the existing footpath that currently occupies the Lindum Road reserve. The Lindum Road upgrade works would be designed and constructed to Council's engineering standards.

Conceptual plans of the proposed new site access road are provided in **Figure 31**.

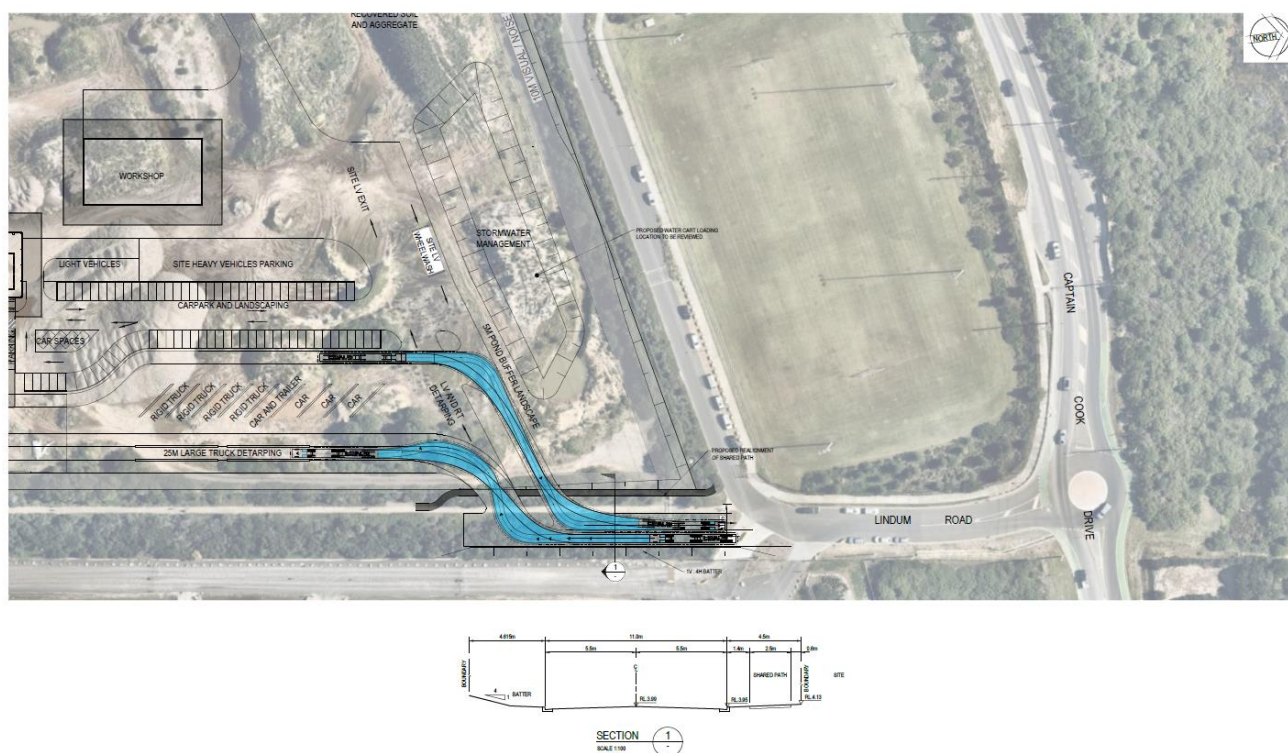


Figure 31 New Proposal Site access

Source: Cardno

4.8 Construction and Operation Staging

The construction sequence has been carefully planned to facilitate a staged release of the Embellished Marang Parklands, allowing this area to be utilised by the public as soon as each stage is completed, rather than waiting for the entire Proposal to be finalised before being able to realise the benefits this Proposal provides. Other advantages of this staging are that it:

- Allows time for the Embellished Marang Parklands to be established prior to the construction of the relevant Playing Field, which will prevent damage to the fields from sediment load during rainfall events.
- Minimises interaction between construction activities and public access which reduces the safety risk to the construction team and the community.

The development sequence is governed by a number of dependent activities:

1. Consent for the proposed New Resource Recovery Facility, Embellished Marang Parklands and landfill contours must be in place before the delivery of the Embellished Marang Parklands (under this SSDA) and Stage 2 and 3 of the Playing Fields (under previous development consents) can commence.
2. Once consent has been granted, Construction Certificates can be applied for and the construction of the New Resource Recovery Facility and Embellished Marang Parklands can commence (following the issue of these certificates).
3. Once the New Resource Recovery Facility has been delivered, Breen can demolish and/or re-locate its Existing Breen Resources Facility and associated infrastructure on Lots 1122, 1123 and Lot 6. Breen can complete the re-profiling, capping and closing works on the Embellished Marang Parklands footprint, and complete the development of the Embellished Marang Parklands.
4. Following the re-location of the Existing Breen Resources Facility and completion of the Embellished Marang Parklands, the works required to enable delivery of the Playing Fields (relevantly referred to as the “Australand Works”, “Australand Compaction Works”, “Breen Works” and “Breen Compaction Works” in the VPA and collectively referred to in this SSDA as the “Owners Works”) can commence.
5. The final surfaces can then be delivered on Stages 2 and 3 of the Playing Fields by Breen and Frasers Property Pty Ltd as development partners to the VPA (referred to as “Developers’ Works” in the VPA). Due to access constraints, these final surfaces can only commence once the Embellished Marang Parklands are complete.

Figure 32 and **Table 4** show the intended staging including approvals.

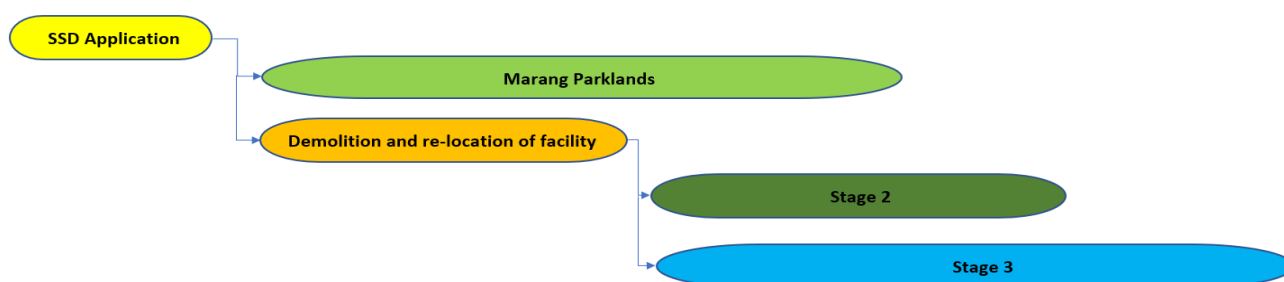


Figure 32 Intended staging of the works

Source: Breen Resources

The below timeframes for practical completion provide an estimate of the commencement and construction duration for each of the elements of work that form part of this Proposal (being sought under this SSDA), and Stages 2 and 3 of the Playing Fields the subject of the VPA.

Table 4 Estimated timeframes for practical completion

Stage	Start	Finish
SSD Application Process	February 2020	June 2022
Relocation	July 2022	April 2023
Embellished Marang Parklands	July 2022	November 2024
Playing Fields Stage 2	November 2023	July 2025
Playing Fields Stage 3	September 2023	June 2026

Source: Breen Resources

Subject to obtaining the necessary government agency consents and approvals, Breen is committing to deliver the following elements of work that relate to the VPA within the provided timeframes:

- Practical Completion of the Embellished Marang Parkland – November 2024.
- Completion of the works required to enable delivery of the Playing Fields (i.e. the Owners Works as defined above) for Stage 2 and 3 of the Playing Fields – November 2024.

Breen will formalise these commitments with Sutherland Shire Council as part of a proposed New VPA offer made to Council. This proposal will include the dates that Breen are able to commit to, and recognise the construction, consent and approvals risk that exists with this Proposal.

4.8.1 Embellished Marang Parklands

The first stage of the construction sequence is the Embellished Marang Parkland area. The area is located over historic landfill cells and as such the EPA requires the capping and closure of these cells to be completed and certified before development of the land can take place.

The Embellished Marang Parklands footprint covers current operational concrete and gypsum processing facilities. These facilities, including any associated stockpiles will need to be re-located before construction of the Embellished Marang Parklands can begin in these areas.

Parkland Earthworks and Landscaping

Once the Existing Breen Resource Facility has been re-located and before capping can take place, the existing landform will be re-profiled to suit the final approved levels in this SSDA. This landform will be capped, and the EPL will be progressively amended or surrendered for those parts of the Proposal Site that will be transferred to Council under the VPA.

Landscaping material (including material recovered from the New Resource Recovery Facility) will be placed and compacted above the cap to form the final approved levels in this SSD application for the Embellished Marang Parklands and landscaped to the requirements defined by the masterplan. The works will be staged to allow existing materials to be efficiently placed and compacted to final levels.

Transfer to council

Once construction is complete and the Embellished Marang Parklands are established and when it is safe to do so, the Embellished Marang Parklands will be transferred to Council.

4.8.2 Works to enable delivery of Playing Fields Stage 2

The commencement of these works, which have already been approved under DA12-0083, requires the relocation of the soil recycling operations component of the Existing Breen Resources Facility which is located on Lot 6 (being part of the Stage 2 Playing Fields).

Following the relocation of soil recycling operations, vegetation in the area will need to be stripped to allow for the required capping and closing works. The capping and closing includes the construction of a seal bearing layer, bridging layers, and the construction of a clay seal layer including compaction and testing.

Earthworks

Earthworks required in this area include re-profiling of existing waste materials, the construction of protective layers, bridging, drainage layers and required capping works within the Stage 2 Playing Fields area on Lot 6. This work will be performed by Breen as part of its obligations defined by the VPA to enable delivery of the Playing Fields (referred to as “Owners Works” as defined above).

Once these works have been completed to the acceptable standards, the area will be handed over to the development partners to the VPA (being Breen and Frasers Property Pty Ltd) to construct the:

- car parks,
- playing fields surface,
- fencing; and
- power, lighting and water.

Developer’s works certification

Upon completion of the work performed by the VPA development partners, the relevant land can be dedicated to Sutherland Shire Council.

4.8.3 Works to enable delivery of Playing Field Stage 3

In order to make the areas for the playing fields available for construction, as previously approved, some operational activities and infrastructure associated with the Existing Breen Resources Facility need to be moved from the area. These items that require relocation include the site offices, workshops, weighbridges, wheel washes, recycling plant and active and legacy stockpiles.

Once relevant infrastructure and equipment has been relocated, the existing facilities will be demolished to allow for earthworks and construction required to deliver the Stage 3 Playing Fields. This will include ensuring vegetation is stripped, stockpiles are relocated and landfill levels in this location are constructed to final approved levels. This will allow the capping of waste to be completed.

Earthworks

Earthworks required in this area include reprofiling of existing waste materials, the construction of protective layers, bridging, drainage layers and required capping works within the Stage 3 Playing Fields area on Lot 1123. This work will be performed by Breen as part of its obligations defined by the VPA to enable delivery of the Playing Fields (referred to as “Owners Works” as defined above).

Once these works have been completed to the acceptable standards, the area will be handed over to the development partners to the VPA (being Breen and Frasers Property Pty Ltd) to construct the:

- car parks,
- playing fields surface,
- fencing; and
- power, lighting and water.

Developer’s works certification

Upon completion of the work performed by the VPA development partners, the relevant land can be dedicated to Sutherland Shire Council.

4.9 Consolidation of Approvals

The Proposal includes the staged surrender and consolidation of DA/269/90, ensuring that all activities associated with its ongoing operations at the Proposal Site will ultimately be captured under this SSD (if approved). Given that the Existing Breen Resources Facility must remain operational during the construction and commissioning of the New Resource Recovery Facility, it is proposed that existing waste management, processing and landfilling activities would continue to be carried out under DA/269/90 until:

- the proposed New Resource Recovery Facility has obtained an Occupation Certificate,
- the activities associated with the Existing Breen Resources Facility have been relocated, and
- the New Resource Recovery Facility is fully operational following the completion of the commissioning period.

For the avoidance of doubt, Breen will only consider surrendering its existing approvals if the conditions of any new consent are acceptable to Breen. If the conditions are unacceptable, for example (and without limitation) because they impose unduly onerous or restrictive controls on the Proposal Site, then Breen will consider its options in relation to relying on its existing approvals.

4.9.1 Activities associated with the Existing Breen Resources Facility

Activities associated with the Existing Breen Resources Facility would continue on existing areas of the Proposal Site until these activities can be successfully relocated to the New Resource Recovery Facility. Whilst they continue to occur on these areas, these activities would be carried out in accordance with DA/269/90. These activities would therefore be removed from those areas once the commissioning period for the New Resource Recovery Facility is finished and it has become operational. At this time, the consent issued pursuant to DA/269/90 will be surrendered and all resource recovery and processing operations will be carried out pursuant to the SSD approval (if granted).

4.9.2 Landfilling activities

The current landfill activities on Lot 5 will continue in the existing active landfill cell area (i.e. Landfill Cells B10 and B11) pursuant to DA/269/90 until such time as the completion of the commissioning period of the New Resource Recovery Facility. At this time, the consent issued pursuant to DA/269/90 will be surrendered and all landfilling operations will be carried out pursuant to the SSD approval (if granted). Breen will not receive or process C&I Waste until the New Resource Recovery Facility has commenced commissioning and can process the C&I Waste.

4.10 Staging of Construction Certificates and Occupation Certificates

The SSD consent (if granted) would therefore need to become active for different activities at different times. In particular, the SSD consent (if granted) would need to commence in line with the scheduling for each stage as illustrated in **Figure 32**. As such, it is requested that the SSD consent (if granted) contains separable provisions relating to these aspects, as well as flexibility to enable staging of Construction Certificates and Occupation Certificates.

4.11 Contributions and the New VPA

4.11.1 Contributions Plans

The EP&A Act enables a consent authority to levy contributions on development for the provision of community infrastructure which is required as a consequence of that development.

The Sutherland Shire Section 7.11 Development Contribution Plan 2016 (Amendment 3, 2020) applies to development that will create additional dwellings in the specified precinct centres around the Sutherland Shire. The Proposal does not include any residential dwellings, and so the Section 7.11 Development Contribution Plan does not apply to the Proposal.

The Sutherland Shire Section 7.12 Development Contributions Plan 2016 (Amendment 3, 2020) relevantly states that it applies to all development within the Sutherland Shire where the proposed cost of carrying out the development is more than \$100,000 other than:

- the types of development subject to the Sutherland Shire Section 7.11 Development Contribution Plan;
- development that is exempted from paying the levy by Director of the Minister for Planning, under Section 7.17 of the EP&A Act;
- development consents for any form of seniors housing as defined by State Environmental Planning Policy (Housing for Seniors or People with a Disability) granted to a social housing provider as defined by that policy;
- components of application for Seniors Housing;

- Secondary Dwellings as defined by SSLEP2015;
- Affordable Housing undertaken by a social housing provider as defined by the SEPP (Affordable Rental Housing) 2009;
- emergency services facilities as defined by SSLEP2015; or
- applications by a Public Authority for services and community infrastructure.

As the Proposal does not strictly fall within the above categories, the Section 7.12 Development Contributions Plan does apply to the development. It is noted, however, that despite not being delivered by a Public Authority, the Embellished Marang Parklands component of the Proposal does in fact provide services and community infrastructure.

As set out in the Section 7.12 Development Contributions Plan, the objective of the Plan is:

- To authorise the imposition of a condition on certain development consents and complying development certificates requiring the payment of a contribution pursuant to Section 7.12 of EP&A Act 1979.
- To assist the Council to provide the appropriate public facilities which are required to maintain and enhance amenity and service delivery within the area.
- To publicly identify the purposes for which the levies are required.

The levies paid to Council under the Plan will be put towards meeting the cost of public facilities within the various employment areas across the Shire. The Section 7.12 Development Contributions Plan authorises contributions to be levied towards the provision of the following public amenities and services:

- Open space and recreation facilities.
- Shared path & Cycleways/Upgrade to shared path of existing footpaths.
- Sea walls.
- Flooding, Stormwater and Drainage Facilities.
- Cronulla Plaza public domain upgrade.

The Section 7.12 Development Contributions Plan states that it is “intended to supplement the operation of the Sutherland Shire S7.11 Contributions Plan 2016 applying to the Sutherland Shire, by levying contributions on developments that are not presently required to make contributions under that contributions plan, **but which nonetheless are still likely to generate demand for additional public amenities and services**” [our emphasis].

The Embellished Marang Parklands component of the Proposal will not generate demand for additional public amenities and services, and will in fact provide such public amenities and services to the Sutherland Shire community. These public amenities and services include open space and recreation facilities which are stated to be purposes for which contributions are levied under the Section 7.12 Development Contributions Plan.

It is therefore Breen’s position that the Embellished Marang Parklands component of the Proposal should be excluded from paying contributions under the Section 7.12 Development Contributions Plan.

Notwithstanding the above analysis, it is highlighted that Breen’s proposed Embellished Marang Parkland delivers a range of embellishments significantly over and above the 2010 VPA commitments. The delivery of the proposed embellishments to the Embellished Marang Parklands is contingent on the production of landscaping products from the proposed New Resource Recovery Facility that are required to deliver the superior landform proposed, including soils, aggregates and mulches.

Without the New Resource Recovery Facility, Breen will not have access in an economical way to the superior landform materials required to deliver the Embellished Marang Parklands. As set out above, over 1.5 million cubic meters of growing medium is required to deliver the desired landform of the Embellished Marang Parklands. This material will be manufactured from selected input waste streams to the proposed New Resource Recovery Facility over a 2-3 year period. Additional materials including; approximately 15,000 cubic meters of mulch for rehabilitation of the Kurnell dune forest and coastal heath, and over 8,500 tonnes of aggregates for carparking and pathways also

are required to deliver components of the proposed Embellished Marang Parklands, and these materials will also be directly produced from the New Resource Recovery Facility.

4.11.2 The New VPA

Pursuant to Section 7.4 of the EP&A Act, Breen is also offering to enter into a New VPA with Council in connection with this SSDA.

Among other things, under the New VPA, Breen proposes to pay Council a road levy of \$0.30 per tonne of waste material delivered by road to the New Resource Recovery Facility. It is Breen's intention that this levy will fund maintenance works for the ongoing operation of the Embellished Marang Parklands. This levy is a key part of Breen's offer to Council for a New VPA, and is inextricably linked to the New Resource Recovery Facility as the levy cannot be funded without the operation of the New Resource Recovery Facility.

The proposed New VPA will reflect the inter-connectedness between the delivery and ongoing operation of the Embellished Marang Parklands with the New Resource Recovery Facility and landfill in terms of sustainability, delivery timeframes and the supply of materials and services which make both the proposed New Resource Recovery Facility and the proposed Embellished Marang Parklands viable.

5.0 Legislative Framework

5.1 Commonwealth Legislation

The *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) encompasses an assessment and approvals system for:

- actions that have a significant impact on matters of National Environmental Significance;
- actions that have a significant impact on the environment of Commonwealth land; and
- actions carried out by the Commonwealth Government.

If the Minister for the Environment decides that the proposed action is likely to have a significant impact on a matter protected by the EPBC Act, it is a “controlled action” that requires approval from the Commonwealth Minister for the Environment. The Proposal Site is not Commonwealth land and the Proposal is also not an action proposed to be carried out by a Commonwealth agency.

In order to understand the potential impact to matters of National Environmental Significance, an EPBC Act Protected Matters Report has been generated from the Australian Government’s Department of Environment and Energy Protected Matters Search Tool (dated 20 October 2020), and is attached in **Appendix T**. The Protected Matters Report identifies that:

- The Proposal Site is located in close proximity to the Towra Point Nature Reserve which is a RAMSAR Wetland located immediately north of Captain Cook Drive.
- The Towra Point Nature Reserve, along with other areas on the Kurnell Peninsula, are listed on the National Heritage Register as the ‘Kamay Botany Bay: botanical collection sites’, being the places where botanist Sir Joseph Banks collected plant specimens in 1770.
- Six Endangered Ecological Communities are likely to occur in the area around the Proposal Site, with 69 threatened species likely or known to occur in the area, or likely or known to have habitat in the area.

Further detailed analysis as part of the Biodiversity Development Assessment Report (see **Appendix S**) identified the following matters of National Environmental Significance as having the potential to be adversely affected by the proposed works:

- *Litoria aurea* (Green and Golden Bell Frog), listed as vulnerable.
- *Pteropus poliocephalus* (Grey-headed Flying-fox), listed as vulnerable.

The significant impact criteria for protected matters under the EPBC Act, as set out by the Commonwealth Department of the Environment in the Significant Impact Guidelines 1.1, were applied with respect to these matters of National Environmental Significance and it was determined that a significant impact is unlikely to occur as a result of the Proposal (see also Section 19.3.4). In particular the nearby Ramsar Wetland, being a matter of National Environmental Significance, is not directly impacted by the Proposal.

As the Proposal will be carried out on land that has been subject of extensive landform modification from historical sand mining activities, and is currently cleared of vegetation, it is considered unlikely that the Proposal will directly impact on any other matters of National Environmental Significance.

For these reasons, a referral to the Commonwealth Minister for the Environment is not required.

5.2 State Legislation

5.2.1 Environmental Planning and Assessment Act 1979

Development in NSW is regulated pursuant to the EP&A Act, which sets out the procedures and objects for all development.

Section 1.3 of the EP&A Act sets out the objects of the Act, which are as follows:

- (a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,*
- (b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,*
- (c) to promote the orderly and economic use and development of land,*
- (d) to promote the delivery and maintenance of affordable housing,*
- (e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,*
- (f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),*
- (g) to promote good design and amenity of the built environment,*
- (h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,*
- (i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,*
- (j) to provide increased opportunity for community participation in environmental planning and assessment.*

The Proposal promotes the orderly and economic use of the Proposal Site as it caters to and supports the ongoing and planned development of the Embellished Marang Parklands, while ensuring a modern and efficient Resource Management Facility continues to operate on the Proposal Site. The Proposal will improve the management and recovery of the State's resources. The Proposal will also improve the conservation of threatened and other species of native flora and fauna and ecological communities and their habitats by virtue of the VPA landscape and revegetation works enabled by the Proposal.

All components of the Proposal are highly integrated and are necessarily interconnected and critically reliant on each other at an operational and commercial level to achieve the overall project objectives. As such, integration of the components into a single development application is critical in ensuring that the proposed development and use of the land is orderly and economic, and to ensure the timely and efficient delivery of high quality activated recreational space and publicly accessible parklands. In particular:

- The close proximity and direct connectivity of the Resource Management Facility to the Embellished Marang Parklands will ensure that the delivery of the parklands is timely, efficient and cost effective, and that off-site environmental impacts are minimised.
- The New Resource Recovery Facility has been specifically designed to service the Embellished Marang Parklands in terms of the balance of waste streams and operational plant and equipment for processing the waste streams. The Embellished Marang Parklands therefore underpin to the economic viability of the New Resource Recovery Facility.
- The resource recovery opportunities available as a result of the Embellished Marang Parklands component of the Proposal will ensure that Breen can maximise the efficiency of the New Resource Recovery Facility, enabling high levels of beneficial reuse of waste materials and minimising the need to dispose of residual materials. In this way, scarce landfill capacity will be optimally used for residual unrecoverable materials.
- The Former Landfill Area on Lots 1122, 1123 and 6 have been historically operated, managed and regulated as a single landfill operation under DA269/90 and a single Environment Protection Licence since 1990, including for the management and regulation of groundwater and leachate. The proposed leachate management system for the Former Landfill Area of the Embellished Marang Parklands requires ongoing collection with treatment occurring on Lot 5 as part of the Lot 5 leachate treatment system that will be detailed in the landfill closure plan under the relevant Environment Protection Licence. As such it would not be orderly or economic to separate the management and regulation of groundwater and leachate in the Former Landfill Area from the ongoing management system that will be retained for the ongoing active landfill areas on Lot 5. If the New Resource Recovery Facility proceeds independently of the Embellished Marang Parklands or not at all, the groundwater management system will lose important operational synergies resulting in a less efficient and effective system. It may result in groundwater for the Embellished Marang Parklands being managed on Lots 1122, 1123 and 6, introducing added unnecessary complexities into the design of the Embellished Marang Parklands.

Separation of these highly integrated components into multiple development applications would undermine their integration through forcing separate administrative, land management and environmental management processes and procedures being enforced by different consent and regulatory authorities on different parts of the Proposal

Site. This would result in the Proposal being delivered in an uncoordinated and inefficient way, ruining the beneficial synergies across the Proposal, and affecting the economic viability of the entire development.

The Proposal seeks to carry out development which is partly SSD (being the New Resource Recovery Facility as explained in **Section 5.3.1 to 5.3.3** below) and which is partly prohibited (being certain components of the resource recovery activities that comprise 'waste disposal' under the Kurnell SEPP, explained further at **Section 5.3.1**). Under Section 4.38 of the EP&A Act development consent can still be granted for SSD that is partly permissible and partly prohibited.

The EIS has addressed the specific criteria within clause 6 and clause 7 of Schedule 2 of the EP&A Regulation (see **Section 5.2.2**). Similarly, the EIS has addressed the principles of ecologically sustainable development through the precautionary principle (and other considerations), which assesses the threats of any serious or irreversible environmental damage (see **Section 22.4**).

The Proposal is consistent with Division 4.7 of the EP&A Act, in particular:

- the development has been declared to have state significance;
- the development is not wholly prohibited by an environmental planning instrument; and
- the development has been evaluated and assessed against the relevant matters for consideration under section 4.15(1).

5.2.2 Environmental Planning and Assessment Regulation 2000

The *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) sets out procedures that relate to preparation and submission of an EIS. In particular, Schedule 2 of the EP&A Regulation sets out:

- The process for obtaining SEARs.
- Requirements relating to the form and content of an EIS.

This EIS has addressed the specific criteria within clause 6 and clause 7 of Schedule 2 of the EP&A Regulation. Similarly, the EIS has addressed the principles of ecologically sustainable development through the precautionary principle (and other considerations), which assesses the threats of any serious or irreversible environmental damage (see **Section 22.4**).

As required by clause 7(1)(d)(v) of Schedule 2, the following additional approvals will be required in order to permit the proposed development to occur.

- An Environment Protection Licence issued under the *Protection of the Environment Operations Act 1997*.
- Approval from Council as the relevant Roads Authority under the *Roads Act 1993* for works within the road reserve of Lindum Road.

5.2.3 Protection of the Environment Operations Act 1997

As described above, the Proposal Site is the subject of the existing EPLs 4608 and 20697 under the POEO Act. EPLs 4608 and 20697 will continue to apply in relation to the ongoing waste management activities, however, will need to be varied as a result of the Proposal. This Proposal will therefore be referred to the EPA for its concurrent assessment of the EPL variations.

5.2.4 Water Management Act 2000

Controlled activity approvals under the *Water Management Act 2000* do not apply to SSD (pursuant to Section 4.41 of the EP&A Act). Further, groundwater interference is unlikely to occur since the Proposal does not involve significant excavations below the existing ground level and is expected to result in improved groundwater conditions (see further assessment in **Section 8.0**). As such, an Aquifer Interference Approval is not required.

5.2.5 Coastal Management Act 2016

The Proposal Site is identified as partly within the Proximity Area for Coastal Wetlands and Littoral Rainforests, the Coastal Environment Area and the Coastal Use Area under the *State Environmental Planning Policy (Coastal Management) 2018* (the Coastal Management SEPP), being coastal zones protected under the *Coastal Management Act 2016*. As such, these matters are considered as part of the EIS at **Section 18.0**, notwithstanding that the Proposal is fully contained within an existing disturbed landscape. The assessment concludes that the proposal will not result in impacts to land protected under the Coastal Management SEPP and therefore is consistent with the aims of the *Coastal Management Act 2016*.

5.2.6 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) provides the legislative framework for clearing native vegetation and protecting threatened species, ecological communities and their habitats across NSW. The BC Act requires proponents for any SSD to prepare a Biodiversity Development Assessment Report (BDAR). Breen notes that the Proposal will be carried out on land that has been subject of extensive landform modification from historical sand mining activities and which is currently cleared of vegetation. Further, the Proposal Site is not identified on the Biodiversity Values Map and Threshold Tool (viewed on 30 June 2020) as containing any native vegetation with significant biodiversity value. The BDAR is provided at **Appendix S** and confirms that there is no significant vegetation proposed to be removed that would require offsets under the Biodiversity Assessment Method. The BDAR does however identify that potential habitat for the *Litoria aurea* (Green and Golden Bell Frog) is present within the Proposal Site, requiring a total of 1 species credit associated with the removal of the habitat under the Biodiversity Assessment Method. Further details of the biodiversity assessment is provided at **Section 19.0**.

5.2.7 Roads Act 1993

The Proposal will involve the construction of a short extension of Lindum Road. The approval of the Council (as the relevant roads authority) under Section 138 of the *Roads Act 1993* will be required for the necessary road works. Pursuant to Section 4.42 of the EP&A Act, the Section 138 Roads Act approval from Council must be consistent with the SSD consent.

5.2.8 Heritage Act 1977

The *Heritage Act 1977* provides for the protection of historic heritage and includes a process for listing of heritage deposits and/or relics that are of State significance on the State Heritage Register and those that are of Local significance on the State Heritage Inventory. A search of the State Heritage Register (29 November 2019), State Heritage Inventory (29 November 2019) and Schedule 5 of the SLEP (29 November 2019) has been carried out to identify heritage items and heritage conservation areas in the vicinity of the Proposal Site.

The Proposal Site is located immediately to the north of the State heritage listed 'Cronulla sand dune and Wanda Beach coastal landscape'. North of Captain Cook Drive is the 'Towra Point Nature Reserve and Quibray Bay' which is also identified as a State heritage item and an archaeological site. Further discussion of the nearby State heritage items, as well as other local heritage items identified State Heritage Inventory and Schedule 5 of the SLEP, is provided in **Section 9.0**. Whilst the Proposal will not impact directly on the fabric of any heritage or archaeological items, the EIS includes a heritage impact assessment provided at **Appendix J** to assess impacts on their visual context and curtilage.

5.2.9 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) includes the protection of Aboriginal objects and Aboriginal places. Impacts to Aboriginal places or objects require an Aboriginal Heritage Impact Permit from Heritage NSW. A search of the Aboriginal Heritage Information Management System (21 June 2020) identifies that 84 Aboriginal sites have been recorded within an 8km by 8km area centred on the Proposal Site (refer to **Section 10.0**). However, the Proposal will be carried out on land that has been subject of extensive landform modification from historical sand mining activities and which is currently cleared of vegetation and natural features. As such, it is unlikely that sites or places with significant Aboriginal cultural heritage values are currently present at the Proposal Site. Notwithstanding, the EIS includes a detailed assessment of potential impacts to Aboriginal cultural heritage values of the Proposal Site and its surroundings in accordance with former Office of Environment and Heritage guidelines at **Section 10.0**.

5.2.10 Legislation which is not applicable

Under Section 4.41(1) of the EP&A Act, the approvals that would otherwise have been required to be obtained under the following legislation are listed below, although these approvals are not required for SSD:

Further, whilst additional approvals under the following legislation is not required for SSD, it is noted that no such approvals would have been required in any case:

- *Water Management Act 2000* (excluding an aquifer interference approval);
- *Rural Fires Act 1997*;
- *Fisheries Management Act 1994*;
- *Heritage Act 1977*; and
- NPW Act.

5.3 Environmental Planning Instruments

The relevant strategies, environmental planning instruments, policies and guidelines applicable to the Proposal are outlined below.

5.3.1 State Environmental Planning Policy (Kurnell Peninsula) 1989

The Kurnell SEPP is the principal environmental planning instrument that currently applies to the land the subject of this Proposal.

The Proposal Site is zoned 7(b) Special Development Zone under the Kurnell SEPP. Land uses of an industrial and commercial nature, as well as tourism uses are permissible in this zone. The majority of the Proposal is permissible with consent within this zone.

Specifically, clause 9 of the Kurnell SEPP sets out that any development is permissible with consent within the 7(b) zone, except for the following prohibited uses:

*Dwelling-houses; extractive industries (other than sand mining); hazardous industry or storage establishments; junk yards; mines; offensive industries; places of public worship; residential flat buildings (other than those used only for holiday or other non-permanent residential accommodation); stock and sale yards; toxic industries; transport terminals; units for aged persons; **waste disposal**.*

(Emphasis added)

Waste disposal is defined as:

*the use of a building or place for the purpose of treating, storing or disposing of any waste, as defined by the Waste Disposal Act 1970, **other than a building or place used for the treatment, storage or disposal of waste resulting from any other activity carried out on the same land, or for the purposes of a depot registered with the Environment Protection Authority for the receipt of natural excavated material and demolition materials as approved by that Authority.***

(Emphasis added)

As referred to in **Section 2.4.1** above, the Proposal Site currently has the benefit of development consent 269/90 and EPLs 4608 and 20697, which provide consent to operate a “depot registered and approved by the EPA for the receipt of natural excavated material and demolition materials” on the Proposal Site. Breen has had continuous use of development consent 269/90.

The proposed New Resource Recovery Facility and landfill on Lot 5 would include *'a building or place used ... for the purposes of a depot registered with the Environment Protection Authority for the receipt of natural excavated material and demolition materials as approved by that Authority'*, which is specifically not prohibited under the 7(b) zone.

As such, the component of the Proposal that involves the receipt of natural excavated material and demolition materials for treatment, storage or disposal is permissible. This partly permissible component applies to the resource recovery facility and the landfill to the extent that they treat, store or dispose of natural excavated material and demolition materials. The partly permissible component would also apply to parklands development to the extent that it involves the use of soil and other materials derived from natural excavated material and demolition materials for land forming. The construction of parkland embellishments, facilities and infrastructure, as well as the use of the area for recreation are also permissible.

Therefore, the only component of the Proposal which is not permissible under the 7(b) zone is the disposal of non-natural excavated material and demolition materials (for example, C&I waste) by way of application to land. Further, depending on the interpretation of the Kurnell SEPP, the resource recovery component of the Proposal relating to the processing of C&I waste may also not be permissible within the 7(b) zone.

As explained in **Section 5.2.1** above, pursuant to Section 4.38 of the EP&A Act development consent can still be granted for SSD that is partly permissible and partly prohibited. As such, because the Proposal is for SSD and is partly (and in fact largely) permissible, development consent can be granted for the Proposal.

To this end, it is noted that the C&I waste stream proposed to be received by the New Resource Recovery Facility would only comprise 50,000 tonnes out of 650,000 tonnes. Further, the C&I waste stream is stated to comprise waste of a similar nature to C&D waste in any event. Therefore, 600,000 of the 650,000 tonnes proposed to be received by the New Resource Recovery Facility are permissible within the 7(b) zone of the Kurnell SEPP.

For completeness, Breen confirms that it has no intention of rezoning Lot 5 at this time, as the vast majority of the Resource Management Facility is permissible in the 7(b) zone as outlined above.

The 7(b) Special Development Zone has the following objectives, with an assessment of each provided in **Table 5** below.

Table 5 Special Development Zone Objectives

State Environmental Planning Policy (Kurnell Peninsula) 1989	
<i>(a) to provide flexible planning controls which permit a broad range of land uses subject to compliance with environmental performance criteria,</i>	The Proposal will not change the land use on Lot 5, and would remain compliant with relevant environmental performance criteria.
<i>(b) to ensure that development is compatible with the unique ecological and landscape attributes of the Kurnell Peninsula, especially the wetland areas and their environs,</i>	The land use is not changing on Lot 5 and remains compatible with attributes of the Kurnell Peninsula. The development will not impact on wetland areas or their environs and will facilitate the rehabilitation of land at Lots 1122 and 1123 and Lot 6 for recreational uses.
<i>(c) to ensure that sand mining is controlled and to facilitate the progressive phasing out of sand mining and the rehabilitation of degraded lands,</i>	The Proposal will facilitate the rehabilitation of land degraded by sand mining.
<i>(d) to promote the orderly and economic development of land within the zone subject to the provision of adequate water and sewerage services and the disposal, in an environmentally sensitive manner, of all wastes and stormwater from the land,</i>	Water is already available at the Proposal Site. No increase in demand is proposed as part of the Proposal. Services will be reticulated through the Proposal Site as required to accommodate the new amenities. The Proposal Site will be connected to sewer.
<i>(e) to promote, enhance and utilise the development potential of the zone primarily for tourism, recreation or industrial parks, where this is consistent with the conservation of the unique, ecological and landscape attributes of the Kurnell Peninsula, and</i>	Lot 5 will remain as an industrial-like land use, which will facilitate the rehabilitation of land at Lots 1122 and 1123 and Lot 6 for public open space and recreational uses.
<i>(f) to promote the sharing of the responsibility for environmental planning by creating a broad framework of controls and requiring the Council to adopt development control codes or design and management guidelines applying to development in the zone.</i>	No development control code or design and management guideline applies to the Proposal Site.

An assessment of the Proposal against the relevant Development Controls in Division 1 of the Kurnell SEPP is provided in **Table 6** below.

Table 6 Kurnell SEPP Development Controls

Development Control	Comment
Clause 13 – Captain Cook Drive	The Proposal comprises land within 20m from the boundary of the Captain Cook Drive Road Reserve. That land is proposed for the purposes of landscaping and access only. All access points into the Proposal Site are pre-existing. Overall, there is no potential for significant adverse impact on the safety and efficiency of Captain Cook Drive. Consent is therefore able to be granted to the Proposal.
Clause 14 – Protection of certain land within Zone No 5 (a) or 7 (b)	The Proposal Site does not contain land that is hatched black on the land zoning map. Consent is therefore able to be granted to the Proposal.
Clause 19 – Development within Zone No 7 (b)	The Proposal does not propose any subdivision. Access to public recreation and parkland that relies Captain Cook Drive occurs on allotments that are larger than 4 hectares. The main access to the Proposal Site will be from Lindum Road, subject to its short extension. Consent is therefore able to be granted to the Proposal.
Clause 20 – Development of certain land within Zone No 7 (b)	The Proposal Site is not located within 300m of the Mean High Water Mark of Bate Bay or Boat Harbour. Consent is therefore able to be granted to the Proposal.

5.3.2 State Environmental Planning Policy (Infrastructure) 2007

Division 23 of the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) relates to **Waste or resource management facilities**, and defines the following types of facilities:

resource recovery facility means a facility for the recovery of resources from waste, including such works or activities as separating and sorting, processing or treating the waste, composting, temporary storage, transfer or sale of recovered resources, energy generation from waste gases and water treatment, but not including re-manufacture of material or goods or disposal of the material by landfill or incineration.

...

waste disposal facility means a facility for the disposal of waste by landfill, incineration or other means, including associated works or activities such as recycling, resource recovery and other resource management activities, energy generation from waste gases, leachate management, odour control and the winning of extractive material to generate a void for disposal of waste or to cover waste after its disposal.

...

waste or resource transfer station means a facility for the collection and transfer of waste material or resources, including the receipt, sorting, compacting, temporary storage and distribution of waste or resources and the loading or unloading of waste or resources onto or from road or rail transport.

The Proposal would constitute a **resource management facility** under the Infrastructure SEPP, comprising a **resource recovery facility** (being the New Resource Recovery Facility) and a **waste disposal facility** (being the continuation of landfilling). Under Clause 121 of the Infrastructure SEPP, the Proposal would be permitted with consent if it were in a prescribed zone – being RU1, RU2, IN1, IN3, SP1, SP2 or a land use zone that is equivalent to any of those zones.

The Proposal Site is zoned 7(b) Special Development under the Kurnell SEPP. Whilst the 7(b) Special Development Zone has characteristics similar to the IN1 and SP1 zones, it is a zone type unique to Kurnell and is not considered to be equivalent to any of the prescribed zones. However, Clause 121(3) of the Infrastructure SEPP includes the following provision:

Development for the purpose of the recycling of construction and demolition material, or the disposal of virgin excavated natural material (within the meaning of Schedule 1 to the Protection of the Environment Operations Act 1997) or clean fill, may be carried out by any person with consent on land on which development for the purpose of industries, extractive industries or mining may be carried out with consent under any environmental planning instrument.

The 7(b) Special Development Zone under the Kurnell SEPP permits a range of development types, including industry (other than extractive industries, hazardous industry or storage establishments; offensive industries; toxic industries). As such, under Clause 121(3) of the Infrastructure SEPP, to the extent that the New Resource Recovery Facility receives and processes construction and demolition material, this component of the proposed New Resource Recovery Facility would be considered to be permissible development under the Infrastructure SEPP. However, Breen primarily relies on clause 7(b) of the Kurnell SEPP as the vast majority of the Proposal is permissible under this zone.

The Proposal is also identified as traffic generating development within Schedule 3 of the Infrastructure SEPP as it is defined as a “landfill, recycling facilities, waste transfer station of any size or capacity with access to any road”. Therefore, Transport for NSW is required to be notified of the development application, and any submission made by Transport for NSW regarding the Proposal within 21 days of the notification is required to be taken into consideration by the consent authority.

5.3.3 State Environmental Planning Policy (State and Regional Development) 2011

The SRD SEPP identifies SSD through a range of triggers and thresholds.

Clause 8 of the SRD SEPP identifies that if the development is specified in Schedule 1 or 2, the development is declared to be SSD.

Clause 23 of Schedule 1 of the SRD SEPP identifies that waste and resource management facilities are SSD, specifically Clause 23(3):

(3) Development for the purpose of resource recovery or recycling facilities that handle more than 100,000 tonnes per year of waste.

As the proposed New Resource Recovery Facility will handle more than 100,000 tonnes per year of waste (with the capacity for up to 650,000 tonnes per annum), that component of the Proposal falls within the meaning of SSD under the SRD SEPP.

Further, clause 8(2) of the SRD SEPP provides that if only part of a proposed development is SSD, the remainder of the development is also SSD unless the Secretary of the Department of Planning, Industry and the Environment determined under clause 8(2) of the SRD SEPP that the non-SSD component is not “sufficiently related” to the SSD component. Specifically, clause 8(2) of the SRD SEPP states the following:

- 8 Declaration of State significant development: section 4.36
- (2) If a single proposed development the subject of one development application comprises development that is only partly State significant development declared under subclause (1), the remainder of the development is also declared to be State significant development, except for—
- (a) so much of the remainder of the development as the Director-General determines is not sufficiently related to the State significant development.

As the New Resource Recovery Facility component of the Proposal is SSD, all of the related components of the Proposal (being the landfilling, as well as the earthworks and site reprofiling, and the development of the Embellished Marang Parklands) may also be declared as SSD so long as they are “sufficiently related”.

Assessment of the Sufficiently Related Test

All components of the Proposal (including the SSD and non-SSD components) are highly integrated and are critically reliant on each other to achieve the overall project objectives and to rehabilitate the land at Lots 1122 and 1123 and Lot 6 for public open space and recreational uses to deliver the Embellished Marang Parklands.

In particular, the proposed Embellished Marang Parklands will deliver a range of embellishments significantly over and above the 2010 VPA commitments. These improvements include picnic areas, playgrounds, an amphitheatre, and lookouts (refer to the Landscape Plan at **Appendix C**). The delivery of the proposed embellishments to the Embellished Marang Parklands is contingent on the production of landscaping products from the proposed New

Resource Recovery Facility that are required to deliver the superior landform proposed, including soils, aggregates and mulches.

The material to be utilised to deliver this landform will be manufactured from selected input waste streams to the proposed New Resource Recovery Facility over a 2-3 year period, with additional materials also to be required. This material includes, by way of example, approximately 1,500,000 cubic metres of additional growing medium to deliver the desired landform which will largely be manufactured from selected input waste streams to the proposed New Resource Recovery Facility. It also includes approximately 15,000 cubic meters of mulch for rehabilitation of Kurnell dune forest and coastal heath, and over 8,500 tonnes of recovered aggregates for carparking and pathways, which are also required to deliver the proposed Embellished Marang Parklands and would be directly produced from the New Resource Recovery Facility.

The New Resource Recovery Facility has been specifically designed to service the Embellished Marang Parklands in terms of the balance of waste streams and operational plant and equipment for processing the waste streams. The Embellished Marang Parklands therefore contribute to the viability of the New Resource Recovery Facility.

The resource recovery opportunities available as a result of the Embellished Marang Parklands component of the Proposal will ensure that Breen can maximise the efficiency of the New Resource Recovery Facility, enabling high levels of beneficial reuse of waste materials and minimising the need to dispose of residual materials. In this way, scarce landfill capacity will be optimally used for residual unrecoverable materials. The key integrated components of the Proposal are necessarily interconnected at an operational and commercial level, as well as in relation to land management, to ensure the timely delivery of high quality activated recreational space and publicly accessible parklands.

The management of groundwater also remains inextricably linked across the entire Proposal Site, being the Former Landfill Area on Lots 1122, 1123 and 6 (which will comprise the Embellished Marang Parklands and be transferred to Council) and Lot 5 (which will comprise the Resource Management Facility and which is to stay in Breen ownership). These areas have been historically operated, managed and regulated as a single landfill operation under DA269/90 and a single Environment Protection Licence since 1990, including for the management and regulation of groundwater and leachate. In particular, the assessment of groundwater discharge to the Towra Point Reserve is based on a site-wide management regime, and the proposed leachate management system for the Former Landfill Area of the Embellished Marang Parklands requires ongoing collection with treatment occurring on Lot 5 as part of the Lot 5 leachate treatment system that will be detailed in the landfill closure plan under the relevant Environment Protection Licence. As such it is not reasonable or feasible to separate the management and regulation of groundwater and leachate in the Former Landfill Area from the ongoing management system that will be retained for the ongoing active landfill areas on Lot 5.

The construction of a new access to the Proposal Site via Lindum Road would also enable construction traffic to be optimised for the entire Proposal, and ensure minimal impacts on the public road network during the construction of the Embellished Marang Parklands.

If the New Resource Recovery Facility proceeds independently of the Embellished Marang Parklands or not at all, the groundwater management system will lose important operational synergies resulting in a less efficient and effective system. It may result in groundwater for the Embellished Marang Parklands being managed on Lots 1122, 1123 and 6, introducing added unnecessary complexities into the design of the Embellished Marang Parklands.

Separation of these highly integrated components into multiple development applications would undermine their integration through forcing separate administrative, land management and environmental management processes and procedures being enforced by different consent and regulatory authorities on different parts of the Proposal Site. This would result in the Proposal being delivered in an uncoordinated and inefficient way, ruining the beneficial synergies across the Proposal, and affecting the economic viability of the entire development.

Under the New VPA, Breen proposes to pay Council a road levy in the amount of \$0.30 per tonne of waste material delivered by road to the New Resource Recovery Facility. It is Breen's intention that this levy will fund maintenance works for the ongoing operation of the Embellished Marang Parklands. This levy is a key part of Breen's offer to Council for a New VPA, and is inextricably linked to the New Resource Recovery Facility as the levy cannot be funded without the operation of the New Resource Recovery Facility.

Further, in addition to Breen's offer to Council of a New VPA, Breen also proposed to enter into a supply agreement with Sutherland Council to, on an ongoing basis, supply landscaping materials for the Embellished Marang Parklands. These materials will include soils, mulches and crushed aggregates, to ensure the ongoing sustainable operation of the Embellished Marang Parklands and can only be supplied by Breen at the proposed reduced sell rates as a result of the operation of the New Resource Recovery Facility. The close proximity and direct connectivity of the Resource Management Facility to the parklands will therefore ensure that the ongoing maintenance of the parklands is timely and efficient. Further, Breen will have plant and equipment, as well as personnel with relevant expertise, available at the Resource Management Facility to support the ongoing maintenance of the Embellished Marang Parklands, including the environmental management and monitoring requirements for the Former Landfill Area.

The proposed New VPA will reflect the inter-connectedness between the delivery and ongoing operation of the Embellished Marang Parklands with the New Resource Recovery Facility and landfill in terms of sustainability, delivery timeframes and the supply of materials and services which make both the proposed New Resource Recovery Facility and the proposed Embellished Marang Parklands viable.

5.3.4 State Environmental Planning Policy (Coastal Management) 2018

State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP) applies controls to land in close proximity to sensitive coastal areas. A very small part of the Proposal Site is mapped under the Coastal Management SEPP as being within the 'Proximity Area for Coastal Wetlands' and the 'Proximity Area for Littoral Rainforests' (i.e. the buffer areas), for mapped wetlands to the north.

As such, the EIS includes an assessment at **Section 18.0** that demonstrates that the Proposal does not significantly impact on the biophysical, hydrological or ecological integrity of the adjacent coastal wetland, or the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland. The Proposal Site is also within the Coastal Environment Area and the Coastal Use Area. The matters for consideration for these areas that are specified within clauses 13 and 14 of the Coastal Management SEPP are also assessed in **Section 18.0** of the EIS.

5.3.5 State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

Dangerous Goods will not be stored on-site in volumes that exceed the thresholds set out in the Department of Planning's *Applying SEPP 33* guideline. A preliminary screening of Dangerous Goods has been provided in **Section 17.0** of the EIS. It finds that the Proposal is not characterised as "potentially hazardous" development. As such, a Preliminary Hazard Analysis is not required as part of the EIS.

While the New Resource Recovery Facility is, under SEPP33, considered to be potentially offensive, the assessments prepared as part of this EIS indicate that the discharges from the facility would not be considered to be potentially offensive, and it is expected that the facility would continue to be able to obtain the necessary EPLs. As such, the facility would not be considered to be offensive under SEPP 33.

5.3.6 State Environmental Planning Policy No. 55 – Remediation of Land

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55) and its associated contaminated land planning guidelines establish the requirements for the investigation and remediation of contaminated land as part of any development of land in NSW. Clause 7 requires that a consent authority is not to consent to the carrying out of development unless it is satisfied that the land is suitable, or can be made suitable, for its future intended use. The proposed land uses are for the continuation of land restoration activities, a resource recovery facility and parklands.

The Proposal is supported by a Contamination Status Report prepared by GHD and provided at **Appendix G**. An assessment of contamination based on the Report is included below at **Section 8.1**.

The proposed parklands on Lots 1122 and 1123 and Lot 6 will be partly located on historical landfill cells of the currently operating Breen Resources Facility. Where appropriate, these former landfill cells will be subject of landfill capping and closure auditing requirements of the EPA, prior to the construction of the parklands landform and embellishments. This capping and closure will be carried out to the satisfaction of the EPA to ensure that these parts of the Proposal Site are suitable for the proposed public recreational use.

5.3.7 Sutherland LEP 2015

The current zoning maps accessible on the NSW legislation website for the *Sutherland Shire Local Environmental Plan 2015* (SLEP) identify Lots 1122 and 1123 and Lot 6 as being zoned E2 Environmental Conservation and RE1 Public Recreation. This is an error, and the land is currently zoned pursuant to the Kurnell SEPP, as discussed in **Section 5.3.1** above. These maps show the changes contemplated by *State Environmental Planning Policy (Kurnell Peninsula) Amendment (Zoning) 2010* Delayed Rezoning Sheets 1-7.

The delayed rezoning maps are not the current zoning for the affected land, but specify what the zoning will be when certain events occur. In this regard, clause 5(4) of the Kurnell SEPP provides that the zoning of land marked "*State Environmental Planning Policy (Kurnell Peninsula) Amendment Zoning 2010 - Delayed Rezoning*" does not have effect until a date specified by the Minister by order published in the Gazette in respect of that sheet. Clauses 5(5) and (6) of the Kurnell SEPP go on to specify the preconditions before the Minister can make such an order, and confirm that until such time as an order takes effect, the zone applying to the land subject of the Delayed Rezoning remains the zone that applied prior to the Delayed Rezoning Maps being gazetted.

The Minister has not published an order in the Gazette in respect of the subject land under clause 5 of the Kurnell SEPP. Lots 1122 and 1123 and Lot 6 therefore remain zoned 7(b) Special Development Zone, as mapped under the Kurnell SEPP zoning map.

Lot 5 is not included in the delayed rezoning maps under the Kurnell SEPP as it was not part of that special delayed zoning regime. Lot 5 is also zoned 7(b) under the Kurnell SEPP. This is confirmed by clause 1.3 of the SLEP which identifies Lot 5 as a "deferred matter" and states that the SLEP "does not apply to land identified as "deferred matter".

As such, the SLEP does not apply to Lot 5. The SLEP also does not apply to the remaining parts of the Proposal Site (comprising Lots 6, 1122 and 1123) until such time as the Minister for Planning has declared that the relevant land has been remediated and the land has been transferred to Sutherland Council.

5.3.8 Sutherland Development Control Plan 2015

The Sutherland Development Control Plan 2015 (SDCP) does not apply to the Proposal Site, as the Proposal Site is not presently subject to the SLEP. However, Council's mapping indicates the certain environmental characteristics in relation to the Proposal Site which are addressed in this EIS including:

- Acid Sulfate Soils – addressed in **Section 8.0** of the EIS;
- Surrounding heathlands and wetlands – which are addressed in the BDAR at **Appendix T** and in **Section 19.0** of the EIS;
- Bushfire prone land – which is addressed in **Section 16.1** of the EIS;
- Archaeological sensitive areas – which are addressed in **Section 9.0** of the EIS; and
- Surrounding heritage items to the north (Towra Point Nature Reserve and Quibray Bay) and south (Cronulla sand dune and Wanda Beach coastal landscape) – which are addressed in **Section 9.0** of the EIS.

6.0 Consultation

A Community and Stakeholder Participation Strategy and Stakeholder Engagement Report has been prepared by KJA and is provided at **Appendix E**.

In accordance with the SEARs issued for this project, consultation was undertaken with relevant public authorities, the community and Council. A summary of the consultation undertaken to-date with Council, the community and relevant agencies is provided below. Several consultants have undertaken additional consultation with relevant parties during the preparation of their reports.

6.1 Consultation Undertaken

Breen has consulted with a variety of stakeholders including:

- Government stakeholders and agencies as identified in the SEARs;
- Elected Council representatives;
- Adjacent and nearby land owners; and
- The Kurnell and Greenhills Beach communities.

Due to the COVID-19 pandemic circumstances, all consultation was undertaken in accordance with NSW Government COVID-19 guidelines and restrictions.

Engagement with these stakeholders was undertaken through the following consultation channels and activities:

- Emails to individual stakeholders informing them of the Proposal and offering the opportunity for a briefing meeting.
- Community information webinars providing information of the Proposal and opportunity for stakeholders to ask questions;
- Provision of a project email address and hotline for stakeholders to direct questions to.
- Project website page with information of the Proposal and updates as required.
- Letterbox drop to Kurnell and Greenhills beach residents providing information about the Proposal, upcoming webinars and project email and hotline.
- Stakeholder briefings and meetings held via video-conferencing providing further information on the Proposal and opportunities for stakeholders to raise any specific issues.

Further detail on the consultation activities and timing, briefing invitations and justification for stakeholder selection is provided in the Stakeholder Engagement Strategy at **Appendix E**.

6.2 Issues Raised by Government and Agencies

A summary of the key issues raised by the Government and Government agencies, and the project team's response to those issues, is summarised in **Table 7** below. Further detail is provided in the Stakeholder Engagement Strategy at **Appendix E**.

Table 7 Summary of Issues Raised with Government and Agencies and Response

Key Issue	Response
NSW Environment Protection Authority (NSW EPA)	
NSW EPA were generally supportive of the Proposal's approach to the parklands, remediation and resource recovery operations. The following issues were raised:	
Loading and unloading of material may cause dust emissions. Consideration should be given to how these emissions will be managed.	Dust will be managed through spraying of material during loading and unloading. Water for spraying will be sourced through a combination of mains water and captured stormwater runoff on site.

Key Issue	Response
Consideration should be given to how stormwater runoff should be protected from leachate generation. Clean water is to be separated.	The following stormwater measures will be employed: – Stormwater from landfill areas is captured in a leachate drainage area where leachate is removed by pump and conveyed to leachate holding ponds. – Leachate is stored and evaporated in the holding ponds. – Prior to heavy rainfall events, leachate is pumped and stored to maintain safe freeboard in the ponds. – Leachate is disposed through a number of mechanisms described in the reports. – Stormwater will also be captured in one of three basins for use at the facility in wheel wash bays and site operations. Refer to Section 8.3 for further discussion on stormwater management strategies.
Consideration should be given to street sweeping in Breen's management plan to limit dust pollution on Captain Cook Drive.	An Operational Management Plan will address dust management.
Department of Planning Industry and Environment (Climate Change and Sustainability Division)	
A list of all known Aboriginal groups with a registered interest in the area was provided.	Further consultation was undertaken with these groups and is included in the Aboriginal Cultural Heritage Assessment at Appendix K and at Section 10.0 .

6.3 Issues Raised by Council and Elected Councillors

Engagement with Council on the Proposal, specifically the proposed future parklands, has been ongoing since 2012, during which multiple iterations of the proposed future parklands have been presented in response to Council's feedback. At these meetings with Council, key issues discussed included design principles for the parklands, landform and visual amenity details, specification of paths and walkways, additional parking, delivery timeframes, the volume and value of additional fill, value capture of the value of fill, recreational facilities, and future planning pathways for the parklands. Breen have sought to either satisfy Council's requests, or reach alternative solutions with Council. Council are generally supportive of the Proposal as a result of the ongoing consultation. Further detail is provided in the Stakeholder Engagement Strategy at **Appendix E**.

A summary of the key issues raised by the Sutherland Shire Council and Sutherland Shire Council Elected Councillors in 2020 in response to the SEARs, and the project-team's response to those issues, is summarised in **Table 8** below.

Table 8 Summary of Issues Raised with Council and Response

Key Issue	Response
Consultation in February 2020	
Breen met with Ian Drinnan (Principal Environmental Scientist), Peter Barber (Director of Planning) and Peter Hazeldine (Director of Infrastructure) from Council to discuss the SEARs application. Council were generally supportive of the Proposal. The delivery timeframes of the Proposal, their relationship with the VPA, ongoing landfilling activities and type of C&I waste were discussed.	As Council were generally supportive, no response was required. The delivery timeframes of the Proposal, their relationship with the VPA, ongoing landfilling activities and type of C&I waste are described in Section 4.0
Consultation in September 2020	
Breen met with Councillor Marie Simone, Councillor Kent Johns and Ian Drinnan (Principal Environmental Scientist). The following key issues were raised.	
Truck movements on Captain Cook Drive impacting the community and causing a burden on the road.	There is expected to be a minor increase in maximum expected number of trucks arriving at the site. This is not expected to have a material impact on traffic or road conditions in the area. Further analysis is provided at Appendix O and is discussed further at Section 15.0
Visual impact of the completed landfill, height is not the primary concern, but the landscaping treatment visible from Greenhills Beach.	Visual impact is assessed at Section 11.0 and in the Visual Impact Statement at Appendix L .
Timing of the delivery of the VPA commitments – notably 7 new playing fields. The community expects new playing fields	The SSD planning pathway will give certainty for Breen to deliver the VPA commitments, cease operating at the current

Key Issue	Response
to be delivered, and new playing fields are projected in Council's strategic plans to manage demographic changes	facility, and build the new parklands by March 2024. Breen are presently working with Sutherland Council to arrive at an amendment to the VPA that provides more certainty to the community on delivery dates.

6.4 Issues Raised by the Community

A summary of the key issues raised by the community, and the project-team's response to those issues, is summarised in **Table 9** below. Further detail is provided in the Stakeholder Engagement Strategy at **Appendix E**.

Table 9 Summary of Issues Raised with Community and Response

Key Issue	Response
Traffic volumes at Lindum Rd roundabout that is shared with Besmaw's facility and other recreational users	The Traffic and Transport Technical Study at Appendix O demonstrates that the existing roundabout has sufficient capacity, and is a suitable design for the proposed use.
Incompatibility of the New Resource Recovery Facility with Besmaw's vision for the area as a residential area	According to the Greater Sydney Commission, the area is not suitable for residential development due to noise and the need to protect the 24-hour freight corridor along the main southern approach to Sydney Airport. Residential development in the location is currently prohibited by the Kurnell SEPP and Sutherland Shire Council LEP. The proposal represents a more compatible use with existing local and state government priorities for Kurnell, including to retain and manage industrial land, and to enhance and expand public open space.
Impact of the Proposal on dust emissions to Greenhills Beach residents	A number of management measures are proposed to improve dust conditions from the current condition, including: – All waste processing will take place in covered buildings. Light waste processing will be carried out in fully enclosed buildings; – Highly trafficked internal roads will be sealed; – Wheel washers will be upgraded; and – The site will be landscaped with additional trees and heath when compared to current conditions.
Whether a wildlife crossing or bridge has been considered from the Breen Site to Towra Point Reserve	Wildlife crossings have not been included in the design, as the need and type of crossing can only be determined once the parklands are established. Further study is required once the new parklands are established including which species may use a crossing, the need and type of crossing.

6.5 Ongoing Consultation

The Proposal will be placed on public exhibition for 30 days in accordance with clause 83 of the *Environmental Planning and Assessment Regulation 2000*. During the public exhibition period Council, State agencies and the public will have an opportunity to make submissions on the Proposal. During this stage Breen will undertake further community engagement to inform stakeholders about the Proposal and public exhibition. Following formal public exhibition, stakeholder and public engagement will continue in order to maintain community support for the Proposal during detailed design, construction, handover of the Embellished Marang Parklands and operation of the New Resource Recovery Facility. Identified opportunities for future consultation include, but are not limited, to the following:

- Updates on the project webpage at major project milestones;
- Letterbox notifications at major project milestones;
- Formation of a Neighbourhood Advisory Panel with community, council and neighbours attending and advising;
- Regular attendance at Kurnell Progress and Precinct Residents Association;
- Further consultation on the parkland design;
- Email responses to questions raised via the project email address or 1800 number; and
- Development of community partnerships.

7.0 Waste Management

7.1 Policy framework and drivers

The Proposal aims to increase the level of recycling and resource recovery on the Proposal Site, by employing modern and advanced equipment. This would address the objectives of the Australian Government (2018) 'National Waste Policy: Less Waste, More Resources' (2018 National Waste Policy), as well as the EPA (2014) 'NSW Waste Avoidance and Resource Recovery Strategy 2014–21' (WARR Strategy).

7.1.1 National waste policy

The Commonwealth Government adopted the National Waste Policy on 5 November 2009. The policy built on the 1992 National Strategy for Ecologically Sustainable Development and attempts to reduce the impact to the environment from waste disposal. It also sought to enhance, build on or complement existing policy and actions at all levels of government. This policy set the direction for Australia to produce less waste for disposal and manage waste as a resource to deliver economic, environmental and social benefits.

The updated 2018 National Waste Policy provides a framework for collective action by businesses, government, communities and individuals until 2030. The 2018 National Waste Policy identifies the following waste management goals:

- Avoid waste.
- Improve resource recovery.
- Increase use of recycled material and build demand and markets for recycled products.
- Better manage material flows to benefit human health, the environment and the economy.
- Improve information to support innovation, guide investment and enable informed consumer decisions.

The Proposal is consistent with these goals, in that it would improve resource recovery, increase the use of recycled material, build demand for recycled products, and improve material flows, by enabling recovered materials to be used to replace virgin material.

7.1.2 NSW Waste Avoidance and Resource Recovery Strategy 2014–21

The WARR Strategy sets the following targets for 2021–22:

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

The Proposal would contribute towards NSW meeting the 70% target for recycling of commercial and industrial waste, as well as the 80% target for recycling construction and demolition wastes. It would also assist NSW in increasing waste diverted from landfill towards the target of 75%.

7.2 Construction

7.2.1 Waste streams

The following waste streams are expected to be generated during construction:

- Construction material including spoil/fill from earthworks, offcuts and packaging.
- Small quantities of general waste generated by site personnel (such as food scraps, aluminium cans, glass bottles, plastic and paper containers, paper, cardboard and other office wastes).
- Building and demolition materials from the decommissioning and demolition of the Existing Breen Resources Facility.
- Wastewater and sewage from construction staff amenities.

7.2.2 Waste management during construction

The management of wastes generated during construction would be in accordance with relevant NSW legislation and the principles of the waste management hierarchy set out in the WARR Strategy.

Any excess spoil from earthworks for the New Resource Recovery Facility would be stockpiled on the Proposal Site for future site applications.

Waste materials from the decommissioning and demolition of the Existing Breen Resources Facility would be segregated, recovered and recycled at the New Resource Recovery Facility or sent to another appropriately licensed facility.

Labelled and colour coded receptacles would be provided at the construction site office for general waste from construction personnel to ensure source separation of recyclable materials and residual landfill waste. These wastes would be collected on a regular basis by authorised and appropriately licensed waste collection contractors for off-site recycling or disposal.

Portable amenities/ablutions will be provided for construction staff. Waste water and sewage from these facilities would be collected on a regular basis by an authorised and appropriately licensed contractor for off-site disposal.

7.3 Operation

7.3.1 Waste streams

Table 10 shows the waste streams expected to be received on Lot 5 and the maximum throughputs on an annual basis. Due to seasonal fluctuations in volume and make up of waste streams the daily, weekly and monthly maximums set out in **Table 10** are estimated maximum values only, and are not distributed evenly across the proposed annual maximum throughput.

Table 10 Incoming waste streams – maximum throughputs (tonnes)

Description	Proposed maximum throughput (tonnes)			
	Per Day	Per Week	Per Month	Per Year
Soils	1,200	12,600	39,000	300,000
Heavy C&D waste (brick and concrete)	600	5,300	18,000	150,000
Light C&D waste	570	6,000	18,000	150,000
Light C&I waste and non-putrescible organic waste	200	2,000	6,000	50,000
Total				650,000

Note: The daily, weekly and monthly values are estimated maximum volumes only, and are not distributed evenly across the proposed annual maximum.

The above estimates have been derived from predicted waste streams from infrastructure projects which would be serviced by the New Resource Recovery Facility.

In addition to the incoming waste, small quantities of waste would be generated during operations, from staff lunch rooms/amenities and general maintenance activities including:

- General waste generated by operational site personnel (such as food scraps, aluminium cans, glass bottles, plastic and paper containers, paper, cardboard and other office wastes)
- Wastewater and sewage from staff facilities in the New Resource Recovery Facility.

7.3.2 Sources of waste streams

Breen provides an important waste management and disposal service for small and medium independent waste transport contractors, who are not aligned with the major waste management operators – and supporting competition on the waste management industry. Breen has existing relationships with a number of these independent waste transport contractors. C&D waste would be delivered to the site by third party generators (such as local builders) or waste contractors, who collect waste from building sites in dump trucks or skip bins. C&I waste would be collected by specialist waste contractors and delivered to site by truck.

The general category of material to be received at the New Resource Recovery Facility is proposed to be consistent with current operations. There would be a greater proportion of heavy mixed waste material including materials such as soil, brick and concrete, rock and sandstone being received as a result of significant infrastructure and housing development activity in Greater Sydney. The processed waste and residual materials would be delivered to a wide range of facilities located both within and outside Sydney for further processing or reuse. The facilities to which waste is delivered vary frequently due to market conditions, gate fees, capacity to accept material and waste acceptance criteria. This situation is expected to continue to be the case for the life of the operation.

A key integrated component of the Proposal is the delivery of the Embellished Marang Parklands as described in this document. The combination of throughput and processing capabilities, modern resource recovery facilities, and the continuation of landfilling and land restoration activities on the Proposal Site using material produced on-site is a unique feature of this Proposal. The circular nature of material, being produced on the Proposal Site and then restored to the Proposal Site, contributes to minimising off-site impacts and ensures, in essence, a closed system of operation and on-site landfilling and restoration activities.

With careful selection of suitable waste streams, and careful design of the screening, sorting and processing activities, Breen can ensure that the opportunities for beneficial reuse of waste material on the Proposal Site are maximised. The design of the New Resource Recovery Facility therefore responds to Breen's own resource recovery objectives for the Proposal Site, being to support the development of high quality activated open space and parklands. It is imperative therefore that the Existing Breen Resources Facility is demolished to facilitate Breen's obligations under the current VPA (and the proposed new VPA), being the delivery of the Embellished Marang Parklands. Without the integrated Resource Management Facility, the local Sutherland Shire community would also lose an important waste management facility.

Limited quantities of garden (green) waste would also be accepted at the New Resource Recovery Facility within other 'mixed waste' streams, however it is expected that this would represent less than 1% of the waste held on the New Resource Recovery Facility site at any one time, and less than 6,500 tonnes handled per year. The anticipated waste streams to be received are provided in **Table 11**.

Wastes permitted to be received at the Existing Breen Resources Facility under EPL 4608 included VENM, Building and Demolition waste, asphalt waste, glass, plastic, rubber, plaster board, ceramics, brick, concrete, metal, paper, cardboard, waste tyres and Potential Acid Sulfate Soils. It is proposed to continue to accept these wastes. Unpermitted waste includes asbestos, putrescible waste, liquid waste and hazardous waste. It is not proposed to change this, and any loads containing unpermitted wastes will be rejected.

Table 11 Incoming waste streams - details

Material	Tonnes (percentage per year)
SOILS 300,000 tonnes per year	46%
Soil that meets the General Solid Waste classification as per the Waste Classification Guidelines as in force from time to time, or as otherwise permitted under an EPL	35% - 25%
Soil that is classified as General Solid Waste (non-putrescible) and contains brick, concrete, timber or metal.	<10%
Grit, sediment, litter and gross pollutants collected in, and removed from, stormwater treatment devices or stormwater management systems, that has been dewatered so that it does not contain free liquids	< 2%
Waste collected by or on behalf of local councils from street sweeping	< 2%
Immobilised wastes to be landfilled	< 2%
Ferric sludge	< 2%
Dredge spoil to be landfilled	< 2%
Virgin excavated natural material	< 2%
HEAVY C&D WASTE (brick and concrete) 150,000 tonnes per year	23%
Building and demolition waste	15% - 10%
Cured concrete waste from a batch plant	< 5%
Asphalt waste (including asphalt resulting from road construction and waterproofing works)	< 5%
LIGHT C&D WASTE 150,000 tonnes per year	23%
Garden (green) waste	< 1%
Wood waste	10% - 5%
Synthetic fibre waste (from materials such as fibreglass, polyesters and other plastics) being waste that is packaged securely to prevent dust emissions, but excluding asbestos waste	< 5%
Household waste from municipal clean-up that does not contain food waste	< 2%
Waste tyres	< 1%
Glass, plastic, rubber, plasterboard, ceramics, bricks, concrete or metal	10% - 5%
Paper or cardboard	< 2%
LIGHT C&I WASTE 50,000 tonnes per year	8%
Non-biodegradable waste generated in industrial or manufacturing processes	< 2%
Non-chemical waste generated from manufacturing and services (including metal, timber, paper, ceramics, plastics, thermosets, glass and composites)	< 5%
Grit and screenings from potable water and water reticulation plants that has been dewatered so that it does not contain free liquids	< 2%
Office and packaging waste (including paper, plastics, glass, metal, timber) that is not contaminated or mixed with any other type of waste	< 1%
TOTAL	100%

7.3.3 Waste handling and storage

Waste transport

Waste would be delivered to the New Resource Recovery Facility on Lot 5 as it currently is delivered to the Existing Breen Resources Facility – being via a combination of small vehicles (such as cars, utes and trailers) and skips/trucks of various sizes. However, access to Lot 5 will be via the proposed Lindum Road access which is discussed further at **Section 4.7**. Loads must be covered on public roads and must be uncovered for inspection at the weighbridge.

Waste handling

All vehicles carrying waste would access the New Resource Recovery Facility and Landfill on Lot 5 via the proposed Lindum Road access. Vehicles would enter the site, stop for de-tarpping and then pass through the main weighbridge precinct. The main weighbridge precinct would contain two 'in' weighbridges and one 'out' weighbridge. The weighbridges would be elevated, and this allows for both the weighing of vehicles/loads and a first material inspection point. Once loads have been inspected and weighed, they would be directed to one of the following:

- Public/light vehicle drop off within the waste operations area
- Concrete processing area
- Soil processing building.

Loads of unrecoverable and/or residual waste products may also be directed to the landfill as applicable for permitted waste materials. (Note: any such loads would still enter the site from Lindum Road via the New Resource Recovery Facility and use internal access roads to access the Landfill. All waste received at the Landfill for landfilling would therefore arrive via the New Resource Recovery Facility, and unless a waste delivery is known to contain no recyclable content, all waste being delivered to the Landfill will be subject of processing in order to extract recyclable and recoverable materials prior to landfilling.)

At each of these areas, vehicles would tip waste, where directed by staff, into a designated tipping slab/pad for inspection.

At each of the processing buildings, after the waste has been tipped and inspected, waste would be pushed into the main processing area and loaded by machine (e.g. loaders) into the relevant processing lines for segregation, size reduction, sorting, blending and/or baling (depending on the process being undertaken). At the processing buildings, a preliminary sort would be undertaken before waste is loaded for processing.

The concrete processing and soil processing areas would receive source separated materials from external customers and materials from the recycling plant (at the waste processing building). Waste would be transferred between processing buildings by heavy mobile plant.

Waste processing activities would all be undertaken in either fully enclosed or partially enclosed buildings. The waste processing building would be fully enclosed, and the soil and concrete processing buildings would be fully covered with partially enclosed walls in order to minimise dust and noise emissions. External areas would be used for stockpiling, but no waste processing would take place outside of the buildings.

Waste dropped off at the light vehicle tipping and sorting pads would be periodically moved to the recycling plant or other site areas by heavy mobile plant.

Residual wastes from the various processing operations would be transferred to the Landfill via one of the landfill access points for disposal by heavy mobile plant.

Recovered aggregate (for use in carparks and pathways), recovered timber mulch, and recovered soils proposed for use in landform shaping and profiling of the Embellished Marang Parklands would also be transferred to the parkland by heavy mobile plant.

An internal weighing zone is also proposed with a weighbridge which would allow for internal materials weighing and tracking – including any residual waste that is landfilled and recovered aggregates and fines for parkland shaping and profiling.

Proposed storage arrangements

Generally, waste accepted by the New Resource Recovery Facility would be received and stored temporarily within buildings on Lot 5. Concrete, tiles, soils and brick would be received and stored outdoors, whilst awaiting processing. These arrangements are in accordance with EPL 4608 and EPL 20697.

Products created from the New Resource Recovery Facility recycling activities, such as crushed concrete gravels, would be stockpiled outdoors, and dust would be managed through regular application of water. Uncontained light

wastes that have the potential to create excessive dust or windblown litter, would be stored inside a building or enclosure.

After sorting and processing, the product materials would be reloaded onto trucks and transported off site via the weighbridge for reuse or further recovery elsewhere. Waste storage at the New Resource Recovery Facility would be temporary and subject to availability of transport and markets for end product.

Approximately 10% of waste received would be transported to landfill, meaning that up to 90% of material received at the New Resource Recovery Facility would be reused or recycled, and thus successfully diverted from landfill.

Once accepted, unprocessed waste would be contained within the processing building in stockpiles prior to processing, or held within covered bins in the designated bin storage area. Processed waste (separated and sorted) would be stockpiled in the designated material bays/bins outside of the New Resource Recovery Facility buildings. It is expected that no more than 272,000 tonnes of waste would be held on site at any one time, as broken down in **Table 12**. Any waste streams not permitted to be accepted on site would either be rejected at the weighbridge or as detected within the process.

Table 12 Proposed maximum stockpiled volumes

Location	Volume (tonnes)
Concrete processing area	56,000
Soil processing area	205,000
Waste operations area	11,000

7.3.4 Waste processing and technology

The key processing activities to be undertaken at the proposed New Resource Recovery Facility include the following:

- Pre-processing: incoming C&D and C&I waste and 'heavy' materials would be pre-processed at the recycling plant (within the waste processing building) to separate various recyclables using size, density and other separation technology. The pre-processing area would be located partially under cover. Staff would separate the material into bins and bays to be transferred either to other parts of the Resource Management Facility or off-site for further processing.
- Processing of residual light waste: processing of up to 200,000 tonnes per year of 'light' C&D waste and 'light' C&I waste, including light residue from the recycling plant, would also be carried out within the enclosed processing building. Processing would include size reduction, density and visual separation to extract recyclables including clean timber, plastics, recovered aggregates and recovered fines (soils). Selected residual materials, including selected timber, contaminated plastics, fibre, rubber and contaminated paper materials, would be landfilled at the on-site Waste Disposal Facility or size reduced, compressed, baled and exported from the facility as SRF for off-site energy recovery.
- Concrete processing: recovered concrete, brick and sandstone would be processed by size reduction and separation to produce a variety of reusable aggregate products (concrete and brick drainage aggregate, crushed concrete, crushed brick, crushed sandstone or blocks and bedding sand).
- Soil processing: soil material and smaller aggregate materials would be size reduced, separated and washed to produce soils, recovered fines and recovered aggregate. This material would initially be used in the construction of the Embellished Marang Parklands. Once the Embellished Marang Parklands has completed construction, this material would be on sold or used to rehabilitate the Waste Disposal Facility area on Lot 5 at the completion of waste emplacement activities, subject to compliance with a Resource Recovery Order and Exemption under the *Protection of the Environment Operations (Waste) Regulation 2014*.

Recovered materials produced by the RRF may be blended with non-waste derived materials to ensure the recovery process is consistent and recovered materials meet the required specifications.

It is expected that occasionally small amounts of garden (green) waste would inadvertently be delivered to the facility, usually as part of a mixed load of waste. The garden (green) waste would be manually segregated from the mixed load of waste and stored in a sealed and covered skip bin, in a dedicated storage area, and transported to an appropriately licensed facility for further recycling or disposal.

It is highlighted that all material processing is proposed to be undertaken internal to buildings. Selected materials, including uncrushed brick and concrete, and moisture conditioned crushed brick and concrete products, may be handled or stockpiled external to buildings and where possible these stockpiles will be sheltered from prevailing wind conditions. Only materials that have acceptably low dust emitting potential are proposed to be stored external to a building. These materials are proposed to be further controlled with the use of water-based dust suppression. All dust emissions have been modelled as part of this assessment, and the off-site air quality impacts associated with the Proposal are acceptable (see **Section 12.0**). Therefore, the construction of additional sheltered areas is not warranted.

Pre-processing

To meet the requirements of Protection of the Environment Operations Legislation Amendment (Waste) Regulation 2018, all incoming loads would be inspected at the weighbridge and at the tipping and inspection areas at each processing area to ensure that hazardous materials such as asbestos and any non-permitted wastes are not concealed within loads. Here waste would be tipped, spread and inspected in accordance with the requirements of EPA (2018) *Standards for managing construction waste in NSW*.

Pre-processing activities at the New Resource Recovery Facility would include:

- Preliminary sorting using a combination of mechanical and manual methods
- Mechanical size separation
- Visual separation of larger fractions
- Extraction of metals and other resources using specialised equipment

Typical outputs from the screening processes would include:

- Brick and concrete
- (-) 80 mm aggregate
- (-) 25 mm aggregate

Incoming material would be sorted into the following categories:

- Timber
- Cardboard
- Metals
- Timber pallets
- Oversize brick and concrete
- Garden (green) Waste

Concrete recovered from the waste processing building would be directed to the concrete processing area. Recovered timber would be sold directly, sent off-site for further processing, or used in the construction of the Embellished Marang Parklands. Recovered metal (ferrous and non-ferrous) would be sent off-site for recycling. **Figure 33** shows the waste processing process flows.



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Processing of residual light waste

Up to 200,000 tonnes per year of light waste would be processed within the waste processing building. This would typically comprise 150,000 tonnes of mixed C&D waste and 50,000 tonnes of C&I waste of a similar nature to C&D waste.

Processing activities would include:

- Preliminary sorting (manual and mechanised)
- Size reduction and sorting by size
- Further mechanical sorting using specialised equipment including magnets, screens and separators.

The physical separation of the incoming waste streams would ensure that materials such as polyvinyl chloride (PVC) plastics, aggregates, clean timber, metals etc. do not end up in the SRF stream.

Recovered fines and aggregate would be directed to the soil processing building for further processing.

Selected residual materials, including timber, some plastics (excluding PVC), which would be sent for off-site recycling), fibre, rubber and paper, would be segregated from other wastes. These materials would then be processed into SRF, baled and exported from the facility for use in off-site energy generation. It is estimated that approximately 65,000 tonnes of SRF would be produced each year.

Materials such as metal (ferrous and non-ferrous) that are recovered in the process would be sent off-site for further processing or recycling.

Figure 34 shows the light residual waste processing process flows.

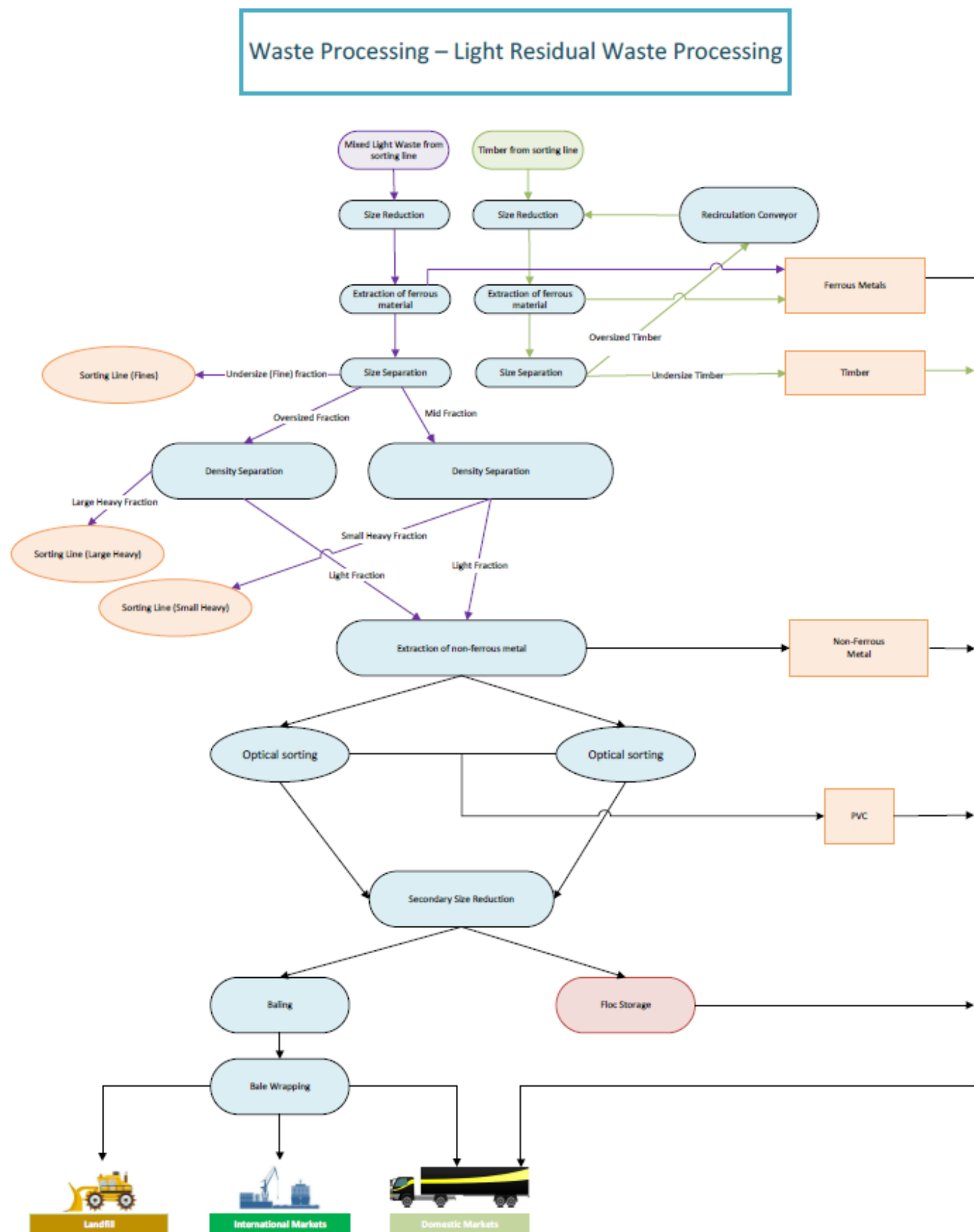


Figure 34 Light residual waste processing process flows

Source: Breen Resources

Concrete processing

In the concrete processing building, recovered concrete, brick, rock and bitumen would be processed into a variety of aggregate products (concrete and brick drainage aggregate, road bases, crushed concrete, crushed brick, crushed sandstone or blocks and bedding sand).

The concrete processing building would receive recovered material that comes into the New Resource Recovery Facility pre-sorted, or material recovered from the on-site recycling plant or soil processing area. Crushing and processing of incoming material, including mechanical size reduction and sorting, would be undertaken within the concrete processing building. The building would be covered with partially enclosed walls and adequate dust suppression controls implemented to mitigate migration of dust from processing activities.

The concrete processing building is within the 'concrete processing area' where pre and post processing activities would be carried out including deliveries, pre-acceptance inspection, and loading. This area would also contain a number of stockpiles of unprocessed, or partly processed concrete, awaiting processing based on customer orders. No processing activities would occur in the concrete processing area outside the concrete processing building.

Soil processing

The soil processing area would receive:

- soil material classified as general solid waste (non-putrescible)
- various gradings of soil and aggregate from the recycling plant

The input material would be processed through mechanical separation and crushing equipment to produce recovered fines and recovered aggregate. Soil processing would be undertaken within the soil processing building.

7.3.5 Landfilling

Landfilling operations, which are already taking place on Lot 5 in accordance with EPL 4608, are typical of a non-putrescible landfill site. Waste is spread and compacted in layers, or baled waste is put into the Landfill. Non baled waste is covered at the end of each day, and in areas where landfilling has ceased, intermediate cover is applied. Final cover is applied to areas where landfilling is complete.

At the anticipated recovery rates the life span of the landfill is approximately 15 years, although improvements in recovery processes may extend this. This SSD Application is seeking consent to build a new landfill cell on Lot 5 to the east of the existing filling area for the continued operation of the Landfill. The new landfill cell is shown in **Figure 27** as Cell B11 Stage C. The proposed leachate barrier and collection system are described in **Table 13**.

The Proposal allows for this land to be stabilised, and retained in Breen's ownership at the cessation of land filling. Any long term environmental responsibilities would remain with Breen until such time as an alternative arrangement may be reached. These responsibilities would be handled day to day by staff based on the Proposal Site.

Landfill excavation stages

A summary of each sub-stage and the associated earthworks is presented in **Table 13**. Overall, excess materials from construction of all stages is expected to be used as the landfill engineering materials elsewhere on the Proposal Site.

Table 13 Landfill sub-stages and associated earthworks

Stage	Description
Lots 1122 and 1123 and Lot 6	Cells within Lots 1122 and 1123 and Lot 6 have reached their final landform contour. The landfill operation in this area would be closed and capped in accordance with the progressive capping plan (Appendix U). This plan was prepared by CES in 2011 and approved by the EPA. This plan would be revised in accordance with the Proposal if approved.
Landfill Cell B11 Stage A (B11A) on Lot 5	Landfill Cell B11A was constructed in accordance with condition E8 of EPL 4608 and comprises the following: – a compacted clay layer with a permeability of no greater than 10⁻⁹ m/s and a minimum thickness of 900 mm;

Stage	Description
	– an upper needle punched, non-woven geotextile layer; an aggregate drainage later; leachate collection pipes laid in a negative projection in an aggregate filled trench placed in intervals of no more than 50 metres; and – a lower needle punched, non-woven geotextile layer.
Landfill Cell B11 Stage B (B11B) on Lot 5	The cell was built in April 2020 in accordance with condition E8 of EPL 4608.
Landfill Cell B11 Stage C (B11C) on Lot 5	To be built in accordance with condition E8 of EPL 2608 and would comprise: – a compacted clay layer with a permeability of no greater than 10^{-9} m/s and a minimum thickness of 900 mm; – an upper needle punched, non-woven geotextile layer; – an aggregate drainage later; leachate collection pipes laid in a negative projection in an aggregate filled trench placed in intervals of no more than 50 metres; and – a lower needle punched, non-woven geotextile layer.

Landfill construction steps

Progressive landfill cell construction, operation and rehabilitation of three landfill stages by filling and profiling on Lot 5 following landfilling of stages Landfill Cell B11A, B11B and B11C and would include the following steps:

- Earthworks for cell formation including extraction of natural fill materials and stockpiling of materials and the reapplication to form the leachate barrier (cell liner) as well as for daily, intermediate and final cover.
- Installation of leachate management structures including the leachate barrier, collection, storage and disposal system.
- Installation of a stormwater management system.
- Installation of a groundwater management system.
- Signage and other ancillary works.
- Closure and rehabilitation of the completed cell.

Waste processing and covering

- Waste would be tipped in a defined filling area which may vary from day to day.
- Staff would restrict the tipping face to about 600 m² (e.g. 30 m x 20 m), depending on the level of demand and where health and safety considerations allow.
- Deposited waste would be progressively consolidated during operations. Landfilled waste would be managed and compacted in general accordance with the EPA (2016) *Environmental Guidelines: Solid waste landfills*.
- As required by the EPA (2016) *Environmental Guidelines: Solid waste landfills*, waste would be covered daily and at intermediate stages of operation to minimise odour, dust, litter, the presence of scavengers and vermin, the risk of fire, rainwater infiltration into the waste (and therefore the amount of leachate generated) and the emission of landfill gas.
- Daily cover would comprise natural soils or approved alternative daily cover and would be applied at a minimum thickness of 150 mm. Daily cover would be sourced from stockpiled resource recovered materials where available.
- As progressive lifts of waste are added to previously placed waste, the cover is stripped away in advance of filling over at least 50% of the area to be filled daily to allow for long-term vertical movement of leachate.
- An intermediate cover of 300 mm would be applied to surfaces which would be unused for a period of 90 days or more.
- The intermediate cover would be compacted to reach a saturated hydraulic conductivity of less than 1×10^{-5} m/s with a compaction of 95% standard maximum dry density. As per section 8.2 of the EPA (2016) *Environmental Guidelines: Solid waste landfills*.

- Cover material would be sourced from approved sources e.g. approved alternate daily cover, excavated natural or virgin excavated natural material.
- Covered sections of the Landfill would be graded to drain rainfall runoff away from the tipping face.
- A small bund of excavated material would be maintained on the low side of the tipping face to collect and retain any runoff resulting from rainfall onto exposed waste surfaces.

Waste monitoring

Every six months, in accordance with the POEO Act, a survey of the landfill operation area is being undertaken by a registered surveyor to confirm the volume of landfill space consumed in the previous six months.

This report is being submitted to the EPA to demonstrate that the quantities of waste recorded by the weighbridge (for the 12-month period) are the same as those committed to the landfill. The details of all vehicles entering and exiting the Existing Breen Resources Facility are being permanently recorded.

A summary report on the quantity of waste received at the landfill is be lodged with the EPA when the volumetric survey and material balance is submitted.

These practices would continue.

7.3.6 Outputs

The New Resource Recovery Facility is expected to generate a variety of products. Outputs from the concrete processing and soil processing areas would meet the requirements of the relevant NSW EPA resource recovery orders.

A variety of soil and aggregate products would be produced (as per market requirements) which meet the above resource recovery orders such as concrete and brick drainage aggregate, crushed concrete, crushed brick, crushed sandstone or blocks, bedding sand and soils. Other outputs from the New Resource Recovery Facility would include separated:

- Recovered timber
- Recovered fines
- Recovered metals (ferrous and non-ferrous)
- Recovered plastics
- SRF
- Mulch and other soil additives
- Residual waste
- Recovered aggregates
- Alternate Daily Cover
- other recyclables

The expected outputs from the waste processing (at full capacity) are shown in **Table 14**.

Table 14 Expected New Resource Recovery Facility output streams

Output	Estimated output quantity (tonnes per year)
Soil (being recovered fines and soily aggregates that meet the requirements of a resource recovery order derived from processing soil)	300,000
Crushed concrete and bricks	150,000
Recovered fines (from non-soil input stream)	40,000
Recovered aggregate (from non-soil input stream)	10,000
SRF and residuals	90,000

Output	Estimated output quantity (tonnes per year)
Recovered timber	50,000
Recovered metals (ferrous and non-ferrous)	8,000
Recovered PVC	2,000

The soils, recovered fines, and recovered aggregate outputs, are proposed to be used to construct the Embellished Marang Parklands. Once construction of the Embellished Marang Parklands is complete, these materials would be sold to customers, or used to rehabilitate or profile the waste disposal area on Lot 5 at the completion of waste emplacement activities.

Other recovered materials including plastic and metals (ferrous and non-ferrous) would be sold on the market for use or further recycling/recovery.

Recovered timber is proposed to be processed into a range of products including mulch. This mulch is proposed to be used in the construction of the Embellished Marang Parklands, rehabilitation of the Proposal Site on Lot 5 for landscaping end of the life of the New Resource Recovery Facility or landscaping following landfilling of the existing cell on Lot 5 or sold to customers.

7.3.7 Quality control, record keeping and waste tracking

A number of other quality control steps are proposed during operation including:

- Signage at the entrance clearly identifying the permitted waste types and prohibited waste types.
- Operation in accordance with the EPA's *Standards for managing construction waste in NSW* including, but not limited to (see also **Section 7.4.1** below):
 - Inspection of all incoming loads at the weighbridge.
 - Secondary inspection of all incoming loads at each of the processing/recycling areas – including a tip and spread and manual inspection by staff.
 - Training of all weighbridge operators, ground staff at the inspection points and supervisors to ensure their ability to recognize and manage unpermitted wastes including nationally accredited asbestos awareness.
- Where applicable, sampling and testing in accordance with the requirements of the respective resource recovery orders. A monitoring plan would be developed for recovered material sampling.
- Accurate recording of all incoming, outgoing (waste and product) in accordance with EPL requirements and the record keeping requirements of the EPA's *Standards for managing construction waste in NSW*.
- Accurate recording of internal waste movements via the separate internal weighing zone.

7.4 Consistency with standards and guidelines

The following provides a summary of how the proposal is consistent with relevant standards and guidelines. An assessment of consistency with the FRNSW (2020) *Fire Safety Guidelines: Fire safety in waste facilities* is provided in **Section 16.2**.

7.4.1 Standards for managing construction waste in NSW

The New Resource Recovery Facility would be operated in accordance with the EPA (2018) *Standards for managing construction waste* in NSW, as assessed in **Table 15** below. Unpermitted waste that, if present, would cause a load to be rejected includes asbestos, putrescible waste, liquid waste and hazardous waste.

Table 15 Proposed measures to meet the requirements of Standards for managing construction waste in NSW

Standard	Measures
Standard 1: Inspection requirements	
Inspection point 1 – verified weighbridge inspection	All incoming loads will be visually inspected at the weighbridge to identify if the load contains any unpermitted wastes Where a load is identified as containing asbestos or other unpermitted wastes the load will be rejected and details recorded Otherwise, loads will be directed to the relevant processing area and load details recorded
Inspection point 2 – tip and spread inspection area	All processing areas including the waste processing building, soil processing building, and concrete processing building include a tip and spread inspection area. Loads will be tipped, spread out and visually inspected by staff. Where any unpermitted waste is identified, it will be removed or the entire load rejected. Where any asbestos is identified, the entire load will be reloaded and rejected. Any rejected loads will be recorded. Vehicles will not be permitted to leave the site until the load has been verified.
Training requirements	All staff in roles which require tip and spread and inspection will be required to undergo training and these training records will be maintained. Current training requirements are defined by the EPA (2018) <i>Standards for Managing Construction Waste in NSW</i> . That includes: • All relevant regulatory and legislative/licencing, standards and guidelines; and • The required asbestos awareness. All staff that may be required to remove bonded asbestos received at the New Resource Recovery Facility will undergo the required bonded asbestos removal training
Rejected loads register	A rejected loads register will be maintained – including records of date, time of load rejected, registration of vehicle(s), type of waste(s) rejected and reason for rejection
Standard 2: Sorting requirements	
Sorting	Any mixed (not source separated) loads received will be sorted and classified into individual listed waste types before being transferred to the relevant waste storage areas
Standard 3: No mixing of waste	
No mixing of inspected and sorted waste with waste that has not been inspected and sorted	Incoming waste that has been inspected and sorted in accordance with Standards 1 and 2 will not be mixed with any other waste unless: • that other waste has been inspected and sorted at the facility in accordance with Standards 1 and 2, and • it is of the same listed waste type as the other waste, or • the mixing is carried out to meet the requirements of a resource recovery order or the recovered fines specifications.
Standard 4: Waste storage requirements	
Waste storage area	Waste storage areas and stockpile areas will be labelled or signposted in a way which is clearly visible – including any material which meets the relevant resource recovery orders Individual separated listed waste types will be stored separately with separation of a minimum of three metres from the base of stockpiles
Inspection point 3	Daily inspections of waste storage areas will be undertaken by trained staff to ensure storage is being undertaken in accordance with the waste storage area requirements and any required corrections implemented immediately. Records of daily inspections will be kept.
Standard 5: Transport requirements	
Transport requirements	Recovered materials will not be transported from the New Resource Recovery Facility unless it has been inspected, sorted and stored in accordance with the EPA (2018) <i>Standards for managing construction waste in NSW</i> and the load of waste consists solely of a single listed waste type or waste that meets the requirements of a resource recovery order or the recovered fines specifications.

7.4.2 NSW Energy from Waste Policy Statement

The EPA's *NSW Energy from Waste Draft Policy Statement* outlines the policy framework and technical criteria that apply to facilities proposing to recover energy from waste in NSW. The EPA considers energy recovery to be a complementary waste management option for residual waste produced from material recovery processes. The policy states that energy recovery facilities may only receive feedstock from waste processing facilities or collection systems that meet specific resource recovery criteria.

The Proposal would not recover energy from waste, but it would produce a SRF suitable for off-site energy recovery. The SRF would be derived from incoming mixed C&D and C&I waste. The resource recovery criteria for facilities processing these types of mixed waste streams are shown in **Table 16**.

Table 16 Resource recovery criteria for energy recovery facilities

Waste stream	Processing facility	% residual waste allowed for energy recovery
Mixed C&I waste	Facility processing mixed C&I waste	Up to 50% by weight of the waste stream received at the processing facility
	Facility processing mixed C&I waste where a business has separate collection systems for all relevant waste streams	No limit by weight of the waste stream received at a processing facility
Mixed C&D waste	Facility processing mixed C&D waste	Up to 25% by weight of the waste stream received at a processing facility

In addition to the above, waste streams proposed for energy recovery should not contain contaminants such as batteries, light bulbs or other electrical or hazardous wastes. The volume and composition of the residual waste produced by the New Resource Recovery Facility would meet the requirements of the EPA's *NSW Energy from Waste Draft Policy Statement* for use as feedstock for an energy from waste facility. In particular,

- Assuming that all C&I waste received at the facility is not subject of separate collection systems at the source, up to 50% could be used for energy recovery. This equates to 25,000 tonnes per annum.
- For mixed C&D waste, up to 25% of the waste stream could be used for energy recovery. With total C&D waste of 300,000 tonnes per annum (excluding soils), this equates to 75,000 tonnes per annum.

As such, based on the projected waste streams to be received at the New Resource Recovery Facility, up to 100,000 tonnes per annum of SRF would be able to be produced whilst remaining compliant with the resource recovery criteria. The proposed 65,000 tonnes per annum of SRF is therefore well below the allowable limit.

The following measures would be adopted to ensure compliance with the EPA's *NSW Energy from Waste Policy Statement*:

- implementation of the quality control measures described in **Section 7.3.7** to ensure the SRF stream would not contain contaminants;
- record keeping and waste tracking measures described in **Section 7.3.7** including accurate recording of all incoming, outgoing (waste and product) including quantities of mixed C&I and mixed C&D waste and maintenance of a rejected loads register as described in **Table 15**;
- physical separation of incoming mixed C&I and C&D wastes with a variety of magnets, screens and separators to ensure materials such as PVC plastics, aggregates, clean timber, metals etc. do not end up in the SRF stream (see **Section 7.3.4**);
- development of SRF specifications, sampling and testing procedures in conjunction with SRF customers (ultimately the SRF specification will be finalised for each customer, and the SRF specification will be subject of commercial agreement with that customer);
- implementation of the sampling and testing regime, which would be performed by a third party, NATA accredited laboratory; and
- preparation of an Energy from Waste Management Plan to address and manage compliance with the EPA's *NSW Energy from Waste Draft Policy Statement*.

7.5 Management and mitigation measures

7.5.1 Construction

Waste would be managed during construction in accordance with the CEMP. The CEMP would include a Construction Waste Management Plan, which will define the processes, responsibilities and management measures that would be implemented during construction to manage waste. This would include procedures for the

assessment, classification, management and disposal of waste in accordance with the EPA's *Waste Classification Guidelines*. **Table 17** provides a summary of the construction waste management measures.

Table 17 Summary of mitigation measures relating to construction waste management

Impact	Environmental Safeguard	Responsibility	Timing
Waste generation and recycling	Detailed design will include measures to minimise excess spoil generation. This will include a focus on optimising the design to minimise spoil volumes, and the reuse of material on the Proposal Site.	Construction Contractor	Detailed Design
Construction waste and spoil management	Construction waste will be managed in accordance with the CEMP. The CEMP will include a waste management chapter that will adopt the waste hierarchy principles contained in the <i>Waste Avoidance and Resource Recovery Act 2001</i> and will detail processes, responsibilities and measures to manage waste and minimise the potential for impacts during construction. The CEMP will be prepared prior to the commencement of the Proposal construction.	Construction Contractor	Pre-construction / Construction
	Construction waste will be minimised by accurately calculating materials brought to the Proposal Site and limiting materials packaging where possible.	Construction Contractor	Construction
	All waste disposal will be in accordance with the EPA <i>Waste Classification Guidelines</i> .	Construction Contractor	Construction

7.5.2 Operation

Table 18 provides a summary of the operational waste management measures.

Table 18 Summary of mitigation measures relating to operational waste management

Impact	Environmental Safeguard	Responsibility	Timing
Operational waste management (staff and maintenance)	Operational waste from site personnel and maintenance activities, including general litter clean up, will be managed in accordance with existing operational practices. It will adopt the waste hierarchy principles contained in the <i>Waste Avoidance and Resource Recovery Act 2001</i> .	Breen	Operation
Waste received	All waste received at the New Resource Recovery Facility will be managed in accordance with the OEMP, site EPLs and EPA Standards for managing construction waste in NSW.	Breen	Operation
	An Energy from Waste Management Plan will be developed to address and manage compliance with the EPA NSW Energy from Waste Draft Policy Statement.	Breen	Operation

8.0 Soil and Water

8.1 Contamination

A Contamination Status Report has been prepared by GHD and is included at **Appendix G**. A summary of the assessment and proposed mitigation measures are provided below.

8.1.1 Existing Environment

Environment protection licences and resource recovery orders

The Existing Breen Resources Facility holds two environment protection licences (EPLs) which have been issued to Breen, as summarised in **Table 19**.

Table 19 Existing EPLs

	Environment Protection Licence - 4608	Environment Protection Licence - 20697
Authorised activities	'resource recovery' (any general waste recovered) and 'waste disposal by application to land under the POEO Act	'resource recovery' (recovery of general waste) and 'waste storage' (waste storage – other types of waste) under the POEO Act 1997
Acceptable wastes	- immobilised wastes able to be landfilled; - virgin excavated natural material; waste tyres; - paper or cardboard; - glass, plastic, rubber, plasterboard, ceramics, bricks, concrete or metal; - building and demolition waste; asphalt waste (including asphalt resulting from road construction and waterproofing works); - ferric sludge (from the Sydney Desalination Plant); - dredge spoil; and - soils.	- grit and screenings from potable water and water reticulation plants that has been dewatered so that it does not contain free liquids; - wood waste; - cured concrete waste from a batch plant; - synthetic fibre waste (from materials such as fibreglass, polyesters and other plastics) being waste that is packaged securely to prevent dust emissions, but excluding asbestos waste; - grit, sediment, litter and gross pollutants collected in, and removed from, stormwater treatment devices or stormwater management systems, that has been dewatered so that it does not contain free liquids; - waste collected by or on behalf of local councils from street sweeping; - household waste from municipal clean-up that does not contain food waste; waste tyre; - soils; - asphalt waste (including asphalt resulting from road construction and waterproofing works); - building and demolition waste; - glass, plastic, rubber, plasterboard, ceramics, bricks, concrete or metal; - paper or cardboard; and - virgin excavated natural material.

A number of resource recovery orders have been issued by the NSW EPA. Two resource recovery orders are regularly used by the Existing Breen Resource Facility:

- The Recovered aggregate order 2014 ('recovered aggregate order 2014') – applies to recovered aggregate. The definition of recovered aggregate, as provided by the NSW EPA, is 'material comprising of concrete, brick, ceramics, natural rock and asphalt processed into an engineered material. This does not include refractory bricks or associated refractory materials, or asphalt that contains coal tar'. The order applies to who supplies the material.
- The "Continuous process" recovered fines order 2014 ('continuous fines order 2014') – applies to fines recovered from continuous processes. The definition of "continuous process" recovered fines, as provided by the NSW EPA, is 'a soil or sand substitute with a typical maximum particle size of 9.5 mm that is derived from the continuous processing of mixed construction and demolition waste including residues from the processing of skip bin waste'.

The orders apply to the producer of the materials. They do not apply to the consumer of the recovered aggregate or recovered fines materials (the consumer is required to comply with the related resource recovery exemption).

Site features

Landfilling operations

The Existing Breen Resources Facility is licenced to accept General Solid Waste (non-putrescible) and waste tyres (Special Waste). No putrescible, hazardous or green/garden organics is accepted at the Existing Breen Resources Facility.

The entire Existing Breen Resources Facility site, including the landfill, is currently operated pursuant to EPLs 4608 and 20967. The newest landfill cell (known as B11 Stage B under EPL 4608) is lined with a geosynthetic clay liner, whilst the older former cells are understood to be clay lined.

Resource recovery operations

The existing C&D recycling plant processes light, mixed C&D waste which is delivered to the site in skip bins and trucks by various collection contractors or by the public in small vehicles. Incoming loads are inspected to determine the appropriate drop off locations at the plant. Incoming loads are directed by staff to either the heavy or light waste stockpiles, skip bin unload area, brick and concrete unload area or general storage area for hand unloading. Waste is then dropped directly onto the concrete tip and inspect slabs for inspection prior to the customer leaving the area.

Current sorting processes include preliminary sort by excavator(s) and some sorting by site personnel by hand, mechanical screening into three size fractions, and manual sorting of the largest size fraction (picking station). The smallest fraction (0-25 mm) is recovered as 'fines', while much of the largest fraction (>80 mm) is recovered via the manual sorting line. The mid-size fraction (25-80 mm), which comprises 30-40% of the waste stream, is currently disposed to landfill. Residual waste is shredded for additional recovery of soil, aggregate and recoverable waste, and remaining waste is then baled for transport to landfill.

Concrete recycling, soil recycling and plasterboard processing are also carried out on site. Cardboard, metals and timber are also recovered.

Recovered fines and aggregate stockpiles

Recovered fines and aggregate from the soil recycling process are stockpiled on Proposal Site for future use as part of the Embellished Marang Parklands construction, with the supplementary material for regrading to come from future resource recovery operations, or imported from off-site if required.

Sedimentation, infiltration, and recovered water basins

There are four sedimentation, infiltration, and recovered water basins on the Existing Breen Resources Facility site that receive site stormwater runoff for sedimentation and infiltration. They are excavated to below groundwater level, which allows for water recharge, recovery and reuse, primarily via the wheel wash/stand pipe and site operations.

Site geology

Regional geology

The Proposal Site and surrounding area is located within the Permo-Triassic Sydney Basin. The Sydney Basin is a 64,000 km² convergent margin foreland sedimentary basin on the central eastern coast of Australia.

The basin overlies the Lachlan Fold Belt and Late Carboniferous volcanoclastic sediments. The basin itself comprises interbedded sedimentary strata with a succession comprising lower sequence of interbedded marine-deposited strata, overlain by local Permian coal-bearing sequences, then additional marine and terrestrial strata. Within the sedimentary sequence are intrusions of Jurassic, Mesozoic and Cenozoic age volcanics. The pre-Quaternary succession is overlain by Quaternary sediments, primarily of alluvial origin.

The Proposal Site is located within the region covered by the 1:100,000 Wollongong-Port Hacking Geological Map (Stroud et al. 1985). The stratigraphic units encountered in the Proposal Site are discussed below.

Fill / landfill

No detailed bore records are available within the historical landfilling of the sand mining operations, however the available information indicates that the sand was excavated to depths of approximately – 23 m AHD. This indicates that filling on the Proposal Site is likely to extend to 25 to 26 m below ground level. The sand pits were filled with

VENM/ENM to ground water level (approx. 2.0m RL). It is understood that a clay liner was installed above the pond fill material. This has been confirmed in some locations.

It is understood that backfilling of the sand pits primarily comprised VENM. Anecdotally, potential acid sulfate soils (PASS) have also been placed below the water table in accordance with EPL 4608; however, it is understood these only comprise a very small fraction of the fill. The Leachate Management Strategy report prepared by Consulting Earth Sciences (see **Appendix X**) states that in 2005 EPL 4608 was varied to allow the acceptance of PASS subject to control conditions which inter alia, required the disposal of PASS at least 1 m below the permanent water table within 24 hours of the time of its excavation at the originating site. It also says that although the Existing Breen Resources Facility was lawfully able to accept PASS subject to the applicable licence conditions, it is understood that only a small amount of PASS was historically accepted at the site.

Quaternary sediments

The Quaternary sediments primarily consist of unconsolidated to semi-unconsolidated permeable sands. These are interspersed with lenses and layers of peat, peaty sands, silts and clays (low permeability). These sediments are identified as medium to fine marine quartz sand and podsols (Qbd) and marine quartz sand (Qmd).

Bedrock

The alluvium, marine deposits and residual soils overlie Hawkesbury Sandstone. The Hawkesbury Sandstone is composed of medium to coarse-grained quartz sandstone, with very minor shale and laminate lenses. The Hawkesbury Sandstone outcrops at the eastern end of the Kurnell peninsula.

Soil landscape

Based on the Soil Landscapes of Sydney, collated by Lotsearch, the Proposal Site is within the soil landscape: Podsol (Cb27). This is characterised of “coastal sand plains and dunes, lagoons and swampy areas: chief soils are leached sands. Associated are dunes of siliceous sands and/or calcareous sands fringing the coastline; and swampy areas of soils and soils with peaty surfaces.

Acid sulfate soils

Acid sulfate soils (ASS) are naturally occurring soils containing iron sulphides. When exposed to air, the oxidation of the sulphides produces sulphuric acid. Acid sulphate soils commonly occur in coastal areas and wetlands, and along waterways and drainage channels. There is the potential for ASS to be present on the Proposal Site with classifications ranging from Class 2 to Class 5 within the Proposal Site and surrounding area. **Table 20** presents the acid sulphate classification of locations within the Proposal Site.

Table 20 Acid sulphate soil classifications

Location	Class
Lot 1122 DP 794114	2, 3, 4 and 5
Lot 1123 DP 794114	
Lot 6 DP 1158627	3 and 5
Lot 5 DP 1158627	3 and 4

Source: Sutherland Shire LEP, 2015

Class 2 are classified as ASS likely to be found below the natural ground surface. Any works beneath the natural ground surface or works which are likely to lower the water table, will trigger the requirement for assessment and may require management.

Class 3 are classified as ASS are likely to be found beyond 1 metre below the natural ground surface. Any works that extend beyond 1 metre below the natural ground surface, or works which are likely to lower water table beyond 1 metre below the natural ground surface, will trigger the requirement for assessment and may require management.

Class 4 are classified as ASS are likely to be found beyond 2 metres below the natural ground surface. Any works that extend beyond 2 metres below the natural ground surface, or works which are likely to lower water table beyond 2 metres below the natural ground surface, will trigger the requirement for assessment and may require management.

Class 5 are classified as unlikely to find ASS. However, they are adjacent to Class 1, 2, 3 and 4 land and therefore consideration is needed if lowering of the water table will affect the neighbouring areas.

Hydrogeology

A review of available data collated by Lotsearch identified two registered extractive bores on the Proposal Site and 13 registered groundwater wells used for domestic, recreational, irrigation, industrial or experiment purposes within a one kilometre radius of the Proposal Site. The majority of the wells are shallow (<20 metres in depth) and expected to be screened within the Botany Sands. **Figure 35** shows registered groundwater bores within 1 km of the Proposal Site, as well as the Proposal Site's groundwater monitoring well network.

A number of surface water features surround the Proposal Site including Towra Point Nature reserve, Quibray Bay, Weeney Bay and Botany Bay to the north of the Proposal Site; Georges River and Woolloomare Bay to the west; and Bate Bay to the south. **Figure 36** shows the locations of these surface water features.



Figure 35 Registered groundwater bores and monitoring well network

Source: Contamination Status Report, GHD (Appendix G)



Figure 36 Surface water features

Source: Contamination Status Report, GHD (Appendix G)

Regulatory information

Contaminated sites register and records of notice

The Contaminated Land Record of Notices under the CLM Act, is a public record of contaminated land. Two sites were identified on the list of contaminated sites notified to the EPA within one kilometre of the Proposal Site. The former Phillips Imperial Chemicals site is located 620 m to the east and regulation under CLM Act not required and Abbott Australasia is located 976 m to the east of the Proposal Site and is listed as having contamination that was formerly regulated under the CLM Act.

POEO license register

The POEO license register identifies premises that are licensed for certain activities under the POEO Act. Information of particular relevance to this assessment, which is listed on the register includes site location, activity type, relevant clean up notices, non-compliance information and load-based licensing data.

Each licence provides information on potential point and non-point sources of soil and groundwater contamination that may be generated on-site through standard operations, accidental spills and leaks.

A search returned eight active EPA Authorisations (covered by five EPLs) within one kilometre of the Proposal Site. A review of these is provided in Table 6 of the Contamination Status Report (at **Appendix G**). These included the two previously mentioned Breen EPLs, and EPLs for Sydney Water Corporation (for the Cronulla Sewage Treatment System), All Sands/Rocla and for Besmaw/Holt Land Rehabilitation Centre.

National Waste Management Site Database

A review of Lotsearch identified an operational landfill operating as Kurnell Landfill Company near the Proposal Site. It is understood that Breen previously conducted landfilling operations under that name, and the register may not be up to date. The search did not show any other premises within a one kilometre radius of the Proposal Site.

National Liquid Fuel Facilities

A review of Lotsearch identified no premises on the register within a one kilometre radius of the Proposal Site.

Per- and polyfluoroalkyl substances (PFAS) investigation and management programs

The search identified that the Proposal Site is within the Botany Bay and Georges River area, which are part of the NSW EPA PFAS investigation program. However, it did not show any premises associated with the following, within a 1 km radius of the Proposal Site.

- Defence PFAS Investigation Program.
- Defence PFAS Management Program.
- Air services Australia National PFAS Management Program.

Site history

The Kurnell Peninsula has been subject to extensive sand mining historically, with estimates in excess of over 170 million tonnes of sand extracted since the 1930s. The Proposal Site has been used for sand extraction since the 1960s. Sand extraction activities produced dredge ponds surrounded by a relatively flat area.

Breen began landfilling activities in 1990. Landfill clay liners were installed at the bottom of excavations in Lot 1122, Lot 1123, and Lot 6. Construction details of the liners are not available. Based on the limited information available, liners were most likely installed at depths between 18 and 20 m below the 2017 level of waste. Excavations produced by sand extraction activities are understood to have been filled with virgin excavated natural materials and a small quantity of potential acid sulfate soils (below the water table) in accordance with EPL 4608.

Previous investigations

A summary of previous, relevant groundwater, leachate, soil (i.e. recovered material produced at the Existing Breen Resources Facility) and landfill gas monitoring reports and data made available to GHD is provided below. Locations of main sampling points are shown in **Figure 37**.



Figure 37 Groundwater and leachate monitoring wells

Source: Contamination Status Report, GHD (Appendix G)

Based on information provided to GHD, the groundwater monitoring well network on-site was first developed by URS, with bores progressively replaced and the network expanded over time by URS and CES.

During well installation, the following lithology was observed at select locations:

- At location LB02, the general stratigraphic sequence was described as “compacted clay line(r) overlying waste layers comprising sandy clay with a significant proportion of waste inclusions, consisting of decomposed wood, aluminium and steel”. The recorded leachate level post installation was 19.17 m below ground level (bgl).
- At BH10A, BH14 and BH19, fill comprising clayey sand and clay to a depth between 2.5 m bgl and 5.8 m bgl, followed by medium grained sand to a maximum investigation depth of 6.8 m bgl.
- At BH25, fine to medium sand from the surface to the well installation depth of 15 m bgl.
- At LW01 to LW06, the general sequence was described as sand or clay cover material, overlying waste up to 27.8 m thick. This was in turn underlain by clay /sandy clay cap in some locations up to 0.9 m thick.

Resource recovery orders have been applied on-site to produce certified recovered aggregate and recovered fines. A weekly sampling regime has been implemented to characterise and verify the recovered materials. Based on sampling and monitoring that has previously been carried out by CES, laboratory results indicated that materials met all requirements set out by relevant resource recovery orders.

Previous Assessment reports

A 2004 Sampling Program prepared by URS in 2004 titled *Ecotoxicological Assessment of Groundwater Quality*, Kurnell Landfill has been reviewed. Monitoring reports from 2007 were also reviewed.

The objective of the investigation was to assess ecotoxicity of groundwater at the Proposal Site and to evaluate risks posed by contaminants, particularly arsenic, ammonia and total petroleum hydrocarbons. The scope of work comprised sampling of groundwater from four wells (BH8A, BH9A, BH11 and BH13A), chemical analyses and ecotoxicological testing. Of the four groundwater samples tested, the highest concentrations of arsenic and ammonia were in groundwater from BH9A (1.7 mg/L and 13.3 mg/L respectively). Nitrate concentrations were highest (1.22 mg/L) in well BH13A.

Findings indicated that groundwater within the landfilled area had the potential to pose adverse ecotoxicological risks to algal growth and to waterflea life cycle. However, groundwater collected from a sampling point towards Quibray Bay (BH13A) did not show ecotoxicological risks.

Monitoring reports

Groundwater monitoring

Groundwater monitoring has been undertaken on a quarterly and yearly basis for various monitoring wells, 22 of which are prescribed by EPL 4608. In addition, eight leachate wells have been historically monitored at irregular intervals. The quarterly analytical suite was limited to pH, electrical conductivity, total dissolved solids, major anion and ions, nutrients and arsenic. The annual analytical suite, in addition to the analytes above, contains heavy metals (Al, Ba, Cd, Cr, Co, Cu, Fe, Pb, Mn, Mg, Hg, Zn), phenolic compounds, organochlorine and organophosphate pesticides (OCP/OPP), polycyclic aromatic hydrocarbons (PAH), total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylene (BTEX) volatile organic compounds.

In January 2007, the scope of monitoring included gauging and sampling of 21 groundwater monitoring wells and one leachate well using bailers; and sampling of four surface water bodies (the concrete recycling pond, Western Wheel wash pond, wheel wash pond, and the pond in Lot 5). Analysis for water pH, electrical conductivity, total dissolved solids, major anion and ions, nutrients and arsenic was undertaken. The main findings were:

- Groundwater flow direction was inferred to the north-east.
- Arsenic concentrations above the adopted trigger values were detected in 11 groundwater monitoring wells. Mild arsenic contamination was present down gradient of the southern landfill area most notably near well BH10A (0.113 mg/L). No increasing concentration trends were noted.
- In groundwater, copper concentrations exceeded the adopted trigger value in one well (BH4A – 0.002 mg/L), and zinc in six wells (up to 0.043 mg/L in BH20). The remaining analytes were not detected or showed concentrations lower than the adopted assessment criteria.
- Ammonia was detected in groundwater downgradient of the southern landfill area (up to 7.69 mg/L at BH10A).

- In leachate monitoring well LB01, ammonia (60.4 mg/L), cobalt (0.005 mg/L) and copper (0.002 mg/L) concentrations exceeded the adopted trigger values. The remaining analytes were not detected or showed concentrations lower than the adopted assessment criteria.
- In surface water, analyte concentrations fluctuated within the normal range for the Proposal Site.

Groundwater sampling was undertaken in April 2007, and the main findings were:

- Mild arsenic concentrations above the adopted trigger values was detected in 12 groundwater monitoring wells. Arsenic contamination was present down gradient of the southern landfill area with a maximum of 0.118 mg/L in BH9B. No increasing concentration trends were noted.
- Ammonia was detected in groundwater at minor concentrations in the southern landfill area, up to 11.9 mg/L in BH9B. Potential increasing trends in ammonia concentrations were detected in groundwater monitoring wells BH5A and BH10A.
- In surface water, analyte concentrations fluctuated within the normal range for the Proposal Site.

In 2018, 22 groundwater wells and one leachate well were sampled by CES. The main findings were that there was no discernible temporal trend in ammonia concentrations between 2009 and 2018. Proposed works at the site were considered unlikely to produce adverse groundwater impacts. The ongoing quarterly and annual groundwater monitoring in accordance with the EPL was considered adequate to meet Development Application (DA) requirements. It was concluded that historical groundwater results, collected between 2009 and 2018, should be used as a baseline to assess potential groundwater impacts associated with the proposed works.

In 2019, CES monitored 22 groundwater monitoring wells and one leachate well; measuring field parameters and analysed samples for the analytical suite prescribed in EPL No. 4608.

Results were considered consistent with previous monitoring round. It is noted that the scope of the monitoring reports did not require comparison of results to assessment criteria as per the EPL. The highest ammonia concentrations were detected in leachate well LB02 (160 mg/L) located in the landfilled area, and groundwater monitoring wells BH5A (23 mg/L) and BH9C (17 mg/L) located in the northern/north-western and central portions of the Proposal Site, respectively. Several wells installed along the site perimeter showed ammonia concentrations above a 95% species protection ecological criterion (0.9 mg/L), and were generally lower than 5.6 mg/L.

In January 2020, CES sampled 23 groundwater monitoring wells and one leachate well; measuring field parameters and analysing samples for the analytical suite prescribed in EPL 4608. An increase in ammonia concentrations from 1.7 mg/L in October 2019 to 13 mg/L in January 2020 was reported. Overall, it was considered that results and trends were consistent with the October 2019 monitoring round. It is noted that the scope of the monitoring reports did not require comparison of results to assessment criteria as per the EPL.

The highest ammonia concentrations were detected in leachate well LB02 (300 mg/L) located in the landfilled area, and groundwater monitoring wells BH5A (19 mg/L) located in the northern/north-western portions of the Proposal Site. Several wells installed along the site perimeter showed ammonia concentrations above a 95% species protection ecological criterion (0.9 mg/L), and were generally lower than 13 mg/L.

Subsurface gas monitoring

Landfill gas (methane) monitoring is currently carried out at five bores, BH4A, BH8B, BH12A, BH13A and BH18 to satisfy EPL (No 4608) requirements. Eleven documents containing monitoring data collected between 2007 and 2020, were provided to GHD.

Landfill gas monitoring (methane) took place in January 2007. The scope of work included monitoring of 17 subsurface gas bores, assessment of surface gas at Lot 1123 and Lot 1122, and monitoring of gas accumulation in four buildings. Methane concentrations were reported as percentage (%) relative to the lower explosive limit (LEL) of methane in air. The main findings were that during surface gas monitoring, methane concentrations were lower than the adopted assessment criterion of 1% v/v for methane.

Sub-surface gas monitoring undertaken at 17 locations showed low methane concentrations and higher levels of oxygen and carbon dioxide. Elevated methane concentrations, up to 608 % LEL (or approximately 30 % v/v), were

detected in bores BH9B and BH11; however, these bores are located within the landfill area. Infiltration and accumulation of landfill gasses within the site's buildings were not detected.

Similar sampling was undertaken in April 2007, and landfill gas was sampled again in 2017, and in 2020. In the most recent sampling, methane concentrations in sub-surface gas and within buildings were lower than the methane assessment criterion of 1% v/v. Carbon monoxide, carbon dioxide and hydrogen sulphide in the sub-surface posed low to negligible risks. Results indicated that risks related to gas accumulation in buildings were low to very low.

Asbestos testing

Data was provided to GHD by Breen for random asbestos testing carried out for incoming loads. It is noted that this testing is not required by the Existing Breen Resources Facility EPLs. Twenty-eight soil and aggregate samples collected between March and July 2020 were tested for asbestos presence/absence. Asbestos was not identified in any sample. All samples contained organic fibres.

Other information

Available soil (i.e. recovered material produced at the Existing Breen Resources Facility under resource recovery orders described above), surface water, groundwater, leachate and soil gas results have been collated from previous reports and excel tables were provided to GHD and are presented in Appendix G of the Contamination Status Report. They are discussed in Section 9 of the Contamination Status Report.

In 2018 NSW EPA sent a letter to Breen (Annual Return Monitoring Data & Inspection Follow-up, ref DOC18/846710 dated 19 November 2018). The following was noted:

- Ammonia concentrations were well above ANZECC guidelines which set an ammonia trigger value of 0.9 mg/L; BH5A with an average of 11.725 mg/L and BH9C with an average of 40 mg/L.
- Elevated ammonia levels were expressed to be of concern as they show that the integrity of the landfill liner may be in question and that the landfill may be discharging leachate. The discharge may be affecting the groundwater quality in the nearby vicinity.
- NSW EPA required that Breen engage a suitably qualified expert to review the water quality data from the boreholes and determine if any follow up action is required as a result of the findings.

Breen subsequently engaged CES to prepare a response which was documented in Re: Response to EPA Correspondence – Annual Return Monitoring Data & Inspection Follow-up dated 21 December 2018 (CES 2018b).

The following are key points from the response:

- CES stated that an appropriate guideline value for ammonia based on a receiving marine environment pH of 8 should be 3.91 mg/L in accordance with ANZG (2018). It was further noted that the default ammonia guideline value was classified as a moderate reliability guideline and therefore could be over-conservative.
- Leachate at the Proposal Site was characterised by ammonia concentrations well in excess of 3.91 mg/L, up to 830 mg/L with a mean of 358 mg/L.
- Leachate was also characterised by elevated concentrations of bicarbonate alkalinity, total recoverable hydrocarbons (TRH), potassium, total dissolved solids (TDS) and total organic carbon (TOC). These were adopted by CES as "leachate marker chemicals".
- Ammonia concentrations in BH5A and BH9C were not considered to exhibit a "constant definable trend" with considerable fluctuations in concentrations, and were typically an order of magnitude less than leachate concentrations.
- Leachate marker chemicals in BH5A, BH9C and surrounding bores were typically not detected (TRH, although some detections marginally above the practical quantitation limit (PQL) did occur), were consistent and within expected ranges for groundwater (bicarbonate alkalinity; except for two isolated spikes at BH9C in 2014 and 2015 and potassium, except for an isolated spike between April and October 2017 at BH9C) and demonstrated considerable variability with no discernible trends (TDS). TOC was determined to have "remained consistent" with the exception of elevated concentrations in BH9C between October 2014 and October 2016 and an isolated spike in BH3A (considered anomalous).

- CES did not consider there was a definitive connection between leachate marker chemicals and elevated concentrations of ammonia in BH5A and BH9C, nor did they identify elevated ammonia concentrations in nearby wells BH3A, BH4A, BH12A, BH13A and BH17.
- CES identified that elevated ammonia concentrations could be from local sources such as mangroves, site compound (workshop, weighbridge, wheel wash and amenities block), Captain Cook Drive or off-site sources.

Fieldwork program

To supplement existing data at the Proposal Site and to address SEARs requirements, GHD carried out the following:

- A walkover of the Proposal Site with Breen staff.
- Gauging of accessible groundwater monitoring wells.
- Hydraulic conductivity testing in selected wells.
- Sampling of surface water features at five on-site and three off-site locations.
- Sampling of sediment pore water at five off-site locations to the north of the Proposal Site (i.e. Towra Point Nature Reserve).

Results for this work are provided in the Contamination Status report (**Appendix G**).

Locations of the groundwater and leachate monitoring wells are shown in **Figure 37**.

On-site surface water (SW1 to SW5) and the off-site pond located to the south-west of the Proposal Site (SW6) were generally fresh (with the exception of SW4 – leachate pond), slightly alkaline and well oxygenated. Surface water samples collected from Towra Bay Nature Reserve (SW7 and SW8) were marine (highly saline), generally neutral in pH and oxygenated.

Bore water samples were saline, although with electrical conductivities lower than marine surface water samples, neutral in pH and poorly oxygenated to anoxic.

Off-site freshwater pond SW6 did not exceed any of the adopted criteria in primary samples. One intra-laboratory duplicate for copper returned an anomalous result of 0.013 µg/L above the adopted criterion of 0.0014 µg/L. Taking the hardness measured at SW6 into account (140 mg/L) the adjusted criterion for copper is 0.005 µg/L, which is still below the duplicate concentration.

Off-site surface marine water samples SW7 and SW8, collected from Towra Point Nature Reserve showed exceedances of ecological criteria, comprising marine aquaculture and ANZG (2018) marine water (95% species protection) guidelines for a number of analytes, with SW7 typically indicating higher concentrations than SW8.

These exceedances were total suspended solids (SW7 and SW8), total nitrogen (SW7), phosphorous (SW7), chromium (total – SW7), copper (SW7 and SW8), iron (SW7), lead (SW7 and SW8), manganese (SW7) and zinc (SW7 and SW8). In addition, analysis detected low concentrations, of the same order of magnitude as the LOR, of mid to heavy TRH fractions in the surface water samples collected from locations SW7 and SW8. These are likely related to high organic material content rather than to petroleum-derived hydrocarbons based on silica gel clean-up results for pore water samples (see **Section 8.4**). Endosulfan, a pesticide, was detected in sample SW7 at concentrations just above LOR.

No adopted human health criteria were exceeded in the marine surface water samples. On-site, exceedances of the assessment criteria for freshwater (95% level of species protection) and/or marine (95% level of species protection) ecosystems (ANZG, 2018) were detected in all on-site surface water samples for copper and chromium (III+VI). Freshwater and/or marine criteria were exceeded for lead and zinc in samples SW4 and SW5. Concentrations of metals were generally of the same order of magnitude as assessment criteria and similar in all on-site ponds. Exceedances of the cyanide and ammonia (as nitrogen) freshwater and marine assessment criteria (ANZG, 2018) were only detected for sample SW4, which was collected from the leachate pond.

Aesthetic and drinking water criteria were also exceeded in one sample, SW4 (leachate), for total dissolved solids, hardness (as CaCO₃), sodium and chloride. The remaining analytes showed concentrations lower than the adopted assessment criteria. TRH, BTEX, PAH, PCB, and OCP were not detected in any surface water samples.

For sediment pore water samples, recreational criteria were exceeded in sample PW02 for lead and B(a)P. Ecological criteria, comprising marine aquaculture and ANZG (2018) marine (95% species protection) guidelines, were exceeded in pore water samples for total dissolved solids (all samples), ammonia (PW01, PW03 and PW07; with only PW03 showing a concentration of 14 mg/L in exceedance of the ANZG (2018) marine criterion of 0.91 mg/L), total nitrogen (all samples), heavy metals aluminium (PW04 and PW07), arsenic (PW02), cadmium (PW02 and PW04), chromium (PW02, PW03, PW04 and PW07), copper (PW02, PW03, PW04 and PW07), iron (PW01, PW02, PW04 and PW07), lead (PW02, PW03, PW04 and PW07), manganese (all), zinc (PW02, PW03, PW04 and PW07) and mercury (PW02).

TRH were detected in all pore water samples, particularly for mid to heavy TRH fractions, at levels two to three orders of magnitude higher than the limit of reporting but below the adopted criteria.

The highest concentration was measured at PW04 – collected in the mangrove swamp to the north of the Proposal Site – where the TRH C16-C34 fraction was 3,000 µg/L. As significant levels of non-petroleum hydrocarbons (e.g. organic matter, polar metabolite compounds) were suspected in pore water in this organic rich environment, TRH silica gel clean-up was performed on the samples showing the higher TRH concentrations, namely PW02, PW03 and PW04. Following silica gel clean-up, TRH were detected only in sample PW04, at approximately half the original concentration.

PAHs such as fluoranthene and pyrene were detected in all samples except for PW07 which is located to the north-west of the Proposal Site. Endosulfan was detected in sample PW04 at the detection level of 0.1 µg/L. No other pesticides, phenols or PCBs were detected.

Nitrogen concentrations, expressed as total N, were greater than the adopted ecological assessment criteria of 1 mg/L (ANZECC 2000, marine aquaculture) in all pore water samples. The highest total nitrogen concentration, 72 mg/L, was detected in PW02; the remaining pore water samples showed levels ranging from 1 mg/L to 16 mg/L. Ammonia concentrations exceeded ecological the assessment criteria for marine water (95% level of species protection, 0.91 mg/L) only in PW03. The latter sample showed the highest ammonia concentration, 14 mg/L, among all pore water samples. In contrast, nitrate, nitrite and total oxidised nitrogen were not detected.

8.1.2 Assessment of Impacts

The investigation has assessed the current contamination status of the Proposal Site using available soil, groundwater, ground gas, pore water and surface water data and evaluated the potential for complete source-pathway-receptor linkages that might exist in the context of current land use and the proposed future use, which includes recreation/public open space in the western portion of the Proposal Site and a New Resource Recovery Facility in the eastern portion.

The primary source of contamination at the Proposal Site is mainly derived from landfilling activities within the western portion, which has occurred after historical sand mining pits were backfilled with VENM and some minor amounts of PASS (below the groundwater table) in accordance with EPL 4068. Placement of waste has resulted in leachate generation as well as production of ground gases such as methane and carbon dioxide, which is typical of landfill sites.

Available soil data from stockpiled recovered fines/ recovered aggregate analysis indicate that contaminant concentrations meet the analytical thresholds in their respective exemptions, and are all below adopted human health criteria for current and future use (recreation / public open space and commercial). Concentrations are also generally below adopted ecological criteria for future use.

Leachate/groundwater samples within the waste mass show impacts with nutrients, (most notably ammonia) and moderate concentrations of heavy metals and petroleum hydrocarbons. Other organic contamination such as PAHs, phenols and pesticides have not been detected.

These impacts are reflected, to a lesser extent, in groundwater at perimeter monitoring locations around the Proposal Site, with the greatest concentrations of ammonia (a leachate indicator) in BH5A off-site to the north,

towards Towra Point Nature Reserve. However, surface water data collected from on-site locations, apart from the lined leachate pond, did not show significant nutrient impacts (i.e. ammonia concentrations did not exceed the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018) marine water criteria, except in the lined leachate pond SW4), although concentrations of some heavy metals were above adopted ecological criteria.

Off-site surface water sampling to the south did not indicate the likelihood for any significant impacts to fresh water ponds, with virtually all contaminant concentrations below adopted freshwater ecological criteria; only one duplicate copper result slightly exceeded the trigger value.

Off-site surface water and pore water to the north indicated impacts in both media from nutrients and heavy metals in excess of adopted marine ecological criteria. However, analysis of the relationship between surface water, pore water and up-gradient groundwater concentrations does not clearly link the observed surface water impacts to groundwater migrating from the Proposal Site, as in most cases the pore water concentrations are greater than measured upgradient groundwater concentrations for COPC.

Given the extensive industrial use of Botany Bay which continues to the present, background sources of impacts cannot be precluded, and are in fact, likely.

Ground gases (methane and carbon dioxide) are present above adopted trigger levels in the waste mass. However; surface monitoring, indoor accumulation monitoring and perimeter in-ground monitoring do not indicate that gases are migrating off-site or into confined spaces and posing a risk.

Data gaps have been identified and evaluated; these primarily relate to the potential for minor localised contamination to be present from Existing Breen Resources Facility operations, the potential for asbestos to be present, and the potential for contaminants other than those specified in EPL 4608 to be present in leachate (PCBs, TBT and PFAS). These data gaps have been assessed as generally low significance, with the potential exception of PFAS, which is a known presence in landfill leachates, and is an emerging contaminant with uncertainty in respect of environmental effects. It is also noted that Botany Bay is a NSW EPA PFAS investigation area due to the many potential sources of PFAS associated with industrial use.

Review of potential source-pathway-receptor linkages for the current use does not identify any that are, or are likely to be, complete, with the possible exceptions of:

- Aesthetic (odour) issues for off-site receptors.
- Leaching from waste to on-site groundwater resources.
- Direct contact to potential localised contamination (if present) for transient wildlife on the Proposal Site.
- Possible migration of contaminants via groundwater to Towra Point Nature Reserve.
- Potential for exposure to hazardous ground gases by intrusive maintenance workers for any excavation work into waste materials.

In respect of future land use (recreational /open space in the western portion and commercial industrial at the proposed New Resource Recovery Facility and landfill in the east), the landfill areas throughout the Proposal Site will be capped in accordance NSW EPA landfill closure requirements, which include mitigation of ground gases and specifications for clean capping materials in the final landform.

With this in mind, the review of potential source-pathway-receptor linkages for the future use can be split into three areas:

- Area 1 – Capped areas of landfilled waste in the west which will be public open space / recreational.
- Area 2 – New Landfill Cell B11 (with geosynthetic liner) in the central eastern portion of the Proposal Site, which will continue to operate subject to this SSDA application.
- Area 3 – New Resource Recovery Facility in the east of the Proposal Site (being Lot 5), which will be primarily sealed.

Source-pathway-receptor linkages for these future scenarios are not identified to be complete, or likely to be complete based on the available data, with the exception of the following:

- Leaching from waste (Area 1 only) to on-site groundwater resources. The potential for this is likely to be reduced post capping due to infiltration reduction.
- Potential for exposure to hazardous ground gases by intrusive maintenance workers (Area 1 only) for any excavation work over capped waste.
- Potential exposure to leachate by site workers on-site by direct contact during use for irrigation, if applicable, at Landfill Cell B11 (Area 2), which can be managed by WH&S protocols.

While there does not appear to be a direct link between leachate impacts (most notably ammonia, but also to a lesser extent heavy metals) in groundwater at the Proposal Site with off-site surface water, the data suggests that leachate from the Proposal Site is likely to have migrated beyond the northern site boundary in groundwater in excess of adopted criteria (for example, see historical groundwater analytical ammonia results for wells BH3A, BH5A and BH12A).

This issue has been, and will continue to be, discussed with the EPA. It is noted that appropriate site closure of non-operational portions of the Former Landfill Area in accordance with NSW EPA requirements will result in a large overall reduction in the generation of leachate associated with the Proposal Site as opposed to existing conditions, which is expected to result in groundwater of improved water quality and lower volume migrating off-site (refer to the Groundwater Assessment at **Appendix I**).

No significant contamination constraints to the Proposal have been identified based on the available data. It is considered that the Proposal Site can be made suitable for its intended uses (including for the purposes of SEPP55) subject to the mitigation measures described in this document being implemented. This will need to include the development and implementation of a Site Closure Plan in accordance with NSW EPA guidelines, which outlines requirements for capping, landfill gas management and long-term environmental monitoring.

Recovered materials produced by the New Resource Recovery Facility will form part of the proposed growing media in the Embellished Marang Parklands and be placed above the low permeability clay capping layer for the Proposal Site. This recovered material will have varying thicknesses depending on the final landform elevations, but is expected to be at least:

- 150 mm to 1000 mm below the final surface level (FSL) in open parkland areas.
- 300 mm to 500 mm below the FSL on the Playing Fields.

GHD has compared results provided against the adopted human health and ecological assessment criteria and this indicates that the recovered material used for reprofiling the Embellished Marang Parklands is considered unlikely to pose ecological and/or human health risks during future works and during future use of the Embellished Marang Parklands as recreational open space.

8.1.3 Mitigation Measures

This section provides measures to be adopted to reduce risks and impacts related to identified contamination on the Proposal Site. Contamination risks should be reduced by:

- Implementing mitigation measures described in the following sections.
- Implementing other mitigation measures described in relevant technical reports prepared for the Proposal Site, such as the Groundwater Impact Assessment (see **Appendix I**).
- Designing and undertaking the Proposal to reduce risks related to soil, groundwater, surface water, leachate and ground gas contamination.
- Managing contamination risks in line with relevant legislation (Section 2 of the Contamination Status report).
- Undertaking construction activities in line with the Landcom Managing Urban Stormwater: Soils and Construction guidelines.
- Preparing, and implementing a Closure Plan in accordance with NSW EPA guidelines.

Mitigation measures should be developed for the contamination, design, construction and operation of the Proposal. Potential measures are discussed in **Table 21** below.

Table 21 Mitigation measures for potential contamination

Issue	Mitigation measure
Addressing identified data gaps	Additional environmental investigations could be carried out for the data gaps in Section 10.7 of the Contamination Status report and in accordance with NEPM and other regulations.
Ground gas management and monitoring	Procedures to manage hazardous ground gases need to be included in a Site Closure Plan, which outlines site closure requirements to meet NSW EPA guidelines. Construction of any future structures (e.g. BBQ facilities) on will be required to be completed in accordance with the Site Closure Plan.
Managing potential risks posed during construction	A CEMP should be developed for construction works to outline how the Proposal will avoid, reduce or mitigate effects on the environment. The CEMP should consider a number of subjects applicable to the redevelopment such as – but not limited to – groundwater, surface water, soil and air quality, dust generation, noise and vibration, waste and drainage. The CEMP should include an unexpected contamination finds protocol to be implemented during construction. If signs of contamination are encountered during construction, such as odours, staining and ACM, work in the area should be stopped and contamination managed in accordance with an unexpected contamination finds procedure.
Acid sulphate soil	While most of the Proposal Site has already been disturbed and mined, some ASS may be present in undisturbed areas and on site boundaries. Disturbance of these areas is not understood to be included in the Proposal, due to heritage constraints. Should disturbance of natural ground be required in future, an acid sulfate soil management plan (ASSMP) should be developed in line with the Acid Sulfate Soil Manual (Stone et al., 1998).
Validation of the site capping system	Capping of the landfilled waste will need to meet NSW EPA landfill closure requirements and a Site Closure Plan will also be required to detail capping aspects.
Long-term management and monitoring	Long-term, ongoing environmental management requirements will need to be identified within a Site Closure Plan; to be prepared in accordance with NSW EPA Guidelines.

8.2 Site Water Balance

A Surface Water report has been prepared by Cardno and is included at **Appendix H**. A summary of the assessment and proposed mitigation measures across the integrated Proposal Site are provided below. For a summary of the surface water report see **Section 8.3**.

Water balances of the current and post-development scenarios across the Proposal Site have been completed using the MUSIC software to compare water usages in both the current condition and the post-development condition. The results of these water balances have also been used to inform the Groundwater Assessment (**Appendix I**) and the water quality assessment in the Biodiversity Development Assessment Report (**Appendix S**). The site water balances took into consideration annual rainfall, runoff volumes, onsite water use, and water losses from the existing and proposed infiltration dams and existing leachate ponds and accounted for catchment properties.

The average annual rainfall for the site was adopted from long-term Bureau of Meteorology records for the Sydney Airport rainfall gauge at station number 66037, for the years 1962-2010 as the maximum period of available data. The site catchment area of the Embellished Marang Parklands and Lot 5 final landform in the current landform and proposed landform assessments includes the Playing Fields, in order to accurately depict all infiltration losses from Infiltration Basin 1.

The water balance of the current landform is based on the site conditions described in Section 2 of the Surface Water Management Assessment (see **Appendix H**), and the catchment plan provided in **Figure 38**. The water balance of the proposed landform is based on the catchment plan and conditions shown in **Figure 40**.

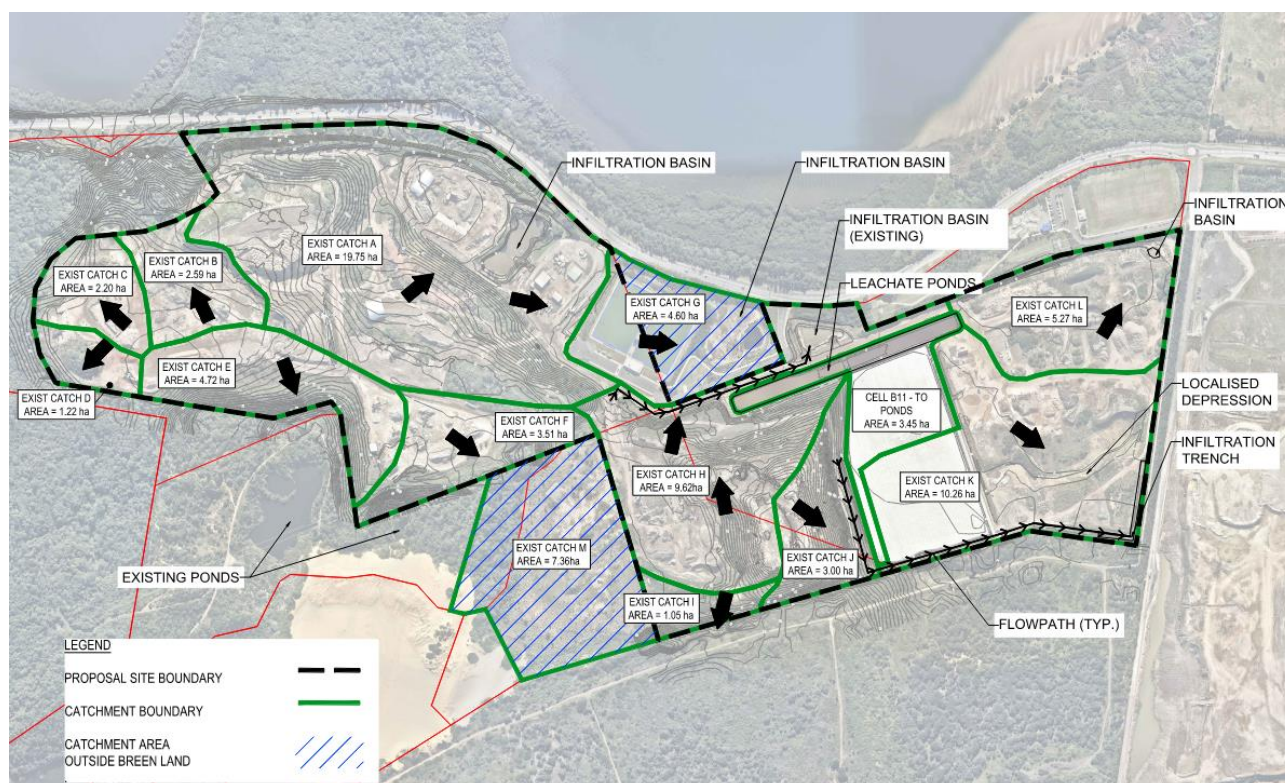


Figure 38 Current landform catchment plan

Source: Surface water management assessment, Cardno (Appendix H)

Surface water balances for the entire integrated Proposal Site, including Embellished Marang Parklands, Lot 5 Final Landform and the New Resource Recovery Facility, in the current and post-development conditions are provided in **Table 22** and **Table 23** respectively.

Table 22 Surface water balance – Embellished Marang Parklands and Lot 5 Final Landform

Water balance component	Current landform volume (ML/year)	Final landform volume (ML/year)
Total rainfall volume	625	680
Evapotranspiration loss	270	430
Infiltration loss	230	200
Runoff to external site	130	50

Source: Surface water management assessment, Cardno, 2021 (Appendix H)

Table 23 Surface water balance – New Resource Recovery Facility

Water balance component	Current landform volume (ML/year)	Final landform volume (ML/year)
Total rainfall volume	190	140
Evapotranspiration loss	75	60
Infiltration loss	95	80
Runoff to external site	20	0

Source: Surface water management assessment, Cardno, 2021 (Appendix H)

As depicted the results show that in the current landform condition there is external runoff from the future parklands and grassed area.

They also show that there is a higher volume of runoff from the Proposal Site in the current landform condition than in the proposed landform condition. In the final landform condition, there would be minimal overflow from the Proposal Site, with a majority of the rainfall falling on the Proposal Site being contained on-site, or infiltrating into the groundwater system.

Overflows in the Embellished Marang Parklands would mainly occur from the existing Infiltration Basin 1. The water quality of any infiltrated flow runoff would be treated through a range of water quality treatment devices and measures in order to meet pollutant load reduction requirements.

It is anticipated the water demand for on-site re-use is 160kL/day or 58.4ML/year. It is proposed to adopt the current strategy of drawing water from the pond, which is being replenished by both groundwater and stormwater runoff.

The water balance result in **Table 22** shows there would be approximately 80ML/year of stormwater infiltrating into the ground water system within the New Resource Recovery Facility. Stormwater reuse has been excluded from the site water balance, which is a conservative assumption for pond sizing.

Water used for wheel washing of vehicle going over the weighbridge would also drain directly into the infiltration basins with minimal losses on internal roads and other surfaces. There may also be potential for some water reuse for toilet flushing from rainfall collected on roof catchments, however these water volumes would be negligible and have therefore been excluded from the site water balance.

Water demand

The New Resource Recovery Facility site would have a maximum of 80 staff on-site at any one time. Drinking water usage would be limited to sanitary facilities, kitchens and other typical office-based applications.

Waters to be used for industrial purposes, such as vehicle wash downs, dust suppression, and greenspace irrigation, would be sourced from stormwater harvesting schemes that collect rainfall and runoff generated on the Proposal Site.

Based on this, water consumption from the New Resource Recovery Facility has been estimated at 18.9 kL/day, which equates to 80 people, using 210 L/day each. This is considered conservative, but allows for fluctuations in staffing and future expansion of the water supply scheme.

It should be noted that there is a potential for the New Resource Recovery Facility to connect to Sydney Water's recycled water scheme. These waters could be used to top up depleted stormwater basins to retain consistent storage levels, or used to irrigate and maintain greenspaces away from built infrastructure.

Recycled water could also be hooked into the buildings for toilet flushing and other non-potable needs. This would further reduce the Proposal's demand for potable water. However, considering a peak hour demand of approximately 1L/s is predicted, the connection to the recycled water network may not be deemed feasible, and could generate more risk than benefit.

Wastewater management

The contributions to sewer are estimated to be approximately 16.2 kL/day. This is based on the 80 staff plus 10 visitors at any one time contributing 180 L/day each. The Proposal would not be contributing trade wastes to the sewer network, and generated flows would be from sanitary facilities, kitchens and other typical office-based applications.

To service the New Resource Recovery Facility, sewage would be drained to an on-site pumping station, where it would be discharged to either the sewer mains adjacent to the Proposal Site, or directly to the wastewater treatment plant. The nature of the local topography (flat landscape), combined with adjacent pressure mains, means the Proposal Site cannot be connected to the Sydney Water network via a gravity connection.

Due to the proximity of the existing sewer infrastructure, and the minor nature of the sewage generated at this facility, on-site treatment is not considered beneficial, economical or feasible.

Based on the understanding of the existing water supply and sewer network in the vicinity of the Proposal Site, combined with the estimated water demands and sewer contributions, a feasibility application was issued to Sydney Water for the provision of future connection to the Proposal Site. The application was issued on 2 September 2020, with case number 186295 allocated to the application.

A feasibility application informs Sydney Water of the developer's intent, and directs Sydney Water to assess the impact of the development on its existing reticulation networks. This is undertaken using Sydney Water's hydraulic modelling software, which will determine if a simple connection is viable, or if amplification to the network is needed to accommodate the development's needs. No advice or response had been received from Sydney Water at the time of reporting.

8.3 Surface Water

A Surface Water Management Assessment has been prepared by Cardno (NSW/ACT) Pty Ltd and is included at **Appendix H**. A summary of the assessment and proposed mitigation measures are provided below.

8.3.1 Existing Environment

The Proposal Site is currently being used as a landfill for non-putrescible C&D materials including concrete, masonry, sand, gravel and soils. Lot 1123 has been partially developed to transform the Proposal Site for recreational usage, with hockey fields, a carpark and an infiltration basin being constructed in 2016. The Proposal Site contains numerous stockpiles and a network of unsealed access roads that are established for the movement and circulation of vehicles around the existing Breen Resources Facility.

The Proposal Site is mostly pervious however an interim clay cap has been applied to the Former Landfill Area cells within Lots 1122 and 1123 and there are other limited impervious surfaces on the Proposal Site (e.g. site sheds), which have been established as temporary measures for the operation of the Existing Breen Resources Facility. As a result, and due to the pervious nature of the Proposal Site, any rainfall on the Proposal Site would not currently generate surface water runoff across the site boundary. Rather, it would pond on this part of the Proposal Site and either evaporate or infiltrate through the underlying material, which is typically sandy.

The Proposal Site generally consists of two primary catchments divided by a ridge running from the north-west to the south-east of the Proposal Site, with levels ranging from approximately RL 36m to RL 4m. Site runoff discharges north towards the existing Playing Fields and Captain Cook Drive or south into Cronulla State Park and some existing ponds built in the 1970s and 1980s. The catchment delineations and existing features of the current landform on the Proposal Site are presented in **Figure 38**.

The existing ground levels within this part of the Proposal Site are generally no higher than RL 4 mAHD. There are currently three distinct low points within the Proposal Site:

- A local depression/infiltration basin in the north-eastern part of the Proposal Site, generally around RL 2 mAHD.
- A localised depression running between the western and eastern site boundaries approximately 100 metres north of the southern boundary, at around RL 2 mAHD.
- An infiltration trench located adjacent to the south-eastern corner of the Proposal Site, as low as RL 2 mAHD.
- A pond at the north-east corner of the Proposal Site.
- A pond at the north boundary of the Proposal Site, adjacent to the hockey field entrance.

Surface water quality

Historical sampling

Historical groundwater sampling results for on-site surface water bodies was carried out between 1998 and 2007 by URS. Surface water sampling locations included the concrete recycling pond, the Western Wheel wash pond, the wheel wash pond, and the pond in Lot 5. URS reported that the composition of the surface waters indicated the source of the water was a mixture of rainwater and groundwater. The location of these surface water sample locations are presented on **Figure 39**. These surface water sampling locations no longer exist. Surface water samples exceeded the human health Australian Drinking Water Guidelines for pH (field) results, TDS, hardness, sodium, chloride, sulfate, ammonia and arsenic concentrations.



Figure 39 Surface water sampling locations

Source: Groundwater Assessment, GHD (Appendix I)

Exceedances of the adopted ecological assessment criteria for freshwater and marine water (ANZG, 2018) were detected at all sampling locations for metals (arsenic, chromium, copper and lead) during most of the sampling rounds. Ammonia concentrations exceeded the adopted ecological assessment criteria (ANZG, 2018 and ANZECC, 2000) in most samples. Electrical conductivity and pH consistently exceeded the ANZECC (2000) criteria in most samples.

Concentrations of metals and ammonia in surface water are generally lower than in groundwater and leachate indicating that surface water infiltration points across the Proposal Site are likely to improve groundwater quality migrating off-site.

Current field investigations

GHD undertook surface water sampling in June and August/September 2020 (see **Appendix G**). In June 2020, five samples were collected from surface water bodies on the Proposal Site. Their respective locations are shown on **Figure 39**.

In August/September bore water sampling and surface water sampling was conducted off-site. One bore water and surface water sample was collected in Weeney Bay, four pore water and one surface water sample was collected in Quibray Bay and one surface water sample was collected from the freshwater pond within the dune system to the west of the Proposal Site. The sample locations are shown on **Figure 39**.

The methodology and a detailed assessment of the results against the adopted screening criteria are reported in the Contamination Status Report (**Appendix G**). A detailed review of the historical and current analytical results in all media is discussed in Section 9 of the Contamination Status Report (**Appendix G**) with the tabulated results for the current surface water sampling provided in Appendix F of that report.

The conclusions were that based on the available data, there is no conclusive evidence that groundwater impacts from the Proposal Site are linked to elevated pore water concentrations in down-gradient Quibray Bay. One pore water sample was collected in Weeney Bay. There is no evidence that impacted groundwater from the Proposal Site is posing an unacceptable risk to Weeney Bay.

It is noted that in general the Quibray Bay surface water sample results were more impacted than Weeney Bay. While there is insufficient data to be conclusive, Weeney Bay is more sheltered from the rest of Botany Bay, and in particular from potential historical impacts arising from heavy industries to the east of the Proposal Site along the Kurnell Peninsula.

Similar to the ecological exceedances, ANZECC (2000) marine aquaculture guidelines were exceeded for a number of metals and nutrients at SW7 and/or SW8. Insufficient data is available to confirm whether the concentrations measured in this assessment are indicative of long term averages, or whether there are seasonal fluctuations. While the measured data indicate potential adverse effects to aquaculture in Towra Point Nature Reserve, such as Oyster Leases, evaluation of the data suggests that some, if not all, impacts may be associated with sources other than the Proposal Site.

Water and waste water infrastructure

The area of the proposed New Resource Recovery Facility is serviced by Sydney Water for the provision of potable water, recycled water and sewer services. Sydney Water currently has large assets in the vicinity of the Proposal Site. These include:

- Drinking Water Main – 300 mm drinking water main installed in the southern verge of Captain Cook Drive;
- Sewer mains – several pressure mains installed within Captain Cook Drive; and
- Recycled Water main – 300 mm recycled water main installed in the northern verge of Captain Cook Drive.

In addition to the sewer mains that front onto Captain Cook Drive, the New Resource Recovery Facility would be located approximately two kilometres from Sydney Water's Cronulla wastewater treatment plant. If pressures/capacity are limited in the existing main, direct connection to the treatment plant could be facilitated.

Environmentally-sensitive areas

A number of nearby environmentally-sensitive areas with potential to be affected by the development include:

- Quibray Bay and Botany Bay;
- Cronulla State Park on the southern boundary of the Proposal Site and existing ponds within this area; and
- Cronulla Beach and Bate Bay.

8.3.2 Assessment of Impacts

Sources of contaminants

The potential impacts on soil and water resources resulting from the Proposal include:

- Erosion and sediment runoff into surrounding surface waters;
- Wind-blown dust from stockpiles upon surrounding land and surface waters;
- Sediment tracking onto Captain Cook Drive from trucks leaving the Proposal Site;
- Increased stormwater runoff from additional impervious areas onto surrounding land, and
- Additional nutrient and gross pollutant runoff onto surrounding land, surface water and groundwater.

Common construction and demolition waste stockpile materials that would be stored at the New Resource Recovery Facility include contaminated soils, concrete, brick and asphalt materials awaiting processing, as well as processed materials.

The stockpiled material would be stored in the designated area within the Resource Recovery Facility site. The stormwater runoff from the proposed stockpile area would be minimised by the construction of a perimeter bund.

Covered stockpile areas would reduce erosion on the stockpiles. The stormwater runoff from the stockpile area would be directed to the proposed bio-retention filter. It is expected that the bio-retention basins would be able to remove up to 80% of the heavy metals and that sand filter would be capable of removing up to 70% of the heavy metals.

The proposed stormwater treatment train would consist of grass swales, bio-retention area and infiltration basins. Filter cartridges would also be used as source control to reduce the volume of contaminants into the bio retention basin, further increasing the performance of the treatment train.

The performance of the stormwater treatment train was modelled by MUSIC, although the software is mainly used to measure pollutants such as Total Suspended Solids (TSS), Total Nitrogen (TN) and Total Phosphorus (TP), however, studies have shown some heavy metals transported to the catchment outlet by attaches to the TSS. Therefore, the performance of the treatment train in relation to the removal of TSS would provide an indication of heavy metal retention levels.

Treatment Objectives

Stormwater runoff from the Proposal Site need to be treated to satisfy the appropriate treatment objectives. Treatment objectives in *Managing urban stormwater: environmental targets* from the Department of Environment, Climate Change and Water (DECCW, 2007) were compared to treatment objectives used in the *Botany Bay and Catchment Water Quality Improvement Plan* (Sydney CMA, 2011). The DECCW treatment objectives were adopted for a more conservative approach.

A stormwater treatment train was developed that satisfies the treatment objectives prior to discharge either via surface runoff to the site boundary or prior to entering the groundwater beneath the Proposal Site.

Pre-development situation

The approved landform condition has been modelled as a combination of the following surfaces:

- Playing Fields design surfaces Stage 1B, 2 & 3 (dated 29/06/2017); and
- Final Hassall Contours (dated 07/06/2017).
- Pre-development catchments of the approved landform are shown in **Figure 40**.

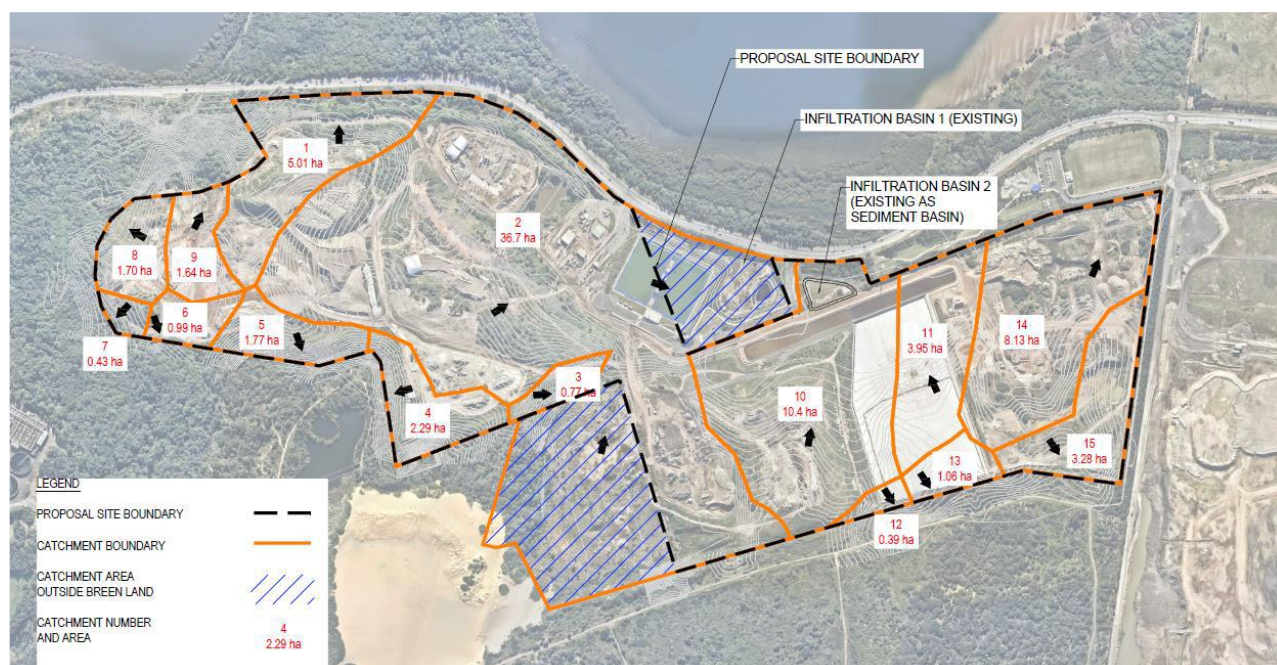


Figure 40 Approved landform catchments and Proposal Site condition

Source: Surface water management assessment, Cardno (Appendix H)

Post-Development Stormwater Management Strategy for the Proposal

Similar to the stormwater management strategy developed for the approved landform, infiltration basins are proposed to drain the stormwater runoff from the Proposal Site in the post-development condition. The proposed unsealed carparks, roads and stockpile areas will be drained by vegetated swales, which will then convey the stormwater runoff to the bio-retention basins and infiltration basins for treatment and detention. The infiltration basins will be located at the low points of the catchment, away from the proposed clay capping layer to allow water to infiltrate through the existing sandy soil.

A stormwater pit and pipe network would be designed during the detailed design stage to drain the paved area at the Playing Fields and New Resource Recovery Facility, then convey the runoff to the infiltration basins.

The proposed stormwater management strategy is shown in **Figure 41**, and the pre-development and post-development flows for water quantity measure sizing have been determined at five (5) Measurement Points, shown in **Figure 41**.

A number of catchments (6 – 9, 12 – 13) drain to external catchments and have not been included in the water quality and water quantity assessments as they are proposed to be revegetated in the post-development scenario. These catchments have been shown in a grey hatch in **Figure 41**.

For water quality, quantity and flood modelling purposes, the modelling incorporated future proposed embellishments with impervious areas within the future Embellished Marang Parkland area in order to model a more conservative outcome and to consider future proposed infrastructure.

It is highlighted that Infiltration Basins 3 and 4 within the New Resource Recovery Facility have been designed to prevent any surface water overland flow from discharging during all storm events up to and including the 1% AEP. As such, for the purposes of this assessment there is no surface water discharge arising from the New Resource Recovery Facility and no impact on surface water quality or flows. Similarly, Infiltration Basin 2, which would collect surface water flows from the Lot 5 Landfill area has been designed to prevent any surface water overland flow from discharging during all storm events up to and including the 1% AEP. As such, for the purposes of this assessment there is no surface water discharge arising from the Landfill and no impact on surface water quality or flows. Groundwater impacts associated with infiltration of surface water is assessed in **Section 8.4**.

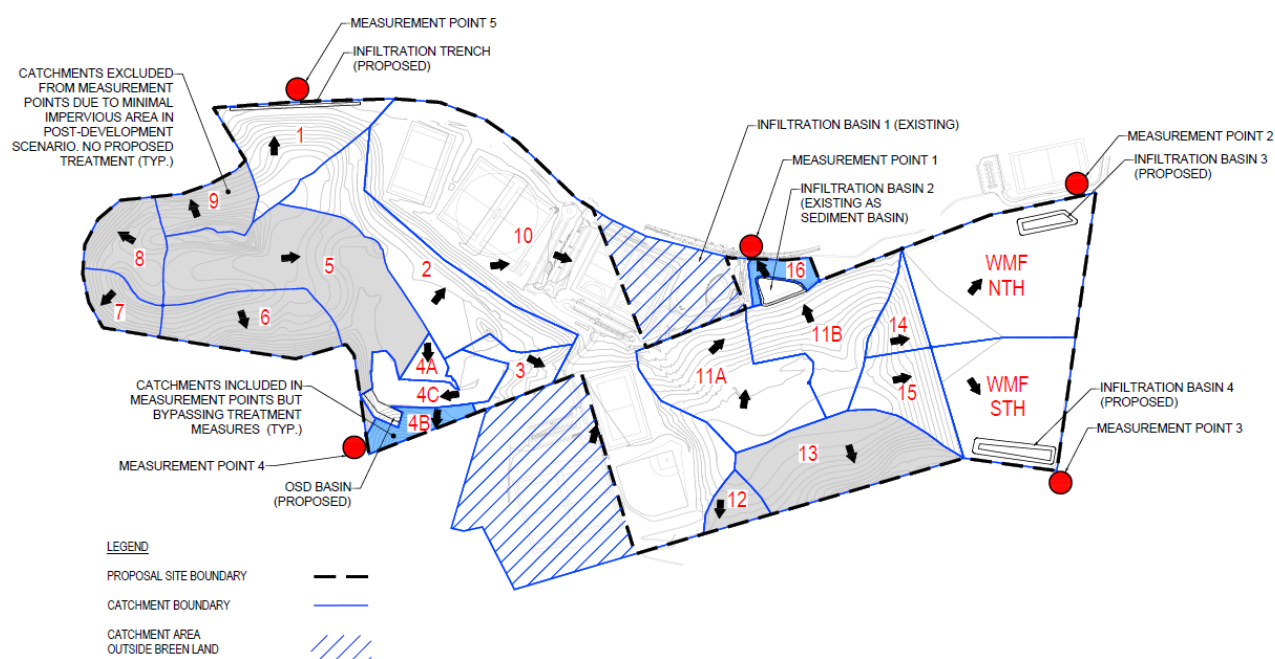


Figure 41 Post development scenario catchment plan and mitigation measures

Source: Surface water management assessment, Cardno (Appendix H)

Water quality impacts

Modelling was undertaken to characterise the water quality at discharge locations considering the proposed water quality mitigation measures. The results indicate that the modelled reduction rates exceeded the target reduction requirements for the pollutants - total suspended solids, total phosphorus, total nitrogen and gross pollutants.

The performance of the stormwater treatment train was modelled by MUSIC, although the software is mainly used to measure pollutants such as Total Suspended Solids (TSS), Total Nitrogen (TN) and Total Phosphorus (TP), however, studies have shown some heavy metals transported to the catchment outlet by being attached to the TSS. The performance of the treatment train in relation to the removal of TSS would provide an indication of heavy metal retention levels. Based on this it is expected that the bio-retention basins would be able to remove up to 80% of the heavy metals and that sand filter would be capable of removing up to 70% of the heavy metals.

It is highlighted that Infiltration Basins 2, 3 and 4 have been designed to prevent any surface water overland flow from discharging during all storm events up to and including the 1% AEP from the Landfill and the New Resource Recovery Facility. As such, for the purposes of this assessment there is no surface water discharge arising from the New Resource Recovery Facility and the Landfill and no impact on surface water quality Groundwater impacts associated with infiltration of surface water is assessed in **Section 8.4**.

Impacts on hydrology

Topography and hydrology

Impacts on the Proposal Site's hydrology would mainly involve increases in percentage impervious areas throughout the Proposal Site, in particular the proposed New Resource Recovery Facility and carparks. The proposed landform would alter the sizes and discharge points of some of the catchments.

There are no known drainage pipes currently located in either the proposed Embellished Marang Parklands or New Resource Recovery Facility. Stormwater lines located within the existing and future Playing Fields or at Captain Cook Drive would not be affected by the Proposal.

A qualitative comparison between the currently approved landform and the proposed landform is summarised below and shown in **Figure 42**.

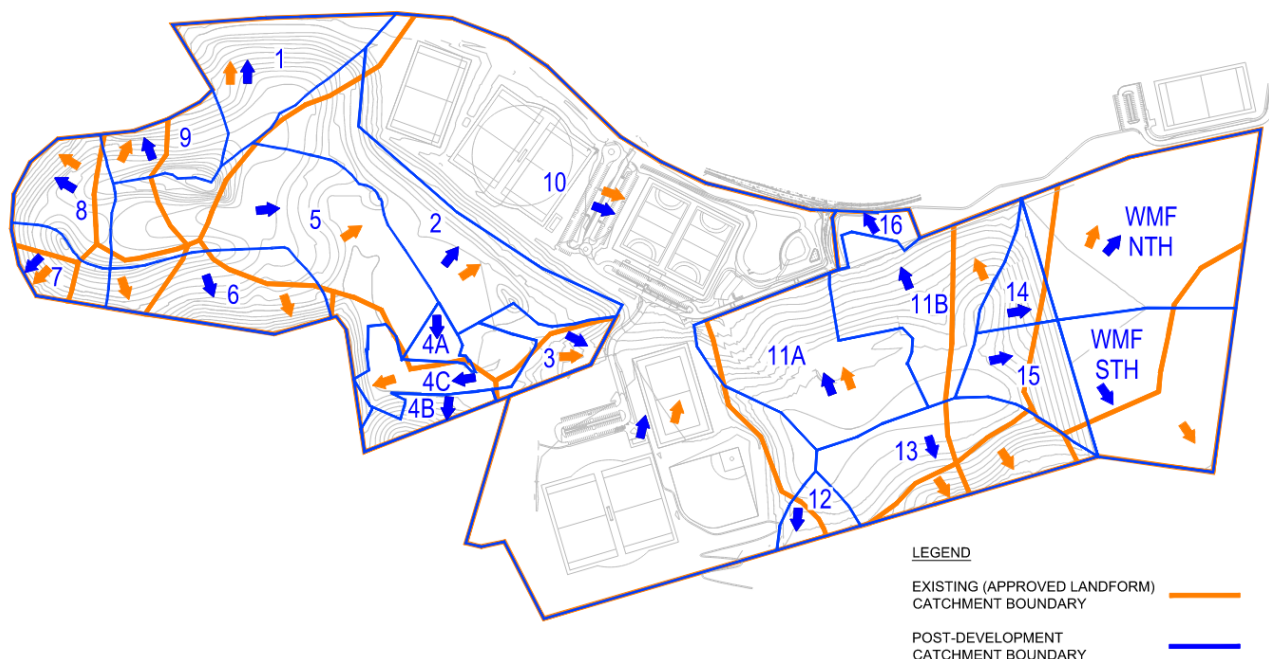


Figure 42 Comparison between the existing (approved landform) and post development catchments

Source: Surface water management assessment, Cardno (Appendix H)

Under the proposed landform, the area of the Proposal Site discharging north and east towards Captain Cook Drive and the Green Hills Sports Fields would be approximately 10.6 hectares, compared to 15 hectares under the currently approved landform. This reduction in catchment area would result in less stormwater runoff discharging towards Captain Cook Drive, which would have a positive impact on stormwater drainage within and adjacent to the road reserve.

Under the proposed landform, the area of the Proposal Site discharging south towards the Cronulla Sand Dunes would be approximately 11.5 hectares, compared to 6.6 hectares under the existing approved landform. Whilst this would result in an overall increase in stormwater runoff towards the sand dunes and the two open water bodies south of the Proposal Site, the depth and velocity of peak flows across the boundaries would be less under the proposed developed landform due to surface water runoff being spread across the boundaries, rather than concentrated over a shorter length as would be the result of the currently approved landform.

The proportion of the Proposal Site discharging west towards Charlotte Breen Memorial Reserve would remain largely unchanged as a result of the proposed landform.

Similarly, the catchments draining to the Cronulla State Park to the south (Catchment 12 and 13) have a total developed area of 4.69 hectares compared to 1.45 hectares under the currently approved landform. The design has been updated to have flows sheeting across the site boundary in the developed case, replacing the three concentrated overland flow paths to the downstream occurring in the approved landform scenario, reducing the risk of erosion in the developed scenario.

The stormwater management strategy for the Proposal has been developed to mitigate potential water quantity impacts discussed above and has been designed to meet the following stormwater design criteria as outlined in Sutherland Shire Council's Voluntary Planning Agreement (VPA) and Development Control Plan:

- Minor stormwater drainage system (pit and pipe network) – 20% AEP
- Minor stormwater drainage system (swales) – 5% AEP
- Major stormwater drainage system (overland flow paths, infiltration basins and OSD basins) – 1% AEP.

The stormwater management strategy has adopted Water Sensitive Urban Design (WSUD) principles and utilises the existing sandy soil to allow infiltration of the surface runoff to the groundwater system. Buffer areas and swales will be designed to drain the proposed open space, roads and carparks to treat the stormwater runoff and convey the stormwater to the end-of-line treatment devices and infiltration basins.

The New Resource Recovery Facility would be drained by a pit and pipe network to control flow widths and ponding depths in publicly-accessible areas and access roads. Pit and pipe networks would be modelled during the detailed design stage.

8.3.3 Mitigation Measures

A water management strategy has been proposed for the Proposal Site to address the potential impacts identified above and to address the SEARs and Agency requirements. The following sections outline the proposed mitigation measures, which include infiltration basins and an on-site stormwater detention basin to address changes in surface runoff quantity. Bioretention basins, vegetated swales and proprietary systems would be used to address water quality requirements.

Water Quantity

- Provision of an infiltration trench to collect stormwater runoff from Catchment 1 and prevent runoff from discharging onto Captain Cook Drive in events up to the 1% AEP storm event.
- Provision of a vegetated swale adjacent to the proposed Green Hills Parklands Stages 1B, 2 and 3 works, which will prevent concentrated flow from discharging across the boundary and towards the Playing Fields, car park and access road. The vegetated swale would discharge into the stormwater drainage system defined by the design for Stages 1B, 2 and 3.
- Provision of an on-site stormwater detention (OSD) basin south of the proposed car park in Catchment 4C to ensure post-development flows towards the existing ponds and sand dunes adjacent to the Proposal Site are

less than or equal to pre-development flows (assuming the pre-development/approved landform is 100% pervious).

- Provision of a level spreader and scour protection at the outlet of Catchment 5 to minimise the risk of scour and erosion adjacent to the boundary and towards the existing ponds external to the Proposal Site.
- Provision of infiltration basins and vegetated swales/buffer strips adjacent to the northern and southern boundaries of the New Resource Recovery Facility to collect and treat surface water runoff prior to discharge to groundwater.
- Provision of proprietary stormwater treatment devices to remove oils and grease, suspended solids, gross pollutants and some nutrients.

No formal stormwater management measures are proposed for Catchments 6-9 and 12-13, as there would be minimal impervious surfaces within these catchments (e.g. pedestrian paths). Catchments 4B and 16 would bypass treatment measures however the post-development peak flows at their corresponding measurement points (numbers 4 and 1 respectively) would meet the pre-development peak flows.

It is envisaged that, as a minimum, the following major and minor system drainage would be incorporated into the Proposal:

- Vegetated swales adjacent to the north-eastern boundary, with discharge points towards Stages 1B / 2 / 3 of Green Hills Parklands that interface with the stormwater management system for that site.
- Vegetated swales within the Proposal Site, in particular in the western portion of the Proposal Site where the proposed landform would result in concentrated flows. These swales would discharge to the Proposal Site boundary via a level spreader and/or outlet scour protection to ensure no scour or erosion is caused outside the Proposal Site.
- Vegetated swales along the carpark. These swales would discharge to the On-Site Detention Basin at the carpark and form part of the water quality management system, and
- Pit and pipe drainage in the vicinity of the proposed Amphitheatre and Village Green, which would discharge to a level spreader and/or outlet scour protection within the Proposal Site.

Details of major and minor system drainage across the Proposal Site would be confirmed during detailed design.

Water Quality

Stormwater quality management measures in the Embellished Marang Parklands would include the following (to be confirmed during detailed design):

- Installation of Kurnell dune forest, coastal heath and grasslands to stabilise the landform.
- A vegetated swale within the proposed car park to capture and treat surface water runoff from the majority of the car park (excluding the eastern portion of the access road that discharge towards Stages 1B / 2 / 3 of the Embellished Marang Parklands).
- An infiltration basin to collect flows from the parklands area.

Stormwater quality management measures at the New Resource Recovery Facility would include the following (to be confirmed during detailed design):

- Infiltration basins to capture and contain flows for all storm events up to the 5% AEP peak flow.
- Bioretention basins co-located with the infiltration basins to treat surface water runoff.
- Vegetated swales around the perimeter of the bioretention and infiltration basins, which would collect surface water runoff and filter any suspended solids from runoff generated on unsealed access roads prior to discharge towards the bioretention and infiltration basins.
- Proprietary cartridge filters (StormFilter or equivalent) to capture and contain sediments and nutrients from sealed pavements and any roof areas. These devices also have capabilities to remove heavy metals and other contaminants from the stormwater runoff. Devices to be detailed during future design stages.

- Hydrodynamic separators (Humes HumeCeptor® or equivalent) to capture and contain oil and grease runoff from the proposed car park and sealed access roads, with a treatable flow rate up to the 3 month ARI peak flow. Devices to be detailed during future design stages.
- Bunding and silt traps to be considered during detailed design to capture heavy metals generated from on-site stockpiles, to be detailed during future design stages.

Erosion and sediment controls

During construction activities across the Proposal Site, erosion and sediment control measures would be implemented in accordance with *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004).

An Erosion and Sediment Control Plan would be prepared for the Proposal prior to construction. This plan would outline strategies to prevent migration of pollutants downstream during and immediately following construction. The following measures would be implemented as a minimum:

- Stabilised site access would be constructed at all entry and exit points to the Proposal Site in order to prevent the migration of soil and sediments.
- At the upstream end of works, clean water from undisturbed or fully rehabilitated areas would be temporarily diverted around disturbed areas.
- Runoff from disturbed areas and stockpiles would be kept separate and diverted to sediment basins.
- Leachate from active cells would be kept separate from other runoff sources.
- Any temporary water collection and conveyance systems installed on the Proposal Site would be designed in a manner that minimises erosion. Steep channels would be avoided, and rip rap installed where appropriate.
- Sediment fences would be installed at the downstream end of any disturbed areas to prevent the migration of soil and sediments.
- The area of soil disturbed at any one time would be minimised where possible. Any stockpiled material would be managed to minimise dust and silt laden run off.
- Any disturbed areas would be rehabilitated as soon as practical, either temporarily or permanently.

These controls would ensure that there are no significant adverse impacts on the quality of stormwater in receiving waters during construction periods. Monitoring surface water on the Proposal Site is also proposed to assess the effectiveness of the sediment and erosion controls.

Surface water runoff from operational landfill activities would be managed through operational controls separate to the construction controls described above.

Water monitoring program

Construction phase

During construction activities water quality modelling would be essential to ensure that the proposed sediment erosion control measures are capable of treating the stormwater runoff from the Proposal Site. The monitoring program would include the following:

- Characterise the quality and quantity of wastewater (leachate and stormwater) generated at the Proposal Site.
- Detect any pollution of off-site surface water and groundwater.
- Ensure that appropriate notification, investigation and remedial procedures are followed when monitoring indicates that pollution may have occurred.
- Ensure that appropriate sampling and analysis methods are used in accordance with the EPA's Approved Methods for the Sampling and Analysis of Water Pollutants in NSW and other recognised guidelines for matters not covered by the Approved Methods.

Based on the above, the quality of the stormwater would be monitored at each catchment outlets, in the sediment basins and at the outlet of the sediment basins.

Operational phase

Stormwater sampling would be undertaken periodically to monitor the efficiency of the proposed stormwater treatment system and provide signs that the stormwater treatment train needs to be maintained or replaced.

The stormwater monitoring program would sample stormwater quality at the inlet of the bio-retention basin, inside the infiltration basin; and at the inlet and outlet of the stormwater treatment chambers (proprietary products such as filter cartridges).

The results from the water sampling would provide valuable information to develop periodic maintenance plans of the stormwater treatment train, identify areas that require improvements; and develop strategy to control surface runoff at the source.

8.4 Groundwater

A Groundwater assessment has been prepared by GHD and is included at **Appendix I**. A summary of the assessment and proposed mitigation measures are provided below.

8.4.1 Existing Environment

Site locality

The Proposal Site is located within the Greater Metropolitan Region Groundwater Sources. The Water Sharing Plan (WSP) for the Greater Metropolitan Region Groundwater Sources covers 13 groundwater sources on the east coast of NSW within and surrounding Sydney.

The Proposal Site is located within the Botany Sands Groundwater Source. The NSW Government has been managing the extraction of groundwater from this source via a Temporary Water Restrictions Order due to contamination issues. In August 2003, an embargo was put in place on the northern part of the aquifer under section 113A of the *Water Act 1912* to prevent extraction. Then in June 2007, an embargo was placed on the rest of the aquifer to prevent additional commercial extraction. The Proposal Site is outside of the management area as the management zones are located to the north of Botany Bay.

The Botany Sands aquifer is considered to be unconfined with high permeability. Groundwater is contained in the pore spaces of the unconsolidated sediments, and there is a strong hydraulic connection between surface water and groundwater. The estimated travel time between rainfall recharge and surface water features is expected to be days.

Groundwater licences

Lots 1122 and 1123 have two water access licences (WAL) for groundwater extraction including a bore and groundwater extraction from excavation. These licences are still current and are WAL numbers 24555 and 24563 respectively. WAL 24555 has an announcement volume of 1ML per share per year and share components of 20ML. WAL 24563 has an announcement volume of 1ML per share per year and share components of 40ML.

Infiltration ponds

On-site rainfall is expected to infiltrate or run-off and collect in topographic low points and either evaporate or infiltrate.

There are four infiltration ponds located across the Proposal Site to capture run-off and re-infiltrate the run-off directly into the Botany Sands aquifer. The ponds are located:

- To the northwest of the Existing Breen Resources Facility office building located off Captain Cook Drive and within Lot 1123 (Infiltration Point 1). This pond is expected to receive water from western areas of the Proposal Site that slope to the north. It was unclear during the site visit on 4 August 2020 how surface water run-off in western areas of the Proposal Site migrates to this infiltration pond.
- To the east of the hockey complex and within Lot 5, noting that this is further to the east than the pond located on the hockey complex itself (Infiltration Point 2). This pond is serviced by a drain running along the south eastern boundary of the hockey complex. During the site visit it was reported by site personnel that this pond received run-off from the landfill mound (Landfill Cell B10) and soil recycling area to the west of Landfill Cell B10.

- In the northeast corner of the Proposal Site and within Lot 5 (Infiltration Point 3). This infiltration point is serviced by a drain running along the northern site boundary from immediately west of the leachate ponds (discussed below). This drain may or may not be in direct connection with the Botany Sands Aquifer. The pond is expected to receive surface water run-off from northern areas of the Proposal Site that are located to the east of Landfill Cell B11. During a site visit on 4 August 2020 perched surface water was observed to be present in a number of locations in this area of the Proposal Site. Ponding around the infiltration pond itself was observed to be much higher than in the infiltration pond indicating that the landfill material in this location was of distinctly lower permeability than the Botany Sands that were intersected by the infiltration pond.
- In the south eastern corner of the Proposal Site and within Lot 5 (Infiltration Point 4). This infiltration pond is a drainage line that is approximately 400 m long and extends along Lindum Road before extending west, along the southern site boundary to Landfill Cell B11. This infiltration point is connected via a culvert to a large ponded area (associated with a low topography) located in the southern portion of the Proposal Site and east of Landfill Cell B11. Due to the depth of the culvert draining the pond the water levels in this area and the infiltration pond were observed to be similar during the site visit on 4 August 2020.

Existing and future points of groundwater infiltration for the Proposal Site receive run-off from the Proposal Site that could result in changes in groundwater quality entering the groundwater system. It is also noted that the Proposal Site does currently generate leachate and will continue to do so in the future at a reduced rate. The development of the Proposal Site will involve capping over the landfill that would result in a reduction in leachate generation. However, there will be ongoing potential risks to down gradient groundwater receptors. On this basis the Proposal is considered to be an aquifer interference activity.

It is highlighted that groundwater has been historically managed across the whole of the Proposal Site through a groundwater monitoring program required as part of the EPL. As the groundwater system around the Proposal Site is not related to the site boundaries, groundwater will need to continue to be managed in an integrated fashion across the entire Proposal Site.

Relevant policies

The AIP (aquifer interference policy) states that aquifer interference approval will not be granted unless the “Minister is satisfied that adequate arrangements are in force to ensure that no more than minimal harm will be done to any water source, or its dependent ecosystems, as a consequence of being interfered with” by the activities the approval relates to.

The NSW Groundwater Dependent Ecosystems Policy was designed to protect ecosystems which rely on groundwater for survival so that, wherever possible, the ecological processes and biodiversity of these dependent ecosystems are maintained or restored for the benefit of present and future generations.

The objectives of this policy are considered by assessing the Proposal Site against the requirements outlined in the WSP and the AIP. This includes criteria to be protective of groundwater dependent ecosystems.

Rainfall

Rainfall data has been obtained from the closest Bureau of Meteorology (BOM) weather station site at Sydney Airport (BOM site number 066037). Sydney Airport has a rainfall record extending back to 1898, for which the data is shown in **Figure 43**.

Most rainfall occurs in autumn with the highest average rainfall in June. The lowest rainfall occurs in spring. The average annual rainfall is 1080.1 millimetres.

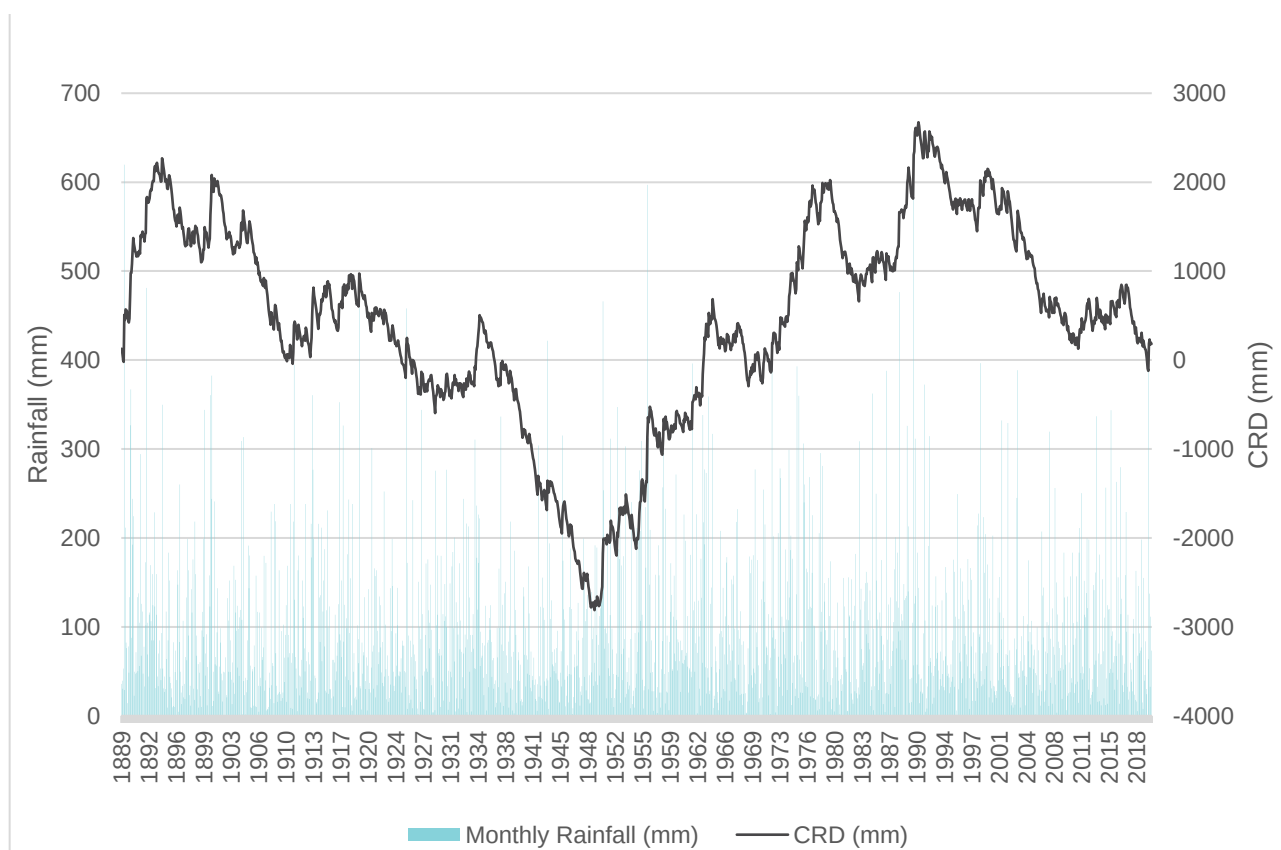


Figure 43 Rainfall and cumulative rainfall deviation for weather station Sydney Airport

Source: Groundwater assessment, GHD (Appendix I)

Leachate generation

HELP modelling has been undertaken for the Proposal Site, as described in the Leachate Modelling Report (**Appendix V**), to characterise potential leachate management requirements. The modelling assumed an existing 500mm intermediate cover, overlying general solid waste. For areas in the western part of the Former Landfill Area, a 300mm clay leachate barrier was modelled. The eastern side has a 300mm leachate drainage layer and leachate barrier. The results of the modelling are summarised below:

Average annual leachate generation rates (and therefore of overall landfill recharge rates) estimated for the eastern area was 35.5 % for the areas excluding Landfill Cell B10, Landfill Cell B11 and the area for the New Resource Recovery Facility. Landfill Cell B10 and Landfill Cell 11 have no leachate generation. The area of the New Resource Recovery Facility is documented as Pond Fill and Stockpiles and therefore it is assumed that there is no leachate generation. Based on the HELP modelling undertaken by CES, and reported in the Leachate Modelling Report (**Appendix V**) the other areas in the eastern parts of the Proposal Site are expected to generate 73,512 m³/year of leachate, assuming an approximate landfill area of 6 Ha.

Average annual leachate generation rates (and therefore of overall landfill recharge rates) estimated for the western landfill areas was 53% of annual rainfall. Based on the HELP modelling undertaken by CES, and reported in the Leachate Modelling Report (**Appendix V**) this is expected to result in approximately 458,156 m³/year of leachate, assuming an approximate landfill area of 24.9 Ha.

The sand mine voids have a clay liner placed ovetop at approximately 2 m AHD, which will reduce recharge in these areas relative to the Botany Sands. Landfill Cells B10 and B11 in the eastern area of the Proposal Site have been lined and have leachate collection systems that will collect and manage any recharge into them as outlined above.

The two long rectangle leachate collection ponds located to the north of Landfill Cells B10 and B11 have a compacted clay liner with a welded HDPE liner and would have no recharge into the groundwater systems.

Groundwater contours and levels

Figure 44 and **Figure 45** present the interpolated groundwater contours for the Proposal Site in January 2017 and for the period field works took place in July and August 2020. These dates were selected as they represent the most complete data sets where leachate levels within the landfill and groundwater levels on the site perimeter have been recorded. It is noted that the 2020 data represents surface water, groundwater and leachate levels over the July to August period and are not instantaneous. Elevation data for LW06 from January 2017 has been included in the 2020 elevations.



Figure 44 Site groundwater elevations and groundwater contours - 2017

Source: Groundwater assessment, GHD (Appendix I)



Figure 45 Site groundwater elevations and groundwater contours - 2020

Source: Groundwater assessment, GHD (Appendix I)

Key points to note from groundwater contour plots are as follows:

- Groundwater/leachate mounds are apparent in Landfill Cell B10 (approximately 5.5 m AHD) and in western landfill areas of the Proposal Site near LB02 and LW03 (approximately 4.5 m AHD). These mounds appear to be relatively consistent between 2017 and 2020. There also appears to be a low rise (approximately 1 m AHD) in groundwater levels across eastern areas of the Proposal Site (east of Landfill Cell B11).
- Groundwater appears to migrate from these mounds to Quibray Bay in the north, Weeney Bay in the north west and the dune pond systems and Cronulla Beach to the south. It appears that the Proposal Site primarily discharges to Quibray Bay, which is part of Towra Point Aquatic Reserve.
- The contours indicate that the groundwater flows toward Greenhills Beach residential development and Sydney Water to the south west could occur, but there is an elevated ridge line through here which is expected to create a groundwater mound / flow divide that will result in groundwater migration either to the north and west toward Weeney Bay and Woolooware Bay and south to the dune ponds.
- It appears that the infiltration pond water elevations are at similar levels to surrounding groundwater suggesting that they have a high degree of connection and that they are likely to be a surface expression of groundwater.

Groundwater levels in the on-site bores have been monitored by CES from 2013 to present. **Figure 46** shows all available water levels in on-site and boundary bores from 2013 to present, and rainfall from the Bureau of Meteorology weather station at Sydney Airport. In general, water levels are approximately consistent over time with no notable relationship to variations in rainfall. It is noted that the quarterly frequency of monitoring may have prevented characterisation of short-term response to rainfall events.

Groundwater elevations at the time of sand mining have not been quantified, however, due to removal of the sand dunes, excavation of voids and expected active dewatering during mining groundwater elevations around the Proposal Site are expected to have been lower than existing conditions during that time.

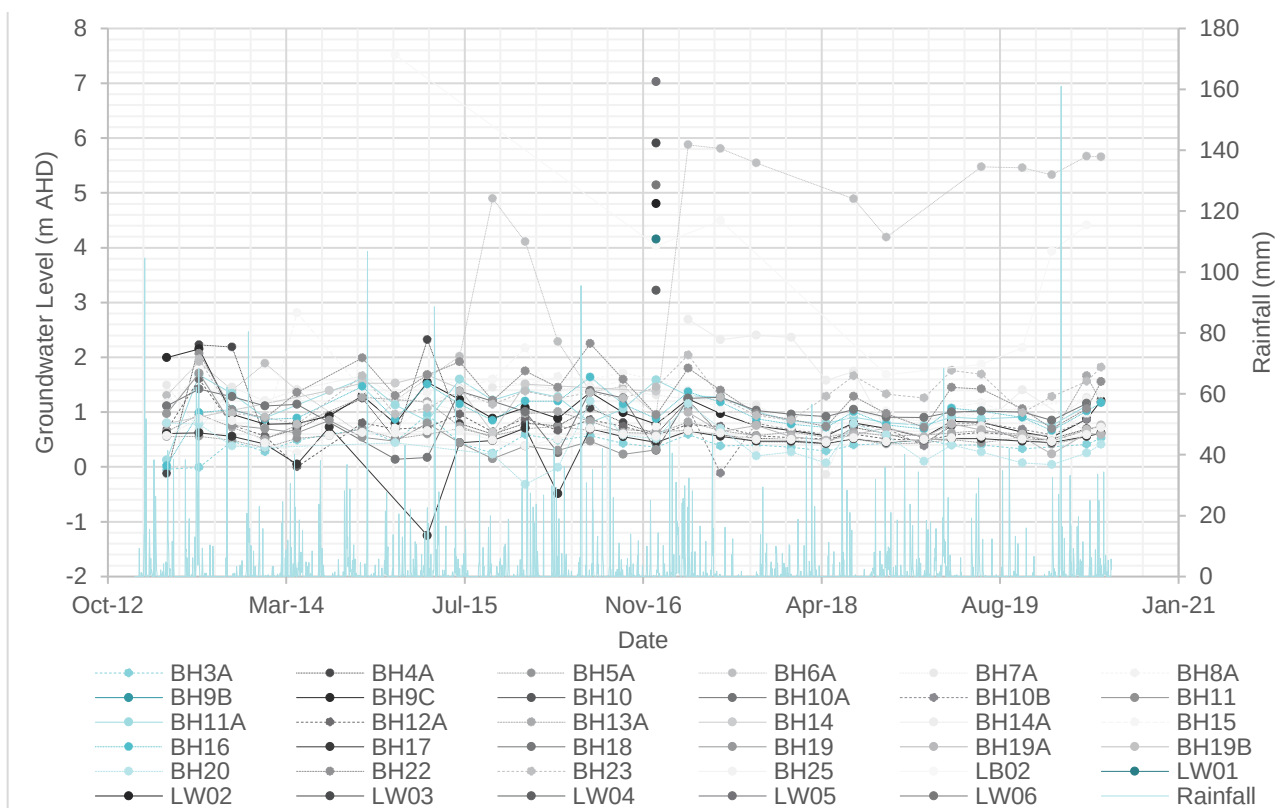


Figure 46 Site groundwater levels over time

Source: Groundwater assessment, GHD (Appendix I)

Registered groundwater users

Review of available data identified 11 registered groundwater wells used for water supply purposes within a one kilometre radius of the Proposal Site. The majority of the wells are shallow (<20 metres in depth) and expected to be screened within the Botany Sands Groundwater Source and alluvial sediments. The location of these wells is shown on **Figure 37**.

Groundwater dependent ecosystems

Potential groundwater dependent ecosystems (GDEs) were identified based on a review of the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources and the Bureau of Meteorology Groundwater Dependent Ecosystems Atlas. There are two GDEs located within the Kurnell area, namely the Towra Point Estuarine Wetlands and the Kurnell Dune Forest in the Sutherland Shire and City of Rockdale.

The Towra Point Estuarine Wetlands are protected by the EPBC Act as they are of national environmental significance. This includes a national heritage place, wetland of international importance, 6 threatened ecological communities, 69 threatened species, 76 migratory species and 101 marine species. The reserve comprises a mixture of spits, bars, mudflats, dunes and beaches. The reserve is a RAMSAR wetlands that are representative, rare or unique wetlands, or are important for conserving biological diversity.

The location of Towra Point Reserve is presented in **Figure 1** and GDE's, mapped by the Bureau of Meteorology Groundwater Dependent Ecosystems Atlas are presented in **Figure 47**. The vegetation identified within the delineated GDE areas adjacent to the Proposal Site include:

- Estuarine saltmarsh.
- Estuarine mangrove forest.
- Coastal foredune scrub.
- Coastal sand forest.

- Coastal sandstone gully forest.
- Floodplain swamp forest.

See Figure 7 of Biodiversity Development Assessment Report (at **Appendix S**) for the location of the Kurnell Dune Forest vegetation community.



Figure 47 Groundwater dependent ecosystems (BoM web atlas, 2020)

Source: Groundwater assessment, GHD (Appendix I)

Groundwater monitoring

As part of its monitoring program for the Existing Breen Resources Facility under EPL 4608, Breen is required to conduct quarterly groundwater monitoring of 21 wells and one leachate bore.

The groundwater wells are located around the boundary of the Proposal Site. The leachate bore (LB02) is located in the western area of the Proposal Site. During a site walkover an additional four leachate wells (that were installed in 2017) were located. These leachate wells are not part of the sampling for the EPL. These wells are also shown on **Figure 37**, and are labelled LW02, LW03, LW04 and LW05. The wells have been sampled for a range of COPCs and physio-chemical parameters.

The groundwater wells are monitored for:

- Metals (yearly) - Aluminium, arsenic, barium, cadmium, hexavalent chromium, total chromium, cobalt, copper, lead, magnesium, manganese, mercury, zinc.
- Major cation and anions (including alkalinity) (quarterly) – calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), chloride (Cl), fluoride (F) and sulfate (SO₄) carbonate.
- Nutrients - Ammonia (NH₃), Nitrate (NO₃); nitrite (NO₂).
- Petroleum hydrocarbon – total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs).
- Physio-chemical parameters – pH, total dissolved solids (TDS), total organic carbon (TOC).
- Pesticides – Organochlorine pesticides (OCPs) and organophosphate pesticides (OPPs).

- Phenols – total phenolics.

The leachate bore is required to be monitored quarterly for conductivity and standing water level only, and yearly for the same parameters listed above as the groundwater wells, as well as for total suspended solids (TSS).

Previous studies that included surface water and groundwater sampling at the Proposal Site were reviewed to characterise the current water quality conditions.

Groundwater quality

Aluminium, arsenic, cadmium, chromium (III + IV and Hexavalent), cobalt, copper, lead, manganese and zinc had exceedances of the ecological screening criteria. Aluminium, arsenic, lead, manganese and zinc had exceedances of the adopted human health screening criteria. The concentrations in the leachate results for arsenic and zinc were higher than that present in leachate on-site, indicating the concentrations of these metals are more likely to be associated with natural background conditions. There was no marked difference between the concentrations of other metals in leachate wells relative to the surrounding groundwater system.

BTEX and TRH concentration results were either less than the laboratory limit of reporting or had low detectable concentrations. There were no exceedances of the adopted screening criteria. PAH concentration results were all less than the laboratory limit of reporting with the exception of two naphthalene results, which were below screening criteria.

OCPs and OPPs results were all less than the laboratory limit of reporting, it is noted however, that the adopted marine ecological criteria was below the laboratory limit of reporting for endosulfan, endrin and chlorpyrifos and below the freshwater ecological criteria for 4,4, DDT, heptachlor, chlorpyrifos and diazinon. The only contaminant identified to be above the adopted recreational criteria for human health was arsenic, which is considered to be indicative of background conditions, as opposed to the historical landfill activities.

The pH (field) results for groundwater monitoring wells indicate that the pH for groundwater is mostly in the range of 6 to 8.5 with an average of 7.4. There are a number of peaks and troughs in the data set where all pH observations have risen or fallen. This may be associated with meter calibration issues at the time of sampling or climatic variations. Overall, there appears to be a broad but slight trend of decreasing pH over the period of monitoring and an increasing variability. The latest data had reported pH values in the same range as data collected prior to 2007.

It is also noted that the range in leachate pH, as discussed in the following sub-section is generally between 6.5 and 8.0 suggesting that values below a pH of 6.5 (since 2012 and which has a reducing trend) may be associated with other climatic stressors as opposed to the migration of landfill leachate off-site. The pH (field) and pH (lab) results are outside of the range criteria in the Australian Drinking Water Guidelines aesthetic guidelines and the ANZECC (2000) guidelines for marine estuaries and freshwater lakes and reservoirs.

The highest concentrations of ammonia (up to 22 mg/L in BH5A) currently migrating off-site are in wells along the north western boundary of the Proposal Site (between BH12A and BH10B). The concentrations in this area are primarily above the adopted ecological criteria of 0.5 mg/L (marine water) and 0.91 mg/L (freshwater).

There is a lower relative concentration at BH4A (0.016 mg/L), which may represent beneficial effects of the surface water infiltration pond that this well is located next to. Concentrations migrating across the southern and western site boundary are also generally lower than elsewhere and below the adopted criteria (other than at the eastern end in BH23 (0.59 mg/L)).

Concentrations along the north eastern and eastern site boundary are variable but lower than in the northwest, with most wells having relatively low ammonia concentrations (e.g. BH20 has 0.005 mg/L), which are below the adopted criteria and others having some impact (e.g. BH14A has 2.2 mg/L), which is above adopted criteria.

The ammonia time series plots indicate that ammonia concentrations in groundwater appear to pulse, which may be associated with climatic variations and the observed upward trends at some wells across the Proposal Site may be part of that pattern.

BH9C has the highest reported concentration (of ammonia 29 mg/L), which was reported in October 2014, which have currently not been exceeded by other wells with current upward trends.

The TDS results for groundwater monitoring wells are mostly indicative of freshwater with an average concentration of 643 mg/L and with the majority of TDS values being under 1000 mg/L.

It appears that the TDS concentrations have had a slight increase over the monitoring period and are becoming more variable (as a higher overall range in each well). BH6A, BH19 and BH10B, located near to Landfill Cell B10 appear to have higher TDS concentrations relative to other wells since 2012.

The TDS concentrations in BH6A appear to have fallen significantly in more recent times with BH10B increasing significantly. Elsewhere across the Proposal Site TDS concentrations appear stable other than the broad trends noted above. The average concentration of TDS exceeds the Australian Drinking Water Guidelines aesthetic guidelines of 600 mg/L. Average TDS concentrations in leachate bores since 2007 approximates 2,400 mg/L (min 1,800 mg/L, max 4,200 mg/L) while average TDS concentrations in surrounding groundwater wells since 2007 approximate 700 mg/L (min 110 mg/L, max 3,900 mg/L at BH25). This suggests that on average there is significant attenuation of leachate migrating off-site in groundwater. It is noted that trends in TDS concentrations at wells BH5A, BH9C, BH10B, BH12A and BH13A broadly correspond to those for ammonia.

The historical averages for bicarbonate in groundwater wells generally range between 84 mg/L in BH16 (min of 45 mg/L) and approximately 615 mg/L in BH6A. The lowest concentrations are generally present in wells located at eastern ends of the Proposal Site (BH16, BH19A, BH20, BH22 and BH23) where groundwater elevations are lower (increasing the potential for PASS exposure) and where there is less influence from the very high bicarbonate concentrations in landfill leachate that influences groundwater migrating off-site. These bicarbonate results provide a conservative approximation of the alkalinity of groundwater, which is an indicator of the capacity of groundwater to neutralise acid.

Comparison of the results (and the associated average pH values) against alkalinity and pH criteria in Table 4.5 of the national acid sulfate soil guidelines for dewatering of shallow groundwater (Water Quality Australia, June 2018) indicates that the concentrations of alkalinity in groundwater have a high to very high buffering capacity. A high to very high buffering capacity is listed in Table 4.5 as being adequate to maintain acceptable pH levels in the future.

It is also noted that in the wells at the eastern end of the Proposal Site, where concentrations are lowest, bicarbonate concentrations appear to be stable with no ongoing downward trend. This indicates that there is unlikely to be an emerging impact associated with acidification, which is where PASS may have previously been deposited in sand mine voids.

Leachate was initially characterised across the Proposal Site in one Leachate bore LB01 between 2003 and 2007. An additional leachate sampling location (LD002) was installed in 2015 and decommissioned in 2017. Leachate water quality was also characterised across the Proposal Site by CES in six leachate wells on two occasions in December 2016 and January 2017 (see the Leachate Management Strategy at **Appendix X**).

Leachate quality sampling was subsequently stopped until the sampling of LB02 was commenced in July 2019. The pH of the leachate is between 6.5 and 8. Ammonia concentrations from 2016 to present ranged from 130 mg/L in LW01 to 830 mg/L in LW06. It is noted that LW06 is located in Landfill Cell B10 which is associated with a leachate collection and management system. Ammonia concentrations exceed the human health Australian Drinking Water Guidelines aesthetic value.

8.4.2 Site conceptual model

Based on a review the existing environmental data the following conceptual model for the Proposal Site has been developed. The conceptual site model forms the basis of the assessment of groundwater impacts. **Figure 48** presents the location of conceptual cross-sections highlighting the groundwater flow conditions at various locations across the Proposal Site. The conceptual cross-sections are presented in **Figure 49** to **Figure 52** and are summarised below.



Ethos Urban | 2200216



Ethos Urban | 2200216

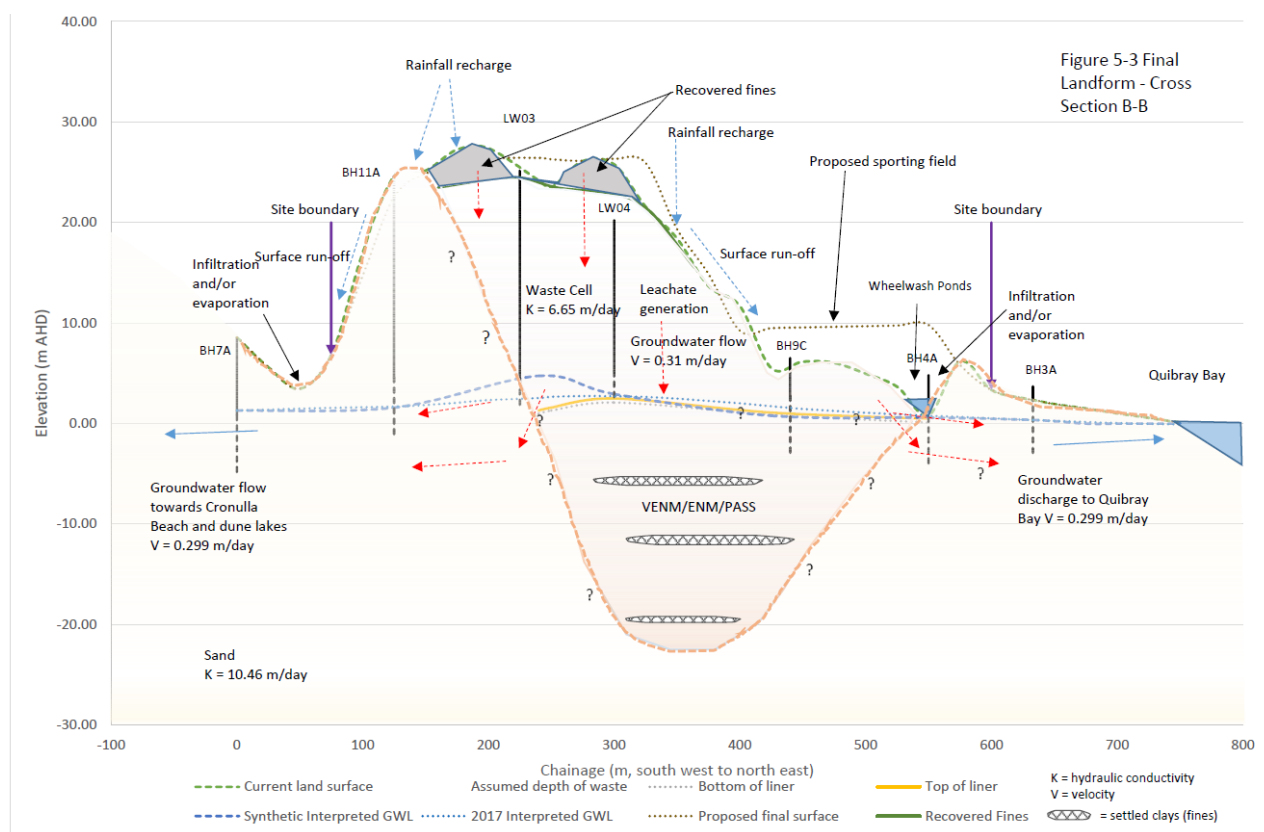


Figure 50 Final landform cross section B-B

Source: Groundwater assessment, GHD (Appendix I)

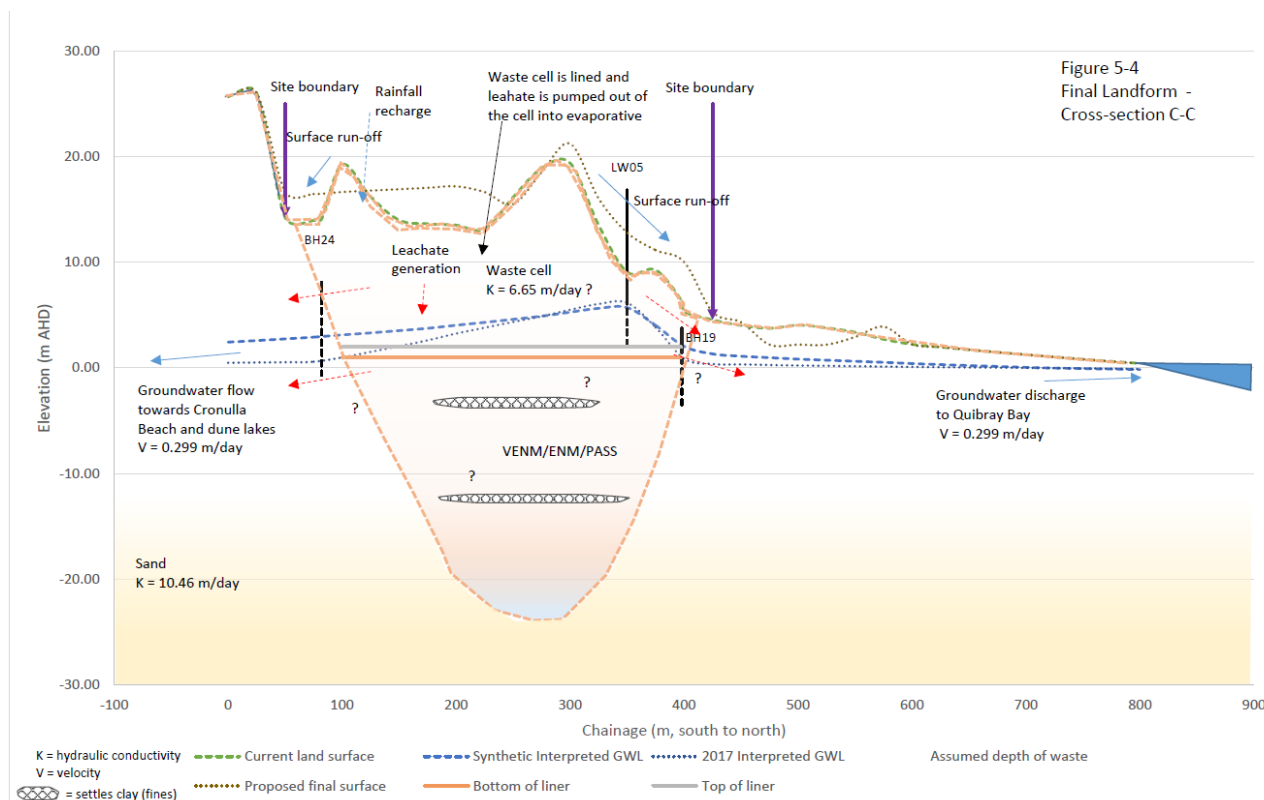


Figure 51 Final landform cross section C-C

Source: Groundwater assessment, GHD (Appendix I)

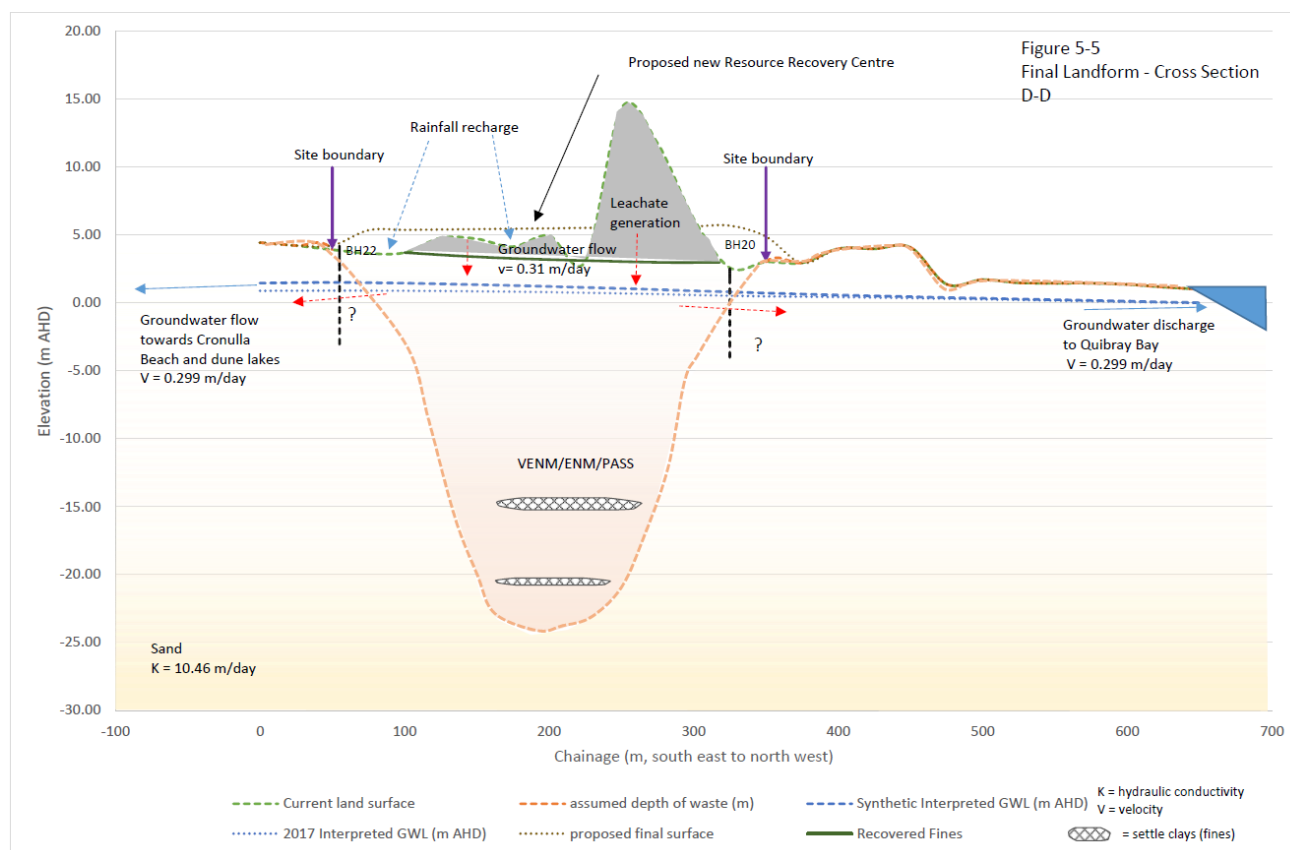


Figure 52 Final landform cross section D-D

Source: Groundwater assessment, GHD (Appendix I)

Leachate is being generated by the landfilled material that has been placed above the clay liner at approximately 2 m AHD and extends up to approximately 35 m AHD. Fines that meet the requirements of a resource recovery order have been placed on top of landfill materials to approximately 46 m AHD.

The leachate has been characterised within Landfill Cell B10 and within the landfill material in western areas of the site above approximately 2 m AHD. VENM / ENM / PASS placed within the former sand mining voids and below approximately 2 m AHD has not been characterised. However, as only natural material has been placed below 2m AHD this material is not expected to be generating leachate.

Leachate influenced groundwater appears to be migrating off-site to the north (Quibray Bay, Weeney Bay) and south (Dune Ponds and Cronulla Beach).

Noting that groundwater is not used for potable purposes and that due to the small discharge of groundwater relative to tidal flushing that Oyster leases are not considered to be viable receptors, the contaminants of potential concern (COPC) in the groundwater migrating off-site include:

- Human health COPC:
 - Benzene, which is in leachate and not present at concentrations exceeding criteria in groundwater migrating offsite.
 - Arsenic, noting that this is expected to be representative of background water quality conditions and that exceedances of recreational criteria are primarily historic with only one exceedance of recreational criteria since 2008.
- Ecological COPC
 - pH.
 - Ammonia.

- Nitrogen (intermittent).
- Phosphorus (intermittent).
- Metals (chromium, copper, lead, nickel exceedances are common while aluminium, cadmium, copper, lead and manganese are uncommon). While there are exceedances of arsenic and zinc, concentrations are generally higher in groundwater than leachate indicating that concentrations of these metals represent natural background conditions.
- Benzene (intermittent and isolated only).
- Ethylbenzene (intermittent and isolated only).

While there are no criteria for TRH it is noted that there are elevated concentrations in the F2 to F3 range present in leachate that are intermittently present, at low detection levels, in perimeter monitoring wells.

Due to the nature of groundwater conditions relative to surface water, dissolved oxygen and suspended solids in groundwater are generally not representative of conditions at downgradient receptors. Data suggests that the Electrical conductivity in the dune ponds is not being impacted.

Leachate from Landfill Cell B10 is being collected and managed. The cell has a clay liner at about 1 to 2 m AHD and accumulated leachate is abstracted and directed to evaporation ponds, with subsequent re-irrigation over the landfill surface when conditions are suitable. There are no other containment and collection systems in place elsewhere across the Proposal Site, other than at the new Landfill Cell B11.

Groundwater and leachate levels are at depth (> 10 m bgl) in central and western areas of the Proposal Site and sit at elevations of approximately 4 to 6 m AHD beneath Landfill Cell B10 and the Former Landfill Areas located in the western part of the Proposal Site. In eastern areas, groundwater is close to ground surface and has minimal mounding with groundwater sitting at elevations of approximately 1 to 1.5 m AHD.

Groundwater migration from Landfill Cell B10 will be impeded by the leachate collection system, whereas elsewhere it is unimpeded.

While there is a trend of decreasing pH, this does not appear to be associated with off-site migration of leachate influenced groundwater as, on average, leachate pH is higher than the surrounding groundwater system.

Trends in ammonia over time suggest that in some locations ammonia concentrations may still be increasing in groundwater migrating off-site. This is most evident in wells located on the northern boundary at the western end of the Proposal Site. This may be due to changes in site activities in these areas or climatic variations. They are currently within the range of the historical concentrations observed and may be part of a historical pattern of pulsing concentrations evident in the historical data.

Bicarbonate in leachate and surrounding groundwater indicates groundwater has a high to very capacity to neutralise acidification associated with exposure of PASS.

Surface water infiltration ponds generally have better water quality than the surrounding groundwater system and are expected to improve the quality of groundwater migrating off-site.

There are no contaminated sites in hydraulic connection with groundwater migrating offsite.

Groundwater migrating offsite is expected to migrate at velocities of 0.3 m/day, which suggests that:

- Travel times for groundwater currently present at the Proposal Site centre would approximate 2.7 to 5.9 years.
- Travel times for groundwater from the Proposal Site boundary to the dune ponds and Towra Point reserve (Quibray Bay and Weeney Bay) would be less than 1.5 years.

This suggests that the status of the surrounding environment are broadly representative of historical landfilling activities at the Proposal Site.

Groundwater discharge from the Proposal Site is expected to approximate 1,464 m³/day, which is broadly consistent with rainfall recharge estimates from MUSIC modelling completed by Cardno and HELP modelling completed by CES for the Proposal Site.

The primary groundwater receptor includes Towra Point Reserve which is a RAMSAR wetland and is listed as a high priority GDE in the water sharing plan for greater metropolitan groundwater source as well as a high probability terrestrial GDE on the BoM web atlas.

The reserve is a marine environment. Quibray Bay, located within Towra Point reserve appears to be the primary discharge point for groundwater migrating offsite, where mature stands of mangroves and active oyster farm leases are present. The oyster farm leases are in open water and the water quality in Quibray Bay is expected to be dominated by tidal flow rather than groundwater. Recreational fishing and collecting shell fish are prohibited in this area and there is no access for recreational swimming.

Further, contaminant concentrations in groundwater associated with the Proposal Site only exceed the recreational criteria for arsenic, which are associated with historical concentrations that are not representative of the current site conditions and which are expected to be representative of background concentrations. Surface water and pore water sampling in these receptors has identified concentrations above adopted aquaculture and ecological criteria. However, if there are impacts within these receptors potentially sourced from the Proposal Site they are not clearly discernible from background influences associated with the urban and industrial setting around Botany Bay.

To the south of the Proposal Site a number of dune ponds are present, which are expected to be freshwater sources and directly connected to groundwater. It appears there is direct public access to the ponds, and they may be used for swimming. Water quality sampling in the pond closest to the site has water quality that is below adopted recreational and freshwater criteria, suggesting that the landfill (at the time of sampling) has limited influence on the pond water quality.

Alternatively, groundwater migration to the south will be to Cronulla Beach. This flow path may be limited to some degree by groundwater mounding beneath the foredune during wetter periods. Vegetation on the foredune of Cronulla Beach is elevated and unlikely to be groundwater dependent, unless around pond areas (which appear to be unimpacted as noted above).

There are water supply bores potentially down-gradient of the Proposal Site that may still be in existence, regardless, if they are present the current water quality in groundwater migrating off-site at the potential locations of these wells is suitable for recreational and industrial use. Domestic water supply wells potentially located on neighbouring industrial sites are not expected to be used for uses more sensitive than recreational uses and are therefore also not likely to be adversely impacted by current site activities.

There is potential for impacts to onsite receptors from groundwater used (from interconnected ponds and groundwater wells) for recreational purposes (irrigation), site activities (such as dust suppression) or intersected by construction or site maintenance works, which will require management.

Potential acid sulphate soils (PASS) are located around the Proposal Site, particularly to the north on the shores of Quibray Bay and Weeney Bay. There are also zones to the south of the eastern site boundary and at the dune lakes. There may also be PASS on site within sand mining voids below elevations of approximately 2 m AHD, although these are expected to be primarily located in eastern areas of the Proposal Site and of small volumes.

It is also noted that groundwater surrounding the Proposal Site appears to have a high capacity to buffer against acidification. Regardless, any potential drawdown, whether active or passive, could result in the generation of acid groundwater with subsequent increasing concentrations of metals.

8.4.3 Assessment of Impacts

There will be a large overall reduction in the generation of leachate associated with the Proposal relative to existing conditions, which is expected to result in groundwater of improved quality and lower volume migrating off-site. This effect will be most evident in western areas of the Proposal Site and represents a positive impact of the Proposal.

The water quality produced by the growing medium used to create the Marang Parkland (Comprising VENM/ENM and material that meets a resource recovery order) is expected to be markedly better than existing leachate quality and any discharge will be offset by the large reduction in leachate being created by the Proposal Site.

Further to the above, the improved water quality from reduced leachate will be augmented by cleaner surface water run-off that is less affected by site activities. Pond infiltration volumes (and therefore cleaner water inputs) are also expected to increase near the new Resource Recovery Facility.

A monitoring program is proposed to monitor and respond to the emergence of any unforeseen impacts.

Groundwater abstraction for site use from a water supply well and or infiltration ponds is simulated to lower the groundwater table below minimum historical levels and expose PASS. A groundwater management plan (or acid sulfate soils management plan) will be developed for the Proposal Site that will consider options for preventing exposure PASS by groundwater abstraction.

A monitoring program has been proposed to provide input to this assessment and monitor for emerging impacts associated with potential impact. This includes further characterisation of baseline minimum groundwater elevations and monitoring of abstraction point water quality.

A reduction in groundwater elevations associated with reduced rainfall infiltration into landfills across the entire Proposal Site will occur. This has potential to decrease minimum groundwater elevations below historical minimums, albeit at small amounts, with exposure of PASS. The potential for impacts is considered to be further reduced by the high acid neutralising capacity of groundwater within and around the Proposal Site. Impacts could occur at downgradient GDE's in Quibray Bay, Weeney Bay and the dune ponds and at recreational users and aquatic ecosystems in the dune ponds, although the probability of occurrence is expected to be low.

An acid sulfate soils management plan is proposed to be developed in accordance with relevant Australian (Water Quality Australia, June 2018) and NSW (ASSMAC, 1998) guidance to manage this potential impact. A management and monitoring program is proposed to be developed in accordance with the Acid Sulfate Soil Manual (ASSMAC, 1998) and Australian guidance (Water Quality Australia, June 2018) to characterise and respond to the emergence of impacts associated with exposure of acid sulfate soils.

There will be an inherent potential for groundwater impacts from leaks and spills during works across the Proposal Site, and during operation of the New Resource Recovery Facility. Construction and operational management plans will be implemented for the Proposal Site and will have appropriate procedures to manage these potential impacts. This will include:

- Emergency spill response protocols for managing clean-up of spills substances with the potential to contaminate groundwater.
- Adequate and appropriate storage and handling of chemicals to reduce the potential for spills or infiltration into groundwater.
- Maintain works practices and procedures that minimise the construction and operational footprint and prevent the liberation of dirty water from active areas and that prevent mixing with clean water from non-active areas.

Due to an expected improvement in groundwater quality migrating off-site associated with the Proposal, cumulative impacts within the surrounding receiving environment are expected to improve. Any reduction in groundwater elevations at the Proposal Site boundary are not expected to extend to surrounding developments due to unchanged recharge conditions off-site.

8.4.4 Mitigation Measures

A monitoring program is proposed to monitor for and respond to the emergence of potential adverse impacts. The monitoring program builds on the existing program required under the current EPL (EPL 4608) but with additional monitoring points to:

- Characterise/verify the improvement in groundwater quality associated with a reduction in leachate being generated from historical landfilling activities.

- Characterise/verify the improvement in surface water quality infiltrating (via infiltration ponds) to groundwater associated with improved site practices and land cover.
- Identify and respond to the potential for generation of acid sulphate soils on-site and off-site.
- Characterise the emergence of potential impacts associated with the New Resource Recovery Facility located in the eastern portion of the Proposal Site.

With the proposed mitigation and monitoring measures recommended, the identified potential adverse groundwater impacts are expected to be manageable and negligible.

8.5 Leachate

A Leachate Management Strategy and Leachate Generation Assessment have been prepared by Consulting Earth Scientists and are included at **Appendix X** and **Appendix V** respectively. A summary of the assessment and proposed mitigation measures is provided below.

8.5.1 Existing Environment

Operational history and leachate management

The Kurnell Landfill commenced operation in 1990 with landfilling activities undertaken in voids left from sand extraction that was undertaken at the Proposal Site. The waste accepted at the Existing Breen Resources Facility comprised a mixture of natural excavated materials and selected demolition waste.

Circa 1990 to 2010:

A review of historical filling practices and leachate management measures was based on the Landfill Environmental Management Plan dated December 2001, early Environment Protection Licences for the Existing Breen Resources Facility and anecdotal information. Key findings are summarised below:

- The filling activities comprised two distinct operations, namely, placement of fill (Virgin Excavated Natural Material) below water table and landfill placement above the water level. The practice at the Existing Breen Resources Facility during this period was to place a clay layer above the VENM fill once filling had reached approximately 1m above the water level in the pond. Above an elevation of approximately 2m AHD landfill waste was then placed.
- The landfill waste is understood to have typically included brick, mortar, concrete, bitumen, timber, glass, ceramics, roofing tiles, plaster matting, plasterboard and other inert building waste.
- This waste was covered progressively with excavated material or approved alternate daily cover to produce a surface of low permeability to rainwater. Around the perimeter of the waste disposal area, a compacted clay bund approximately one metre thick was understood to have been constructed.
- Review of the early versions of the Environment Protection Licences for the Existing Breen Resources Facility indicates that until December 2008, the Proposal Site was categorised as a Class 2 Inert Waste Landfill.
- In 2005, EPL 4608 was varied to allow the acceptance of Potentially Acid Sulfate Soil (PASS) subject to control conditions which inter alia, required the disposal of PASS at least 1 m below the permanent water table within 24 hours of the time of its excavation at the originating site. Although the Existing Breen Resources Facility was lawfully able to accept PASS subject to the applicable licence conditions, it is understood that only a small amount of PASS was accepted at the facility.
- Wastes permitted to be received at the Existing Breen Resources Facility under EPL 4608 included VENM, Building and Demolition waste, asphalt waste, glass, plastic, rubber, plaster board, ceramics, brick, concrete, metal, paper, cardboard, waste tyres and PASS (subject to similar disposal conditions as per the previous versions of the EPL).
- In June 2010, infilling of the sand dredge ponds at the Existing Breen Resources Facility was completed with the exception of a number of small ponds that remained present for the purpose of surface water management.

2010 to present:

- On 3 December 2010, EPL 4608 was varied to allow the placement of Soil and Dredge spoil in parts of Lot 5 and Lot 6 that became to be referred as Landfill Cell B10. The EPA approved areas had a perimeter bund and basal liner of compacted clay.
- The proposed engineered leachate barrier for Landfill Cell B11 Stage A, located on Lot 5, was a Compacted Clay Liner constructed in accordance with a defined Construction Quality Assurance Plan. The Compacted Clay Liner was required inter alia to have a permeability of no greater than 10^{-9} m/s and a minimum thickness of 900mm, placed and compacted in accordance with a geotechnical specification and subject to confirmatory testing by an independent NATA accredited laboratory.
- The Leachate Collection and Conveyance System proposed for Landfill Cell B11 Stage A consisted of:
 - Needle punched, non-woven geotextile separation layers top and bottom of an aggregate drainage layer.
 - Minimum 300mm thick Aggregate Drainage layer constructed from gravel with defined properties.
 - Leachate collection pipes (minimum internal diameter 150mm) to be laid in the aggregate drainage layer at defined spacings with a minimum longitudinal gradient of 1% transverse gradient toward a leachate collection sump constructed in the western corner of Landfill Cell B11 Stage A.
- The leachate holding pond was constructed in the vicinity of the north-west boundary of Landfill Cell B11 and was constructed with base and sidewall liners that comprised:
 - A needle punched Geosynthetic Clay Liner with a permeability of 3×10^{-11} m/s, with bentonite enhanced seams constructed between overlapping adjacent panels.
 - This Geosynthetic Clay Liner layer was overlain by a 2mm thick High Density Polyethylene (HDPE) Flexible Membrane Liner that was fully welded and weld tested.
- Construction of Landfill Cell B11 Stage A and the first phase of the leachate holding pond construction was completed in July 2015 with approval to place waste in the landfill cell given by the EPA by variation of the EPL on 18 September 2015.
- The design for Stages B and C of Landfill Cell B11 on Lot 5 included the following alternative leachate barrier system (from bottom up):
 - A Geosynthetic Clay Liner;
 - A High Density Polyethylene (HDPE) geomembrane;
 - Protection geotextile overlying the HDPE;
 - Installation of a Leachate Collection and Conveyance System comprising (from the bottom up):
 - Minimum 300mm thick layer of drainage aggregate overlying a protection geotextile on the floor of the cell.
 - Perforated leachate collection pipework placed within the drainage aggregate and draining with a minimum fall of 1% to a leachate collection sump;
 - Separation geotextile overlying the drainage aggregate; and
 - Triplanar geocomposite geonet overlying the protection geotextile on the cell sidewalls, including construction of the interface with the Landfill Cell B10 clay liner.
- A Technical Specification for construction of Landfill Cell B11 Stages B and C was prepared which also included upgrade works to the leachate holding pond. These upgrade works included amendment to the geometry and configuration of the pond to facilitate maintenance, construction of a 600 mm thick compacted clay liner with a 2mm thick high density polyethylene geomembrane liner and installation of a fluid pressurisation mitigation system to mitigate water and gas pressure accumulation beneath the geomembrane.
- Construction of Landfill Cell B11 Stage B and pond upgrade works were completed by Breen in December 2019. Permission to place waste in Landfill Cell B11 Stage B was provided by the EPA by variation of the EPL on 6 May 2020.

Leachate study

A leachate study was undertaken in 2016/2017 to investigate leachate/water levels and characterise the water quality in the areas of the Proposal Site landfilled prior to 2011 (being Lots 1122 and 1123 in DP 794114 and Lot 6 in DP 1158627). A primary purpose of this study was to provide information for assessment of potential long term leachate management requirements for these lots. The results of the study are summarised in the Leachate Management Strategy (see **Appendix X**) and are summarised below.

Ground conditions

The leachate study comprised a drilling investigation of the waste and the installation of six observation wells (LW1 to LW6), permeability testing to provide an estimate of the hydraulic conductivity of the landfill waste, monitoring of leachate level fluctuations and a programme of sampling and testing of collected water samples.

Based on the results of the investigation, the following inferred geotechnical model was assessed for Lots 1122 and 1123 in DP 794114 and Lot 6 in DP 1158627, as detailed in **Table 24**. The borehole logs are provided in the Leachate Management Strategy (**Appendix X**).

Table 24 Inferred Geotechnical Model for Lots 1122, 1123 and Lot 6

Unit	Base of Unit		Thickness	Description
	mBGL	mAHD	m	
Unit 1 – Cover	0.15 – 0.5 ^A	19.7 – 31.2 ^A	0.15 – 0.5	Clayey/Gravelly SAND, fine to medium grained, pale brown to grey and CLAY, red/brown, medium plasticity with fine to medium gravel.
Unit 2 - Waste	14.8 – 27.8	1.5 – 3.6	14.8 – 27.8	Mix of wood (timber and manufactured wood), brick, concrete, brick, metal, plastic and ceramic fragments. Trace clay, sand and gravel. Black to dark brown.
Unit 3 – Leachate liner	17.8 – 27.7 ^B	2.1 – 2.3 ^B	0.4 – 0.9	CLAY/sandy CLAY, medium to high plasticity, brown, red and grey, sand is fine to medium, trace fine to medium gravel.
Unit 4 – Fill	Not penetrated ^C	Not penetrated ^C	Not penetrated ^C	SAND, fine to medium, grey/white to red/brown, with fine to coarse gravel.

^A Not encountered in LW05 and LW06

^B Not encountered in LW02. Not penetrated in LW03, LW05 and LW06

^C Only encountered in LW01, LW02 and LW04. In LW03, LW05 and LW06 liner not penetrated

Source: Leachate Management Strategy, CES (Appendix X)

Waste permeability testing

Following installation of the observation wells, falling head permeability tests were carried out in each well. A summary of the results of the permeability testing is presented in **Table 25** below. The results of the permeability testing indicate that the hydraulic conductivity of the waste is variable between 1.65×10^{-4} m/s and 9.29×10^{-6} m/s. This is within the expected ranges based on published information for the hydraulic conductivity of waste. The variability was considered to be likely due to the heterogeneity of the waste composition and compaction.

Table 25 Summary of falling head permeability test results

Hydraulic conductivity (K)		
Location	Metres/second	Metres/day
LW01	1.74×10^{-4}	15.03
LW02	9.29×10^{-6}	0.80
LW03	1.65×10^{-4}	14.26
LW04	2.29×10^{-5}	1.98
LW05	6.44×10^{-5}	5.56
LW06	2.63×10^{-5}	2.27

Source: Leachate Management Strategy, CES (Appendix X)

Leachate levels

Following development of the observation wells, water level data loggers were installed in each well and the water level monitored for the period 12 December 2016 to 11 January 2017. The monitoring results are summarised in the Leachate Management Strategy (**Appendix X**), as follows:

- The standing water levels in the observation wells installed in Lot 1122 was recorded as being approximately 4 m AHD. This was a depth of leachate of between about 0.5 m and 0.7 m above the clay liner.
- The standing water levels in the observation wells installed in Lot 1123 was between approximately 3 m and 5m AHD. This was a depth of between approximately 0.5 m and 3.5 m above the clay liner.
- The standing water levels in the observation wells installed in Lot 6 were between approximately 5 m and 7 m AHD. This was a depth of between approximately 3 m and 4.5 m above the clay liner in Lot 6.

Leachate sampling

Samples were taken from each observation well on 20 December 2016 and 11 January 2017. The results of the leachate testing are summarised in the Leachate Management Strategy (see **Appendix X**). The leachate was characterised as possessing elevated concentrations of ammonia, total suspended solids, arsenic, chromium, nickel, potassium, total recoverable hydrocarbons and bicarbonate alkalinity. Leachate field parameters are summarised in **Table 26**.

Table 26 Summary data leachate field parameter measurements

Location	Date	DO (mg/L)	EC (µS/cm)	pH	Redox (mV)	Temperature (°C)
LW01	20-Dec-16	0.60	4061	6.85	-138.1	29.9
	11-Jan-17	0.83	4270	6.76	-128	31.6
LW02	20-Dec-16	0.14	5834	6.88	-124.9	26.5
	11-Jan-17	1.63	6340	6.80	-126.0	28.8
LW03	20-Dec-16	1.22	4518	6.74	-272.4	24.5
	11-Jan-17	0.28	4590	6.76	-291	28.1
LW04	20-Dec-16	0.33	4703	6.85	-154	22.2
	11-Jan-17	0.13	4890	6.84	-216	26.0
LW05	20-Dec-16	1.12	5541	6.92	-228.6	26.3
	11-Jan-17	0.08	5320	6.94	-332	30.4
LW06	20-Dec-16	1.26	11200	7.06	-288.9	32.2
	11-Jan-17	0.05	9710	7.13	-324	37.8

Source: Leachate Management Strategy, CES (Appendix X)

8.5.2 Mitigation Measures

The existing leachate management measures implemented currently across the whole Proposal Site would be continued as part of the Proposal. Leachate mitigation and minimisation measures include:

- Utilise the engineered barrier system in Landfill Cell B11 to trap and contain leachate within the Lot 5 landfill area.
- Control, collect and manage leachate through the use of the Leachate Collection and Conveyance System installed over the floor of existing landfill cells located on Lot 5 and Lot 6. The leachate drainage layer comprises an aggregate drainage layer with collection pipes laid on the floor of the landfill cell that drains to leachate collection sumps.
- Leachate from Lot 5 is conveyed by pumping to the leachate holding pond. The leachate holding pond is specifically designed and constructed for the purpose of holding and evaporating leachate.

- The interface between Landfill Cell B10 and B11 has been constructed in such a manner that the leachate barrier of Landfill Cell B10 is connected to and drains to that of Landfill Cell B11 Stages A and B. The intention of which is to provide continuity with the leachate barrier in Landfill Cell B11. The collection system constructed in Landfill Cell B11 allows leachate generated in Landfill Cell B10 to drain into the leachate management infrastructure constructed in Landfill Cell B11 and then conveyed for disposal by evaporation from the leachate holding pond.
- Minimisation of leachate generation by:
 - Application of daily and intermediate cover over deposited waste to minimise rainfall infiltration.
 - Diversion of stormwater so it does not come into contact with leachate or waste.
 - Diversion of runoff from surrounding land away from the landfill.
 - Minimise the size of the active tipping face.
- Leachate disposal by:
 - Evaporation from the leachate holding pond.
 - Controlled irrigation onto the active area tipping of Cell for dust suppression purposes. Active tipping area of the cell.
 - Re-injection into the waste mass of Cell, particularly following periods of high levels of leachate generation.
 - Discharge to sewer subject to approval by relevant authorities.
 - Tanker transfer off-site for disposal at a suitably licensed facility.
- Leachate monitoring by:
 - Daily measurement of leachate level within the leachate pond.
 - Daily recording of the volume of leachate transferred from each cell to the holding pond.
 - Daily recording of the volume of leachate removed from the storage pond by pumping and its method of disposal.
 - Daily inspections of the leachate sump and daily measurements of the leachate level in the sump following placement of waste in the cell.
 - Quarterly monitoring of leachate quality in the leachate holding pond should be undertaken.
 - Alternatively, the daily recording frequency may be reduced upon installation of an automated leachate level detection system.
- Reduce the amount of leachate generated by the progressive construction of the final capping for the site in accordance with the Updated Progressive Capping Plan (**Appendix U**). It is anticipated that construction of the final capping will result in a reduction in the generation of leachate by approximately 64% compared to the operational condition of the landfill areas.

8.6 Flooding

A Surface Water report containing a flooding assessment has been prepared by Cardno and is included at **Appendix H**. A summary of the assessment and proposed mitigation measures are provided below.

8.6.1 Existing Environment

Topography and hydrology

The existing topography and hydrology within the Proposal Site boundary including catchment areas and existing low points is described in **Section 8.3.1**. LiDAR data available through NSW LPI via ELVIS (2014, 1 m resolution, 2018, 5 m resolution) was used for topography outside the Proposal Site boundary.

Infiltration losses

The initial and continuing infiltration losses for the existing surface types are identified in Section 8.3.3 of the flooding assessment provided at **Appendix H**. The Kurnell Peninsula is characterised by sandy soils with high levels of infiltration. Model parameters for infiltration were adopted from previous studies of runoff from local catchments on the Kurnell Peninsula.

Hydraulic structures

There are two culverts crossing Captain Cook Drive to the north of the Proposal Site. These are belowground pipes with ground level inlet pits that discharge to the wetland within Quibray Bay. Being outside of the Proposal Site boundary, the details of these pipes were not available on the detailed survey. As information regarding the exact pipe location, dimensions, invert levels and blockage was not available at the time of assessment, these pipes were assumed to be 100% blocked for the purposes of the rainfall on grid modelling.

No other hydraulic structures were included in the rainfall on grid model.

8.6.2 Assessment of Impacts

In the absence of a Council-adopted Flood Study or Floodplain Risk Management Study and Plan available for the Proposal Site, Cardno has developed site-specific modelling tools, listed below, in order to undertake the flood risk assessment to model flood behaviour both under current conditions and future climate scenarios.

- Utilise the DRAINS hydrologic model to determine the critical storm duration and temporal pattern for each design flood event and obtain corresponding IFD data;
- Develop a Rainfall on Grid TUFLOW hydraulic model to simulate flood behaviour under pre-development and post-development conditions;
- Compare results of each to determine flood impacts of the proposed development compared to predevelopment conditions in a range of design flood events; and
- Assess the Proposal against the relevant flood related development controls set out in the Sutherland Shire DCP 2015.

The resulting flood behaviour is characterised as follows:

- Little to no flooding across the majority of the internal area of the Proposal Site in the 5% AEP and 1% AEP events, with localised areas of flood affectation occurring at the north-eastern and south-eastern corners of the Proposal Site at the basin locations, and some well-defined flow paths in the north western parts of the Proposal Site;
- Areas of low hazard, low velocity ponded water occur in and around the infiltration basins, with high hazard in the deepest parts of each basin in events as frequent as the 5% AEP event;
- All infiltration basins are classified as flood storage, with one flow path inside the Proposal Site leading to the basin adjacent to the hockey fields categorised as a floodway.

The difference in peak flood levels in the 1% AEP event is shown on Figure E13 of **Appendix H**, which indicates the following:

- Within the Proposal Site, runoff is directed to infiltration basins via a system of swales and bunds. These act to ensure runoff is contained within the Proposal Site and does not flow across the boundary and worsen overland flow affectation outside the Proposal Site;
- The containment of runoff within the Proposal Site (via swales, bunds and infiltration basins) reduces flood levels on Lindum Drive and results in localised areas of Captain Cook Drive being no longer flooded, reducing the flood hazard to motorists;
- The proposed fill in the western parts of the Proposal Site contributes to a minor increase in peak flood levels south west of the site boundary in the 1% AEP event. The impact is less than 0.05 m, does not impact on roads or dwellings, and does not increase the flood hazard. It is proposed that this impact will be mitigated by internal drainage and resolved at the detailed design stage.

The difference in peak flood levels in the Probable Maximum Flood (PMF) event is shown on **Figure 53**, which indicates the following:

- East of the Proposal Site, peak flood levels on Lindum Road are increased by up to 0.1 m towards the southeast corner of the Proposal Site and up to 0.05 m towards the northeast corner. The runoff travelling across the regraded area towards the infiltration basins exceeds the capacity of the swale and bund, which at this stage, have been sized to contain the 1% AEP flow. At this location, the flood hazard on Lindum Road is not materially increased.
- To the north of the Proposal Site, peak flood levels are reduced by up to 0.2 m on Captain Cook Drive for a length of approximately 450 m immediately west of the Lindum Road intersection.
- Immediately north of the existing hockey fields, peak flood levels are locally increased on Captain Cook Drive by up to 0.05 m as the capacity of the infiltration basin is exceeded. It is noted however that the basin capacity is not exceeded in the 0.2% AEP event.



Figure 53 Post development PMF hydraulic categories

Source: Surface water management assessment, Cardno (Appendix H)

As per the requirements of the SEARs, the 0.2% AEP and 0.5% AEP events have been modelled as “proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change”. The results are consistent with the trends in peak flood impacts seen in the 1% AEP event, with peak flood levels reduced on Lindum Road and Captain Cook Drive due to runoff being contained within the Proposal Site. These results indicate that the Proposal will not adversely affect flooding outside the Proposal Site with increased rainfall intensity induced by climate change.

8.6.3 Mitigation Measures

Sutherland Shire Development Control Plan (DCP) 2015 presents controls in a matrix, where the applicable controls are determined based on the land use type and the flood risk precinct. The proposed land use type is classified as “Commercial and Industrial”. Under post-development conditions, the Proposal Site is largely flood free in the 1% AEP event, and is therefore classified as “Low Flood Risk”, which is defined as follows:

Low Flood Risk is all land that could potentially be inundated (i.e. within the extent of the probable maximum flood) but not identified as either a high flood risk or a medium flood risk precinct. The low flood risk precinct is that area above the 100 year flood, and most land uses would be permitted within this precinct.

As such, the applicable controls are identified as follows:

- Proposed buildings should be located outside of the 1% AEP flood extent.
- Proposed buildings (habitable and non-habitable) should have finished floor levels at a minimum of 150 mm above the ground to prevent nuisance ingress of stormwater.
- Flood evacuation will be managed by proponent through the Breen Site Emergency Management Plan.

The following controls will be confirmed at detailed design stage and are likely to be achievable given the limited flood affectation:

- The minimum surface level of open car parking spaces or carports should be no lower than the 1% AEP flood or the level of the crest of the road at the location where the Proposal Site has access to the road.
- The level of the driveway providing access between the road and parking space should be no lower than 300 mm below the 1% AEP flood or such that the depth of inundation during a 1% AEP flood is not greater than either the depth at the road or the depth at the car parking space.
- Reliable access for pedestrians or vehicles should be provided from the building commencing at a minimum level equal to the lowest habitable floor level to an area of refuge above the PMF level.
- Adequate flood warning systems, signage and exits should be available to allow safe and orderly evacuation without increased reliance upon the State Emergency Service or other authorised emergency services personnel.
- Materials which may cause pollution or be potentially hazardous during any flood should not be stored below the 1% AEP plus 500mm.

9.0 Cultural Heritage

A Statement of Heritage Impact (SoHI) has been prepared by Coast History and Heritage and is included at **Appendix J**. A summary of the assessment and proposed mitigation measures are provided below.

9.1 Existing Environment

The Proposal Site does not contain any heritage items and is not located within a heritage conservation area. Further, it is a heavily remodelled and degraded dune-scape, which has been subject of extensive historical sand mining activities and subsequent infilling with acquired waste since the 1960s. Through these activities, the pre-mining land surfaces and features have been removed and local stratigraphy has been reconstituted and remodelled. The Proposal Site does not contain any items or features of particular historic or heritage interest, nor areas of historical archaeological potential-sensitivity.

Searches of the Australian Heritage Database, State Heritage Register, State Heritage Inventory, and SLEP identify that the Proposal Site is located in close proximity to the following listed heritage items:

- The 'Cronulla sand dune and Wanda Beach coastal landscape' (SLEP Item No. 2502):
 - This item is also listed on the State Heritage Register (SHR No: 01668).
 - It has both a historical and contemporary cultural significance for the Aboriginal community, as well as an historic, scientific, cultural and natural significance as a site of early European contact with indigenous Australians.
 - It also has social significance as a place of recreation and tourism since the late nineteenth century and community activism to protect the dune from sand mining in the later part of the twentieth century, and has been a location for significant Australian films.
 - The Cronulla sand dune is the last major exposed dune in the surrounding landscape.
- The 'Towra Point Nature Reserve and Quibray Bay' (SLEP Item No. 2509)
 - This item is also listed on the State Heritage Register (SHR No: 1918), and forms part of the 'Kamay Botany Bay: botanical collection sites' listed on the National Heritage List.
 - The Towra Point Nature Reserve, together with the nearby Kamay Botany Bay National Park, contains rare remnant vegetation and flora communities and are a critical link in the network of parks and reserves that conserve the biodiversity of NSW.
 - Previous archaeological excavations indicate that Kamay Botany Bay National Park and Towra Point Nature Reserve have significance for their high level of archaeological potential, and are also listed in the SLEP as an archaeological site of State significance (A2528) and on the National Heritage List because it contains one of the greatest botanical collections of all time as part of the first landing of the *Endeavour* in Australia.
- Cronulla Sewage Treatment Plant, located to the west of the Proposal Site, is listed on the State Heritage Inventory (Database number 4573705)
 - It is identified as having significance as the fourth in the series of large sewage treatment plants with ocean outfalls built to service the growing population of Sydney during the twentieth century.
 - The Cronulla Sewage Treatment Plant has some historic and social value relating to its function, and contains a set of equipment and structures that are representative of their period and type.
- A former 'Four wheel drive track' that follows the Captain Cook Drive alignment, which is listed as an archaeological site of local significance (A2523).

9.2 Methodology

The SoHI documents contextual history of the Kurnell Peninsula and Proposal Site, compiled by Coast History and Heritage. The contextual history has been compiled from a range of secondary sources including books, maps, photographs and aerial photographs.

Coast History and Heritage have also reviewed the following heritage registers to determine the surrounding heritage items context:

- Sutherland Shire LEP 2015
- State Environmental Planning Policy (Kurnell Peninsula) 1989
- State Heritage Inventory (SHI)
- State Heritage Register (SHR)
- Australian Heritage Database (AHD)

In order to assess the heritage potential of the Proposal Site, a site survey was conducted on Friday 26 June 2020. It involved a drive-over and selective walkover of the various areas subject to the Proposal, with particular emphasis on notable features (including fill mounds) and areas of least disturbance (including property margins) at the Proposal Site.

9.3 Assessment of Impacts

The Proposal Site is not considered to exhibit any inherent heritage value or historical archaeological potential. While the Proposal Site once exhibited a rare dunescape of considerable natural and cultural significance, the use of the Proposal Site for extensive sand mining and receipt of waste materials since the 1960s has impacted this significance. Moreover, the Proposal Site in its current state, does not demonstrate links to New South Wales' natural or cultural history. The significant landform transformations since the 1960s have also extinguished any aesthetic appeal of the Proposal Site. .

As such, the Proposal will not have any direct heritage impact to the Proposal Site.

Moreover, the Proposal Site is presently considered to detract from views to and from the heritage-listed dune and beach landscape to the immediate south-southwest. As such, the proposed revegetation and the creation and activation of the Embellished Marang Parklands and recreational facilities in accordance with the VPA will improve the landscape appearance and function and provide enhanced views to allow for greater observation and appreciation of neighbouring natural and cultural heritage places.

Coast History and Heritage have concluded that the Proposal, including the New Resource Recovery Facility operations and ultimate establishment of the Embellished Marang Parklands are unlikely to impact the heritage significance of surrounding heritage items including the Cronulla Sand Dune & Wanda Beach Coastal Landscape, Kamay Botany Bay National Park & Towra point Nature Reserve, and Cronulla Sewage Treatment.

As the adjacent heritage dunes represent a soft boundary with the Proposal Site, the transition between the future Embellished Marang Parklands and existing dunescape will require careful design and management to mitigate potential impacts. The detailed design of the Embellished Marang Parklands, allied infrastructure and landscaping will consider this transition in its orientation, topography and planting selections.

Overall, the Proposal will have a positive impact on the heritage significance of surrounding heritage items as the rehabilitation renewal and activation of the Embellished Marang Parklands will enhance the Proposal Site and provide a more appropriate, compatible and sympathetic setting for the adjacent heritage-listed landscape dunes and nature reserves.

9.4 Mitigation Measures

In respect of the potential heritage impacts described above and data gaps, the SOHI recommends the following mitigation measures that are summarised below in **Table 27**.

Table 27 Summary of mitigation measures relating to cultural heritage

Impact	Environmental Safeguard	Responsibility	Timing
Impact of future Embellished Marang Parklands on adjacent coastal dunes and nature reserves to the south/south-west of the Proposal Site	Preparation of a Landscape Management Plan by a suitably qualified landscape architect with experience in coastal-dunescape contexts should be undertaken to inform detailed parkland planning. The design and management of transition zones between the Embellished Marang Parklands and dunes and at the Proposal Site margins should be central to this plan. The plan should consider ways of interpreting the shared history of the peninsula to parkland users. The detailed planning of the Embellished Marang Parklands should also address contouring, revegetation and infrastructure (such as security lighting and drainage) – especially on the approach to the dunescape, and more generally at property margins and where works will interface with extant bushland/reserves	Landscape architect	Detailed design and planning of Embellished Marang Parklands prior to execution of final stage of the VPA
	The SoHI should be reviewed (and possibly amended) at such time as detailed planning of the Embellished Marang Parklands (and any allied works) is advanced.	Heritage consultant	Detailed design and planning of Embellished Marang Parklands prior to execution of final stage of VPA

10.0 Aboriginal Cultural Heritage

An Aboriginal Cultural Heritage Assessment Report (ACHAR) has been prepared by Coast History and Heritage and is included at **Appendix K**. The ACHAR contains an Aboriginal archaeological assessment in accordance with the (former) Office of Environment and Heritage (OEH) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*, and documents Aboriginal community consultation in accordance with the *National Parks and Wildlife Regulation 2019*. A summary of the assessment and proposed mitigation measures are provided below.

10.1 Methodology

In order to assess the Aboriginal cultural significance of the Proposal Site, Coast History and Heritage undertook consultation with the Aboriginal community. Direct Agency Notices were sent to government and indigenous agencies on 26 May 2020 to ascertain further contacts of potentially interested Aboriginal parties. A public notice was placed in the St George and Sutherland Shire Leader on 27 May 2020 calling for registrations of interest from Aboriginal people with cultural knowledge relevant to the Proposal. Notices were then sent to all the Aboriginal people and organisations identified by the agencies contacted on 26 May 2020. A total of 10 Registered Aboriginal Parties were registered for the Proposal.

Coast history and Heritage have reviewed the Heritage NSW Aboriginal Heritage Information Management System and reviewed historical assessments of Aboriginal sites and artefacts.

An archaeological inspection of the Proposal Site was also undertaken on 26 June 2020.

10.2 Existing Environment

A 'basic search' of the Aboriginal Heritage Information Management System (AHIMS), carried out by Coast History and Heritage on 26 June 2020, identified that 84 Aboriginal sites have been recorded within the 8km x 8km search area surrounding the Proposal Site. However, the Proposal Site has previously been subject of extensive landform modification from historical sand mining and waste management activities, and is currently cleared of vegetation and natural features. It is therefore considered unlikely that any Aboriginal sites would currently be present at the Proposal Site.

The basic AHIMS search identifies that no Aboriginal places have been declared in or near the Proposal Site. Notwithstanding this, it is identified from review of the State Heritage Register that the immediately adjoining 'Cronulla Sand Dune and Wanda Beach Coastal Landscape' have historical and contemporary cultural significance to the Aboriginal community. This indicates that there may be areas of Aboriginal cultural heritage significance at the Proposal Site or on land immediately adjoining the Proposal Site.

The field survey inspection did not result in the discovery of any previously unrecorded Aboriginal archaeological remains, and no remains are confirmed to have survived within the Proposal Site. However, the field inspection resulted in a refinement of the potential survival of buried original landforms along the northern edge of the Proposal Site, where an open pond showed a level of disturbance that was not identified through desktop study. The maximum area in which buried former foredune or swamp margin areas with potential to contain Aboriginal archaeological remains may survive is shown in **Figure 54**.

The area surrounding the New Resource Recovery Facility as highlighted in **Figure 54** is considered to retain Aboriginal heritage sensitivity. Any surviving landform is likely to be at least a metre below the current surface due to redistribution of sand, and in many cases, deposition of substantial quantities of clean fill. The kinds of Aboriginal archaeological remains that could survive within these areas includes shell middens, open campsites and Aboriginal burials. Any such remains are likely to be part of the extensive Aboriginal sites recorded within the foredune and swamp margins over the past century.



Figure 54 Identified Aboriginal heritage sensitivity (buried landforms) within the ACHAR study area

Source: ACHAR, Coast History and Heritage (Appendix K)

10.3 Assessment of Impacts

10.3.1 Aboriginal Heritage Significance of the Proposal Site

The ACHAR has assessed the significance of Aboriginal heritage at the Proposal Site. While no Aboriginal heritage is confirmed to have survived within the Proposal Site, any possible remains are likely to be part of the sites or complexes of sites previously recorded in and around the eastern end of the Proposal Site. Any remaining traces of these sites would be significant as part of a locally and regionally significant suite of Aboriginal heritage sites, and as a comparative element to other sites elsewhere around the Kurnell Peninsula. However the level of significance would depend on what remains, as well as its extent and condition.

In addition to these potential archaeological elements, the Kurnell Peninsula as a whole, retains high Aboriginal cultural and historical significance for its significant and diverse evidence of a long history of Aboriginal occupation, as a place of cross-cultural contact, and as a place of continuing Aboriginal occupation after the arrival of Europeans. This is reflected in Aboriginal site recordings and listings, and the inclusion of Aboriginal cultural and heritage values in State Heritage Register listings of adjacent areas.

As such, the Proposal Site and broader Kurnell Peninsula have a considerable level of Aboriginal heritage significance.

10.3.2 Potential Impacts

Construction and operation of the New Resource Recovery Facility on the eastern part of the Proposal Site (Lot 5), will involve filling the current landform with VENM up to 2 metres above the existing landform to avoid any potential Aboriginal remains that are at least 1 metre below the surface. All proposed structures and services trenches are proposed to be constructed and installed above this filled level. However, two new infiltration basins which form part of the Proposal will be excavated 2-2.5m in depth in the eastern part of the Proposal Site. This excavation may result in disturbance to Aboriginal heritage remains.

The ongoing landfilling and capping of Lot 5 following the completion of landfilling, and the capping, contouring and profiling of areas within Lot 1122 and 1123 and Lot 6 that will comprise the Embellished Marang Parklands, as well as the construction of the Embellished Marang Parklands may have some potential for subsurface impact from

levelling earthworks. However, these activities are largely in areas of the Proposal Site which have been subject to previous sand extraction, and which has previously removed any Aboriginal heritage sensitivity. Any potential small areas of remnant buried land surfaces that may survive are at least 1m below the current surface and will not be impacted by these activities.

Coast History and Heritage have also considered potential impacts to the Aboriginal heritage values of the adjacent heritage listings of the Cronulla Sand Dune & Wanda Beach Coastal Landscape and Towra Point Nature Reserve and Quibray Bay. Coast History and Heritage have concluded that the Proposal will not negatively impact these values. While the construction of the New Resource Recovery Facility in a previously mined and degraded area of Lot 5 in the eastern part of the Proposal Site will be visible from the dunes of the Cronulla Sand Dune & Wanda Beach Coastal Landscape, it will not impact the intangible Aboriginal heritage values of this place. Significantly, the creation of the Embellished Marang Parklands in closer proximity to both heritage listed places will offer an opportunity for Aboriginal people to reconnect with parts of the Kurnell peninsula that have been inaccessible for decades, and to the broader surrounding landscape through the extensive views offered by the recreated hills within the Embellished Marang Parklands.

As such, the only potential direct impact to Aboriginal heritage on the Proposal Site is the proposed excavation of the infiltration ponds. In order to avoid these impacts, the initial position and layout of these recovery basins were redesigned and relocated to ensure that they sit within the footprint of areas subject to deep sand dredging, where there is no potential for buried former land surface with Aboriginal archaeological sensitivity to occur. A plan showing the relocated infiltration basins outside of the Aboriginal heritage sensitivity areas is shown in **Figure 55**. Water percolating through the basins will filter directly down to the water table below and will not impact nearby areas which may retain buried original landforms.

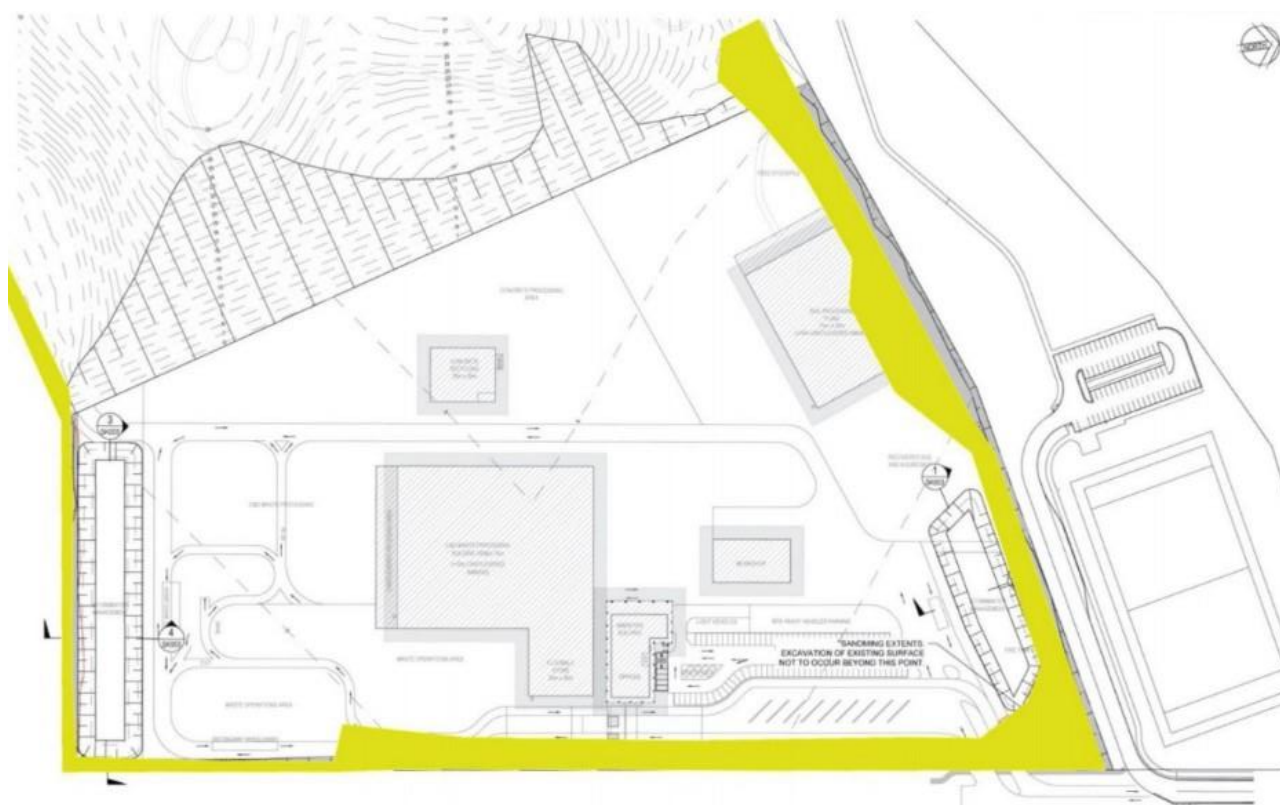


Figure 55 Aboriginal heritage sensitivity (yellow) in relation to the proposed New Resource Recovery Facility

Source: ACHAR, Coast History and Heritage (Appendix K)

As a result of the redesigned Proposal, the Proposal has avoided all potential impacts to Aboriginal heritage. The Proposal will result in positive Aboriginal heritage impact as the newly created public lands will improve Aboriginal community access to the peninsula and foster a sense of the broader natural and cultural landscape that has been absent from this part of the peninsula for many decades.

Notwithstanding, the ACHAR recommends mitigation measures that will provide further protection to Aboriginal heritage through worker awareness of the Aboriginal heritage sensitivity of some areas, and by ensuring identification of Aboriginal archaeological remains in disturbed contexts which could potentially be uncovered during works at the Proposal Site. Further assessment is also recommended should design elements change in future which may involve impacts into potential buried former landforms.

10.4 Mitigation Measures

The ACHAR recommends the following mitigation measures that are summarised below in **Table 28**.

Table 28 Summary of mitigation measures relating to Aboriginal heritage

Impact / Issue	Environmental Safeguard	Responsibility	Timing
Aboriginal heritage induction	An Aboriginal Heritage Induction should be prepared for the Proposal by an appropriately qualified archaeologist and/or representative of the La Perouse Local Aboriginal Land Council. The induction should highlight the legal protections afforded to Aboriginal objects under the National Parks & Wildlife Act 1974. It will also explain the nature of the dune sands, the types of buried landforms that may exist in parts of the Proposal Site and the types of archaeological remains that may be found within them. This will include 'stop work' procedures for dealing with unexpected finds (such as human or animal bone, shell material or stone artefacts) that may be exposed during construction. The Aboriginal Heritage Induction should initially be delivered on commencement of Proposal works by an appropriately qualified archaeologist and/or representative of the La Perouse Local Aboriginal Land Council to the main contractor and other relevant management personnel. The Aboriginal Heritage Induction materials will also be incorporated into the general site induction materials for all workers and contractors involved in excavation works related to the resource recovery facility and elsewhere across the Proposal Site.	Contractor	Pre-construction

Impact / Issue	Environmental Safeguard	Responsibility	Timing
Unexpected finds procedures	During any works not subject to archaeological monitoring, if any Aboriginal objects or bones suspected of being human remains are identified during construction, site workers must: • Not further disturb or move these remains. • Immediately cease all work at the location. In the case of Aboriginal objects: • notify the Heritage NSW Enviroline on 131 555 as soon as practicable and provide available details of the objects or remains and their location. Notify the La Perouse Local Aboriginal Land Council to assist in the determination of appropriate management for the objects or remains. • do not recommence any work at the location unless authorised in writing by Heritage NSW. In the case of any bone which may possibly be human: • all works will immediately cease in that area. • a specialist physical anthropologist will be called in to determine whether the remains are definitely human. • In the event that the bones are human, the NSW Police will be contacted, and any further investigations will be undertaken under their guidance. If the bone is found to be deposited within the last 100 years, whether of Aboriginal or non-Aboriginal origin, the NSW Police will determine further actions to be taken as it may be a coronial matter. If the NSW Police are satisfied that the bone is that of an Aboriginal person not suspected of being buried within the last 100 years, Heritage NSW will be notified, and a determination made in consultation with the La Perouse Local Aboriginal Land Council as to the appropriate management of the remains.	Contractor	Construction
Triggers for further Aboriginal heritage assessment	• Any proposed future additions or amendments to design should avoid subsurface impacts that may extend below the current ground level within the area of Aboriginal heritage sensitivity shown in Figure 55. If subsurface impacts within this area cannot be avoided, further Aboriginal heritage assessment in consultation with the Registered Aboriginal Parties to this Proposal will be required. • As long as the procedures outlined above are implemented as part of project approval, there are considered to be no archaeological grounds for further Aboriginal heritage investigations in relation to the current proposal.	Breen	Ongoing
Aboriginal Parties	When finalised, a copy of the ACHAR should be forwarded to the Registered Aboriginal Parties and to: The Registrar Aboriginal Heritage Information Management System Heritage NSW Locked Bag 5020 Parramatta NSW 2220	Coast History and Heritage	Lodgement

11.0 Visual Impact

A Visual Impact Assessment has been prepared by Clouston Associates and is included at **Appendix L**. A summary of the assessment and proposed mitigation measures are provided below.

11.1 Methodology

Visual Impact Assessment in NSW has been informed by a number of cases in the NSW Land and Environment Court which have resulted in the preparation of Planning Principles for the assessment of public domain views. The key steps in the process include:

- Identify the nature and scope of the views from the public domain as they are currently or will be at the completion of the approved development.
- Identify the locations in the public domain from which the potentially interrupted view is enjoyed.
- Identify the extent of the obstruction at each relevant location as a result of the Proposal.
- Identify the intensity of public use of those locations where that enjoyment will be obscured, in whole or in part, by the Proposal.
- Identify whether or not there is any document that identifies the importance of the view to be assessed.

Clouston Associates have undertaken the Visual Impact Assessment a sequential manner to determine the potential visual impact of the Proposal.

Firstly, the assessment established a baseline, drawing on background documents and investigations of the Proposal Site, to document the existing landscape character and visual environment of the Proposal Site and its visual catchment. This allowed for the determining of the most significant views and vistas currently enjoyed within the surrounding area.

Secondly, visual impacts of the Proposal were assessed against the planning and design principles, which lead to the determining of appropriate mitigation measures required to reduce potential visual impacts.

11.2 Existing Environment

To document the existing landscape character and visual environment of the area and its visual catchment, key viewpoints have been identified by drawing on background documents, site investigation, desktop mapping and the NSW Land and Environment Court Planning Principles for visual assessment policy guidance.

View selection criteria have included:

- Locations where the New Resource Recovery Facility is most visible to the public
- Views from the New Resource Recovery Facility at close quarters
- Views from adjoining roads
- Views in the context of the proposed parklands
- One private view from an adjoining landowner

Seven viewpoints have been selected as key locations from which the Breen Site would be potentially visible to the general public, as follows (the location of each of the selected viewpoints is shown in **Figure 56**):

- Viewpoint 1 – Existing Breen Resources carpark entry looking west.
- Viewpoint 2 – Adjacent to existing hockey fields amenity building looking south.
- Viewpoint 3 – Existing soccer field opposite to the Greenhills Skate Park looking south.
- Viewpoint 4 – Captain Cook Drive roundabout with Lindum Road looking south-west.
- Viewpoint 5 – Future (proposed) sport field at south-west corner of Lot 6 in DP1158627 looking north-east.
- Viewpoint 6 – Private land on eastern side of Lindum Road looking west.

- Viewpoint 7 – Existing lookout platform adjacent to the southern boundary of Lot 5 in DP1158627 looking north-east.



Figure 56 Viewpoints utilised for montages

Source: Visual Impact Assessment, Clouston Associates (Appendix L)

11.3 Assessment of Impacts

A visual impact rating for each selected viewpoint has been determined from a human vision perspective during a site visit. The assessment addresses both the quantitative (objective) characteristics of the landscape and views, as well as the qualitative (subjective) assessment of the values ascribed to those scenes. Quantitative measures of the significance of the view include the nature and number of potential viewers, and their distance from the proposed development.

This viewpoint analysis is accompanied by block model visualisations of the Proposal within the landscape context, with consideration of the relocated 'depot' infrastructure and the final landform. These block models have been created using 3D modelling and geographical mapping software in order to accurately position the Proposal within the landscape. The images are designed to give an indicative impression of the size and scale of the Proposal within the view frame.

Table 29 provides the images representing the existing view for each of the viewpoints in the first column, with the view as it is proposed to be affected in the second column (Note: These photos and images are approximate representations only, and where appropriate include a representation of the vegetation that would be planted in the landscaped buffer that will visually screen elements of the New Resource Recovery Facility from surrounding properties and the public domain).

Table 29 Viewpoint photos and montages

Existing View	Proposed View
Viewpoint 1 – Existing Breen Resources carpark entry looking west	
	
Viewpoint 2 – Adjacent to existing hockey fields amenity building looking south	
	
Viewpoint 3 – Existing soccer field opposite to the Greenhills Skate Park looking south	
	

Existing View	Proposed View
Viewpoint 4 – Captain Cook Drive roundabout with Lindum Road looking south-west	
	
Viewpoint 5 – Future (proposed) sport field at south-west corner of Lot 6 in DP1158627 looking north-east	
	
Viewpoint 6 – Private land on eastern side of Lindum Road looking west.	
	

Existing View	Proposed View
Viewpoint 7 – Existing lookout platform adjacent to the southern boundary of Lot 5 in DP1158627 looking north-east (View during operations)	
	
Viewpoint 7 – Existing lookout platform adjacent to the southern boundary of Lot 5 in DP1158627 looking north-east (View after operations)	
	

Source: Visual Impact Assessment, Clouston Associates (Appendix L)

Table 30 provides a summary of the visual impact assessment provided in **Appendix L** for each viewpoint.

Table 30 Visual Impact Assessment Summary

Existing View	Visual Impact
Viewpoint 1 – Existing Breen Resources carpark entry looking west	
The existing facility entry and the overhead power lines running adjacent to Captain Cook Drive dominate the existing view. Existing mature vegetation to the right of the view running along the road verge obstructs views to part of the Proposal Site. The existing landfill sits in the background and in the middle of the view frame.	While the existing driveway and entry will be modified it has been shown as it currently exists for purposes of comparison and to reveal the proposed mid-ground and background. The Proposal shows an improved visual scene in the form of a new rolling skyline landform and new planting forming a partly canopied ridgeline.
Sensitivity rating of receptor	Low
Overall magnitude rating	Moderate/Low
Overall visual impact rating	Low
Viewpoint 2 – Adjacent to existing hockey fields amenity building looking south	
The existing view is dominated by the existing carpark in the foreground with the existing mounded vegetation in the background.	The proposed sculptured landform which forms the platform for the proposed fields will be highly visible from this view. The associated planting on the access road to the proposed playing fields (such as tree and understorey planting), have a positive impact

Existing View	Visual Impact
	on the visual scene from this viewpoint and helps to mitigate the level of change as a result of the proposed earthworks. If required, further planting could be added to parts of the embankments, but this is not a critical mitigation requirement.
Sensitivity rating of receptor	Low
Overall magnitude rating	Moderate/Low
Overall visual impact rating	Low
Viewpoint 3 – Existing soccer field opposite to the Greenhills Skate Park looking south	
The existing view is dominated by a green field in the foreground with the existing vegetated mound in the background.	Due to proximity, the proposed buildings will be highly visible from this view. The associated mounding and planting on the New Resource Recovery Facility boundary will reduce visual impacts the most when the trees are fully mature. In effect the visual impacts will be slightly higher until they grow, but this difference would not be sufficient to warrant a change of rating. The mounding and larger shrubs will achieve the bulk of the impact reduction within a short period of planting.
Sensitivity rating of receptor	High
Overall magnitude rating	Moderate
Overall visual impact rating	Moderate/High
Viewpoint 4 – Captain Cook Drive roundabout with Lindum Road looking south-west	
The existing view is dominated by Lindum Road with existing landform and vegetation in the background.	The proposed facility buildings will be visible in the background but due to the distance and the existing vegetation in the foreground, the visual impact rating is expected to be low, as the existing trees will help to filter views of the built form within the proposal. Proposed tree planting on the New Resource Recovery Facility boundary will assist in further reducing any impacts.
Sensitivity rating of receptor	Low
Overall magnitude rating	Low
Overall visual impact rating	Low
Viewpoint 5 – Future (proposed) sport field at south-west corner of Lot 6 in DP1158627 looking north-east	
The existing view is dominated by the Existing Breen Resources Facility in the foreground. Existing hockey fields sit in the midground to the left of the view frame, with city skyline and water views visible in the distance. Powerlines are also visible running from left to right of the view.	The new landform creates a green and regular foreground; however, it cuts off views to the existing hockey fields in the mid-ground. For the most part views to the water of Botany Bay and the CBD skyline in the background remain unaffected.
Sensitivity rating of receptor	High
Overall magnitude rating	Moderate/Low
Overall visual impact rating	Moderate
Viewpoint 6 – Private land on eastern side of Lindum Road looking west.	
The view is comprised of the existing driveway to the left of the foreground with existing vegetated mounds sit in the distance.	Despite the proximity of the proposed landform and buildings, the existing mature vegetation would filter some of the proposed buildings. Current uses of the land from which this viewpoint is taken generate few visual receptors. The mature vegetation would provide a landscape buffer to the New Resource Recovery Facility buildings.

Existing View	Visual Impact
Sensitivity rating of receptor	Low
Overall magnitude rating	Moderate
Overall visual impact rating	Moderate
Viewpoint 7A – Existing lookout platform adjacent to the southern boundary of Lot 5 in DP1158627 looking north-east (View during operations)	
The existing view is in an elevated position from a viewing platform with a footpath and mature vegetation in the foreground. Views of the water and city skyline sit in the distance.	The proposed landform and constructed mounds will dominate this view, and remove the view of Botany Bay to the northeast. Although proposed planting will significantly increase the level of vegetation visible (which generally has a positive impact) the loss of the city skyline, and specifically the water views, will result in a 'High' visual impact, with any further mitigation techniques unlikely to change the 'High' rating. The presence of ongoing operation and source view of the New Resource Recovery Facility also contribute to the 'High' rating.
Sensitivity rating of receptor	High
Overall magnitude rating	High
Overall visual impact rating	High
Viewpoint 7B – Existing lookout platform adjacent to the southern boundary of Lot 5 in DP1158627 looking north-east (view after operations)	
The existing view is in an elevated position from a viewing platform with a footpath and mature vegetation in the foreground. Views of the water and city skyline sit in the distance.	The proposed landform and constructed mounds will dominate this view. Although proposed planting will significantly increase the level of vegetation visible (which generally has a positive impact) the loss of the city skyline, and specifically the water views, will result in a 'High' visual impact, with any further mitigation techniques unlikely to change the 'High' rating. The presence of ongoing operation and source view of the New Resource Recovery Facility also contribute to the 'High' rating. The presence of vegetated mounds and trees in the fore mid ground will reduce the visible impacts when compared with the operations phase.
Sensitivity rating of receptor	High
Overall magnitude rating	Moderate
Overall visual impact rating	Moderate/High

Source: Visual Impact Assessment, Clouston Associates (Appendix L)

Overall, it can be seen that majority of selected views have only a low to moderate visual impact. Clouston Associates conclude that the potential visual impacts are acceptable for the following reasons:

- The remodelling of the earthworks to create a rolling landform for the future parklands will create an improved visual amenity for many of the views.
- The New Resource Recovery Facility buildings will be visible in several views but when accompanied by planting the buildings will not be visually dominant.
- New planting of native species (using a coastal headland dune plant palette) in the foreground, midground and/or background of many views will improve visual amenity.
- There will be some loss of views from existing locations, (particularly view 7). However, more elevated views of similar vistas will be available on lot 6 and from various vantage points within the Embellished Marang Parklands, including the dedicated lookout point.

It is also highlighted that contemporary visual impact assessment methodologies are based on impact ratings that do not include a scale for positive visual contribution. While the visual impacts of the New Resource Recovery Facility can reasonably be said to fall within the standard impact ratings, there is a reasonable argument that the remodelling of landform and the creation of the Embellished Marang Parklands, which provide the setting for that New Resource Recovery Facility, could be considered a positive contribution to the local landscape and its visual amenity.

11.3.1 Construction Visual Impact

Throughout the construction phase, the following activities are likely to result in additional visual impacts and reduction of visual amenity at the selected viewpoints:

- Clearing of vegetation.
- Construction compounds.
- Stockpiling.
- Earthworks.
- Site fencing and lighting.
- Increased traffic including heavy vehicles.

However, these visual impacts will be temporary in nature and will reduce for all viewpoints once construction is complete. Moreover, these visual impacts will reduce as viewing distances increase and screening vegetation is planted and matures.

11.3.2 Operational Visual Impact

Any potential operational visual impact when the New Resource Recovery Facility and Embellished Marang Parklands commence operation is limited to external light spill at night times. While some ambient light is expected to be visible, visual impact can be mitigated by seeking to reduce light spill in the design of any lighting. It is also noted that existing and proposed sporting facilities will also involve extensive night lighting that is likely to be of a higher intensity.

11.4 Mitigation Measures

The visual impacts arising from the construction of the Embellished Marang Parklands have been identified as being broadly positive. As such, the consideration of mitigation measures has focussed on the New Resource Recovery Facility.

As outlined by Clouston Associates in the Visual Impact Assessment (see **Appendix L**), the Proposal already responds to the six typical broad approaches to mitigating visual impact outlined below:

- Design brief – the design parameters for the location and design of the New Resource Recovery Facility have been altered to mitigate potential visual impacts.
- Avoidance – there is no viable alternative location for the New Resource Recovery Facility.
- Reduction – the built form has been reduced to the minimum scale, being the height required to meet operational requirement in accordance with environmental and waste management controls.
- Alleviation – planting and minor mounding are reasonable forms of mitigation for the Proposal. However, the design for the New Resource Recovery Facility and future Embellished Marang Parklands already includes mounding and tree planting, so no additional mitigation measure would be required.
- Off-site Compensation – there are no significant viewpoints from the surrounding locality.
- Management – there are no operational options that will reduce visual impacts, assuming that lighting design will minimise light spill

As such, there are limited measures required to mitigate potential visual impact. The Visual Impact Assessment recommends the following mitigation measure that is summarised below in **Table 31**.

Table 31 Summary of mitigation measures relating to visual impact

Impact	Environmental Safeguard	Responsibility	Timing
Light spill from operation	Ensure that the design of lighting seeks to reduce light spill	Landscape architect	Pre-operation

12.0 Air Quality and Odour

An Air Quality Impact Assessment has been prepared by Wilkinson Murray, in accordance with the EPA's Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, and is provided at **Appendix M**. A summary of the assessment and proposed mitigation measures are provided below.

12.1 Existing Environment

The Air Quality Impact Assessment includes analysis of local climate conditions and existing ambient air quality in the area, as well as air quality modelling of dust emissions – including Total Suspended Particulates ('TSP'), Particulate Matter (PM₁₀ and PM_{2.5}), and deposited dust.

Strong north-easterly winds are prevalent at the Proposal Site in summer and spring, moderate to strong westerly and south easterly winds are prevalent in autumn, and moderate to strong southerly and south easterly winds are prevalent in winter. January is the hottest month of the year, with a mean daily maximum temperature of 26.6°C. July is the coolest month with a mean daily minimum temperature of 7.3°C. June is the wettest month with an average rainfall of 124 mm falling over 9 days. There are, on average, 96 rain days per year, delivering 1,083 mm of rain.

The nearest meteorological monitoring station is located at Randwick, and provides the following existing ambient air quality (excluding bushfires and hazard reduction burning events):

- PM₁₀ has an annual average of 19.2 µg/m³, with a maximum 24-hour average of 46.2 µg/m³; and
- PM_{2.5} has an annual average of 6.9 µg/m³, with a maximum 24-hour average of 22 µg/m³.

There is no readily available site-specific monitoring data for TSP and deposited dust. However, estimates of the annual average background TSP concentrations can be determined by assuming that 40% of the TSP is PM₁₀, a relationship that has been established as part of a review of historical ambient monitoring data collected by co-located TSP and PM₁₀ monitors. Applying this relationship results in an estimated annual average TSP concentration of 48.0 µg/m³. Dust deposition levels can be similarly calculated to establish a background annual average dust deposition of 2.13 g/m²/month for the area around the Proposal Site.

The nearest sensitive receptors include residential properties approximately 1.5km south-west of the Proposal Site in Greenhills Beach, and in Kurnell, approximately 2km north-east of the Proposal Site. Other recreational facilities nearby include the hockey and soccer fields which are adjacent to the Proposal Sites northern boundary, with several commercial land uses located north-east of the Proposal Site fronting Captain Cook Drive (**Figure 57**).

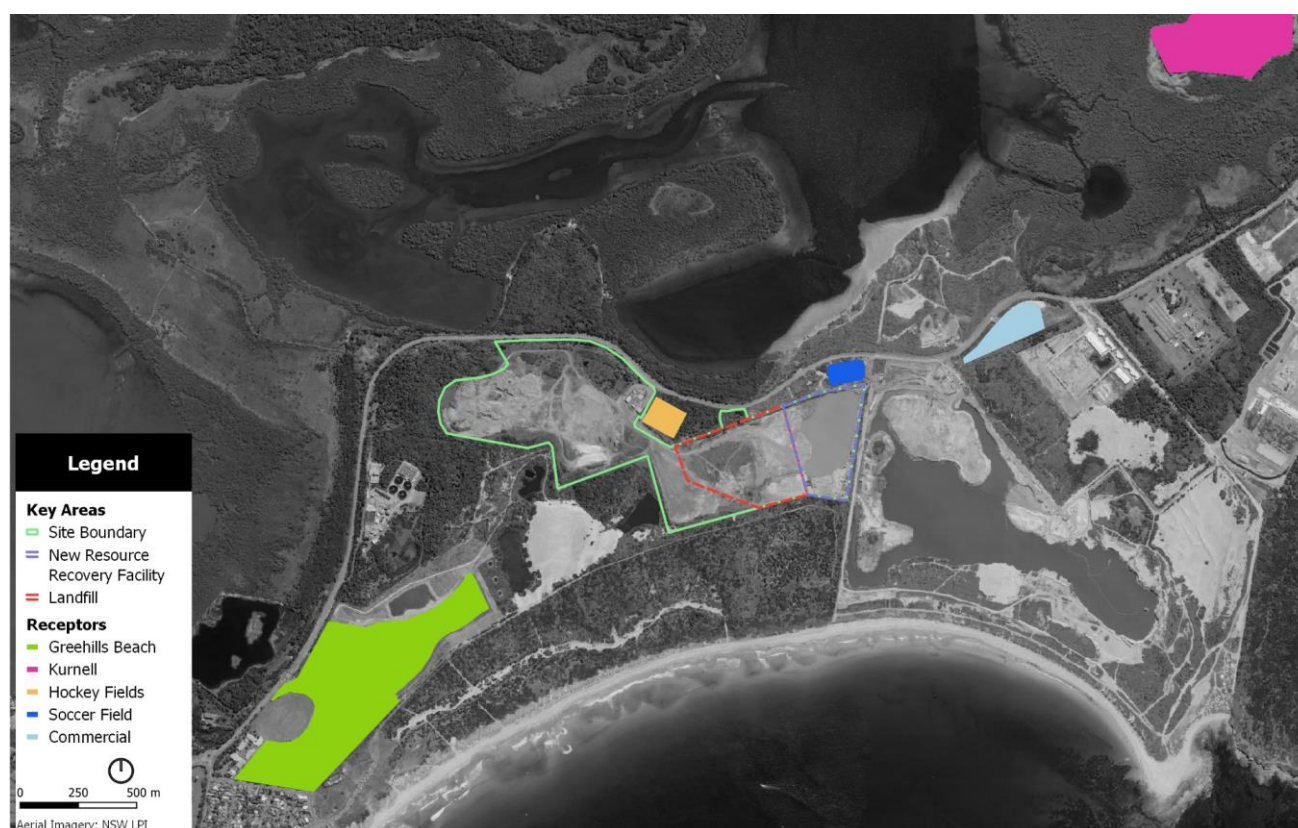


Figure 57 Nearby sensitive receptors

Source: Air Quality Impact Assessment, Wilkinson Murray (Appendix M)

12.1.1 Impact assessment criteria – air quality and odour

The EPA's Approved Methods for the Modelling and Assessment of Air Pollutants in NSW has established air quality impact assessment criteria for these pollutants. **Table 32** summarises the relevant criteria.

Table 32 Impact assessment criteria – particulate matter

Pollutant	Averaging Period	Impact	Criteria
Total suspended particulates (TSP)	Annual	Total	90 $\mu\text{g}/\text{m}^3$
Particulate matter $\leq 10 \mu\text{m}$ (PM_{10})	Annual	Total	25 $\mu\text{g}/\text{m}^3$
	24-hour	Total	50 $\mu\text{g}/\text{m}^3$
Particulate matter $\leq 2.5 \mu\text{m}$ ($\text{PM}_{2.5}$)	Annual	Total	8 $\mu\text{g}/\text{m}^3$
	24-hour	Total	25 $\mu\text{g}/\text{m}^3$
Deposited dust	Annual	Incremental	4 $\text{g}/\text{m}^2/\text{month}$ (or 4 $\text{g}/\text{m}^2/\text{month}$ incremental)

Source: Air Quality Impact Assessment, Wilkinson Murray (Appendix M)

NSW legislation prohibits emissions that cause offensive odour to occur at any off-site receptor. Offensive odour is evaluated in the field by authorised officers, who are obliged to consider the odour in the context of its receiving environment, frequency, duration, character and so on and to determine whether the odour would unreasonably interfere with the comfort and repose of the normal person.

The NSW criteria for acceptable levels of odour range from 2 to 7 OU, with the more stringent 2 OU criteria applicable to densely populated urban areas and the 7 OU criteria applicable to sparsely populated rural areas, as outlined below in **Table 33**.

Table 33 Impact assessment criteria – complex mixtures of odorous pollutants

Population of affected community	Impact assessment criteria (OU)*
Urban (≥ 2000) and/or schools and hospitals	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence (≤ 2)	7.0

Note: * 99th percentile nose-response time.

Source: Air Quality Impact Assessment, Wilkinson Murray (Appendix M)

12.2 Methodology

12.2.1 Meteorological Modelling

As no meteorological observation data is available for the Proposal Site, Wilkinson Murray used site-specific meteorological data generated through a prognostic model named The Air Pollution Model (TAPM) which is developed and distributed by the CSIRO. The prognostic modelling domain was centred at 34.03° S, 151.18° E and involved four nesting grids of 30 km, 10 km, 3 km and 1km with 41 grids in the lateral dimensions and 25 vertical levels. The TAPM model included assimilation of wind data collected at the Kurnell BoM Station during 2018.

The TAPM results, including predictions of wind speed, wind direction, temperature, humidity, cloud cover, solar radiation, and rainfall, were used as inputs to AERMET, to calculate mixing heights and velocity scaling parameters.

12.2.2 Dispersion Modelling

The dispersion model chosen for this assessment was AERMOD, which is the US EPA regulatory Gaussian plume air dispersion model. AERMOD is accepted by NSW EPA for use in air quality impact assessments.

To account for the time-averaging limitations of the dispersion model, peak-to-mean ratios were incorporated into all odour flux rates in accordance with the Approved Methods.

12.3 Assessment of Impacts

12.3.1 Operation of the New Resource Recovery Facility and Landfill only

Dust and particulate matter

Dust emissions from the New Resource Recovery Facility and Landfill have been estimated (as no significant dust generating activities are expected to occur during the use of the Embellished Marang Parklands) based on the proposed operational activities using emission factors sourced from both locally developed and US EPA developed documentation. The most significant dust generating activities during the operation of the Proposal would be:

- Wheel generated dust;
- Material processing and handling; and,
- Wind erosion.

The following dust controls have been accounted for in the emissions estimation:

- Paved roads would be regularly swept;
- Soil and concrete recycling activities would be conducted in fully covered buildings with semi-enclosed walls in order to minimise dust and noise emissions;
- External areas around the soil and concrete processing buildings would be used for stockpiling, but no waste processing would take place outside of the buildings;

- Light waste processing activities would be conducted in a fully enclosed building;
- Water carts would be used on all unpaved roads; and
- Water sprays would be used at the “working face” of stockpiles and to suppress dust from crushing and screening activities.

With consideration of these dust controls, the operations will result in an estimated 29,792 kg per year of particulates.

Preliminary air quality modelling using TAPM, AERMET and AERMOD models indicates that the predicted concentrations of dust and particulate matter will be able to demonstrate compliance with the impact assessment criteria at all residential receptors, as shown in **Table 34**. However, the results indicate the potential for exceedances of the 24-hour average impact assessment criteria for PM_{2.5} and PM₁₀ at the nearby Playing Fields (in particular the soccer and hockey fields), and commercial receptors, and exceedance of the annual average impact assessment criteria for PM_{2.5} at the soccer field.

Table 34 Predicted TSP and particulate matter impacts at sensitive receptors

Receptor	PM _{2.5}		PM ₁₀		TSP	
	24-hour		Annual		24-hour	
	Increment	Total	Increment	Total	Increment	Total
Goal	25 µg/m³		8 µg/m³		50 µg/m³	
Greenhills Beach	0.1	24.8	0.0	7.6	0.6	48.0
Kurnell	0.1	24.8	0.0	7.6	0.8	48.2
Soccer Field	3.0	27.7	0.6	8.2	24.0	71.4
Hockey Field	0.6	25.3	0.1	7.7	4.5	51.9
Commercial	0.4	25.1	0.1	7.7	2.9	50.3

Source: Air Quality Impact Assessment, Wilkinson Murray (Appendix M)

As such, in accordance with the Approved Methods, Wilkinson Murray undertook a contemporaneous assessment to provide a more detailed analysis of the potential impacts of the New Resource Recovery Facility and landfill components of the Proposal at the closest affected receptor, being the soccer field. The results of this contemporaneous assessment are shown in **Figure 58** and **Figure 59** for PM_{2.5} and PM₁₀ respectively, and are summarised as follows:

- This operation will contribute a minimal amount of total PM_{2.5} concentrations and are unlikely to result in additional exceedances of the goal of 25 µg/m³.
- This operation will contribute a small to moderate amount of PM₁₀ concentrations at the most potentially affected location at the soccer fields and indicates the potential for one additional exceedance of the goal of 50 µg/m³.
- The predicted incremental annual average PM_{2.5} concentration at the soccer field is 0.6 µg/m³, or 7.5% of the impact assessment criterion. While the small incremental concentration results in a predicted exceedance of the impact assessment criterion, due to the large existing ambient concentration of 95% of the impact assessment criterion, its incremental increase would be largely indistinguishable from the specific background. As such, mitigation measures are not warranted.

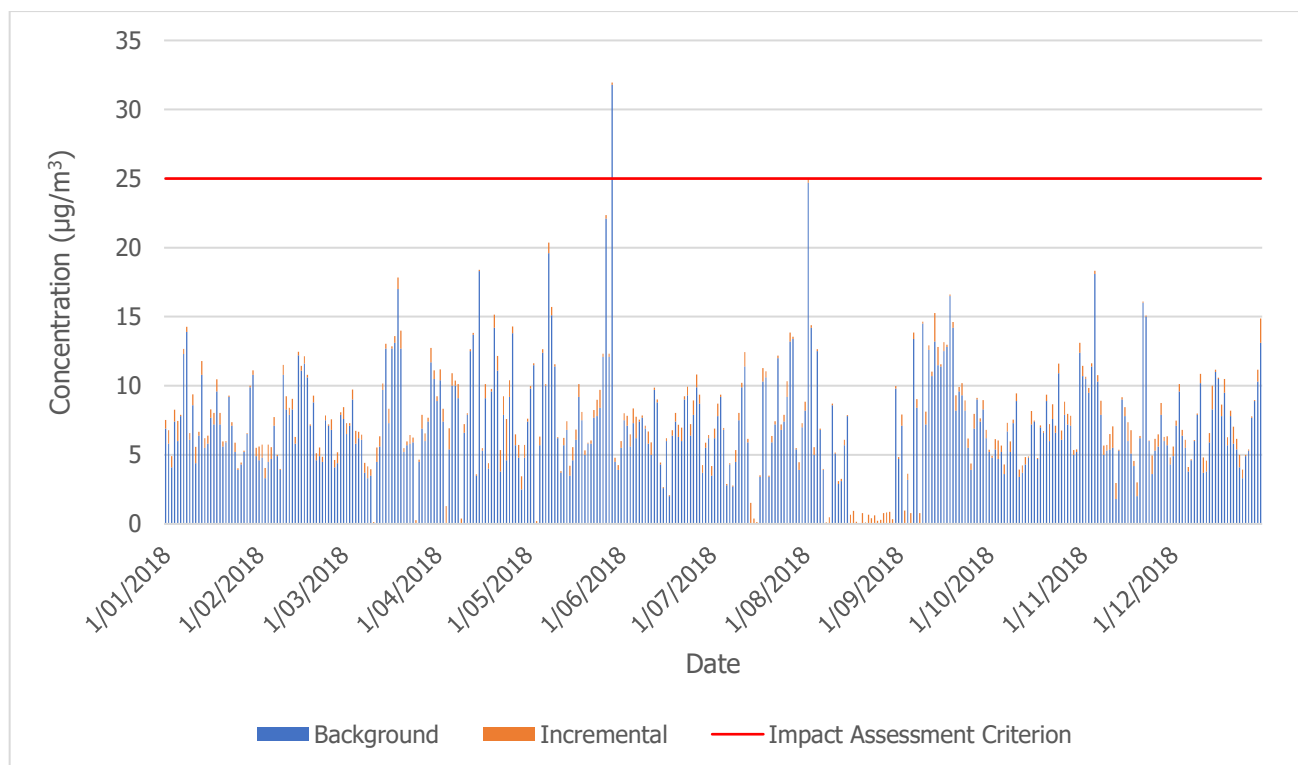


Figure 58 Contemporaneous 24-hour average PM_{2.5} concentrations

Source: Air Quality Impact Assessment, Wilkinson Murray (Appendix M)

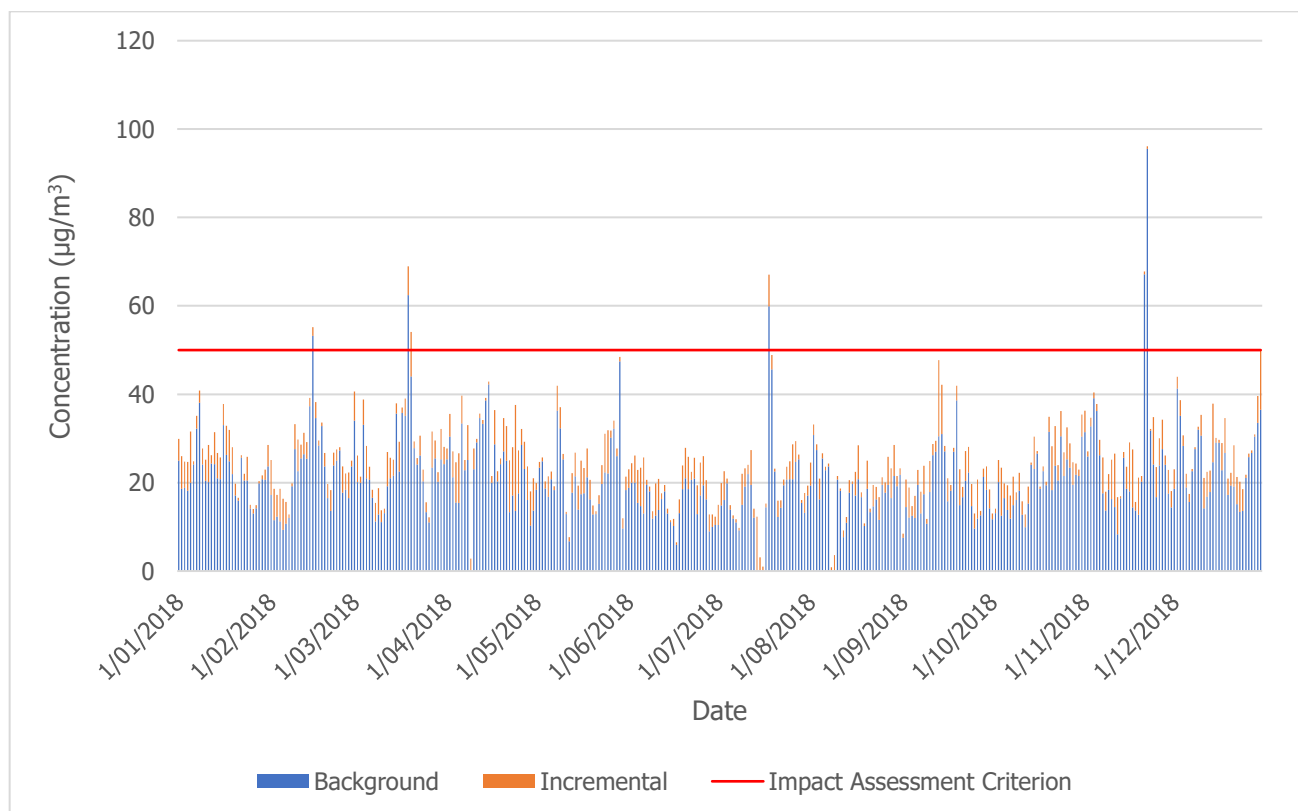


Figure 59 Contemporaneous 24-hour average PM₁₀ concentrations

Source: Air Quality Impact Assessment, Wilkinson Murray (Appendix M)

The operation of the New Resource Recovery Facility and landfill only will be able to demonstrate compliance with the impact assessment criteria for deposited dust at the nearest sensitive receivers.

It should be noted that, within the New Resource Recovery Facility, all material processing will occur within either fully-enclosed or semi-enclosed areas. No specific ventilation systems are proposed for the buildings. Truck loading and unloading activities and stockpiles will be located outside buildings, however dust emissions from these sources will be managed with water sprays.

Notwithstanding the conservativeness of the assessment, subject to the implementation of dust monitoring and reactive management, dust impacts associated with the Proposal are expected to comply with the impact assessment criteria and would therefore be acceptable.

Additionally, all material processing is proposed to be undertaken internal to buildings. Selected materials, including uncrushed brick and concrete, and moisture conditioned crushed brick and concrete products, may be handled or stockpiled external to buildings and where possible these stockpiles will be sheltered from prevailing wind conditions. Only materials that have acceptably low dust emitting potential are proposed to be stored external to a building. These materials are proposed to be further controlled with the use of water-based dust suppression. All dust emissions have been modelled as part of this assessment, and the off-site air quality impacts associated with the Proposal are acceptable. Therefore, the construction of additional sheltered areas is not warranted.

Odour Impact

The predicted ground level odour concentrations associated with the operation of the Proposal show that the predicted odour concentrations comply with the impact assessment criteria at all nearby sensitive receptors.

12.3.2 Cumulative Dust Impacts

Cumulative impacts have been assessed during operation of the New Resource Recovery Facility and Landfill combined with the construction of the Embellished Marang Parklands. During the construction of the Embellished Marang Parklands, the most significant dust generating activities would be:

- Wheel generated dust;
- Handling and shaping fill; and
- Wind erosion.

The use of a water cart on the unpaved roads has been accounted for in the emissions estimation. The construction of the parklands will result in an estimated 39,526.8 kg per year of particulates.

The findings of the cumulative dust impact are very similar to those during operation of the New Resource Recovery Facility and landfill only. The predicted concentrations of dust and particulate matter would comply with the impact assessment criteria at all residential receptors, as shown in **Figure 35**. However, the results indicate the potential for exceedances of the 24-hour average impact assessment criteria for PM_{2.5} and PM₁₀ at the nearby Playing Fields and commercial receptors, and exceedance of the annual average impact assessment criteria for PM_{2.5} at the Playing Fields.

Table 35 Predicted TSP and particulate matter impacts at sensitive receptors

Receptor	PM _{2.5}		PM ₁₀				TSP			
	24-hour		Annual		24-hour		Annual		Annual	
	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total
Goal	25 µg/m³		8 µg/m³		50 µg/m³		25 µg/m³		90 µg/m³	
Greenhills Beach	0.4	25.1	0.1	7.7	3.5	50.9	0.6	21.8	1.1	54.1
Kurnell	0.1	24.8	0.0	7.6	1.1	48.5	0.1	21.3	0.2	53.2
Soccer Field	3.2	27.9	0.7	8.3	26.3	73.7	5.7	26.9	13.2	66.2
Hockey Field	2.3	27.0	0.7	8.3	23.0	70.4	6.5	27.7	22.3	75.3
Commercial	0.6	25.3	0.1	7.7	4.5	51.9	0.6	21.8	1.5	54.5

Source: Air Quality Impact Assessment, Wilkinson Murray (Appendix M)

Similar to the non-cumulative assessment, it is predicted that the cumulative dust impacts will contribute a small amount to the total PM_{2.5} concentrations, with the potential for one additional exceedance of the goal of 25 µg/m³. The cumulative dust impacts will also like result in a moderate contribution to total PM₁₀ concentrations at the hockey field, with the potential for three additional exceedances of the goal of 50 µg/m³.

Analysis of the dispersion modelling results shows that the haul road from the New Resource Recovery Facility to the Embellish Marang Parklands would be the major contributor of dust and particulate matter at the hockey field. However, in the vicinity of the hockey field, the haul route passes through an intersection, at which haul trucks would be travelling much slower than elsewhere along the haul road. As such, the wheel generated dust from haul trucks travelling at these lower speeds would be significantly lower than elsewhere along the haul road. Therefore, the predicted dust and particulate matter impacts at the hockey field are considered to be conservative.

Moreover, the application of a 24-hour dust impact assessment criteria is conservative as the nearby Playing Fields will only be used on an intermittent basis for 1-3 hours per day. As such, it is considered that any dust impacts can be readily managed and mitigated through real-time dust monitoring and reactive management. It is considered most likely that, if PM₁₀ concentrations are managed down to the 24-hour average impact assessment criterion, then PM_{2.5} and deposited dust impacts would also comply with the relevant criteria.

The cumulative deposited dust impacts of the operation of the Resource Recovery Facility and landfill, and construction of the parklands, will result in exceedances of both the incremental and total criteria at the hockey field. Compliance can be achieved at all other receptors.

12.4 Mitigation Measures

In respect of the potential dust impacts described above, the following reactive management trigger levels outlined in **Table 36**, and the dust mitigation measures that are summarised below in **Table 37**.

Table 36 Reactive management trigger levels

Trigger Stage	Averaging Period	Trigger Value (µg/m ³)		Action Required
		PM _{2.5}	PM ₁₀	
1 Investigate	1 hour	45	85	Site Manager to undertake review of possible dust sources operating during the average period. Identify possible measures for these activities; action if deemed necessary.
	3 hour	40	80	
2 Action	1 hour	235	470	Site Manager to attend site and ensure implementation of the control. Effectiveness of control actions to be reviewed and escalate where appropriate.
	3 hour	80	160	
3 Stop Work	1 hour	470	940	Targeted shut down of dust-generating activities until the measured pollutant levels are below the stated trigger value. Identify long-term solutions to dust issues.
	3 hour	160	320	

Table 37 Summary of mitigation measures relating to air quality

Impact	Environmental Safeguard	Responsibility	Timing
General dust impact	• Training all staff and personnel on the need to minimise dust • Site induction to include details regarding measures to minimise dust impacts • On-site vehicles and mobile plant engines switched off when not in use • Visually monitor to ensure no dust plumes travel off site • Review of complaints relating to dust • Monitor weather conditions and ambient air quality to identify periods where off-site dust impacts may be exacerbated	Project Manager and Breen	Construction and operation
Traffic movements	• Watering of unpaved haul roads • Suppressants on unpaved haul roads • Regular cleaning of paved haul roads • Restricting traffic to designated routes • Enforcing on-site speed limits • Keeping vehicle loads covered except when loading/unloading	Project Manager and Breen	Construction and operation
Material handling	• Minimising drop heights • Apply water sprays to loading/unloading activities and at active faces of stockpiles	Breen	Operation
Wind erosion	• Minimise size of exposed areas • Rehabilitate exposed areas as soon as practicable • Cover stockpiles when not in use	Project Manager and Breen	Construction and operation

13.0 Greenhouse Gas Emissions

An Air Quality Impact Assessment has been prepared by Wilkinson Murray, in accordance with the *Technical Guidelines for the Estimation of Greenhouse Gas Emissions by Facilities in Australia* and *National Greenhouse Accounts Factors*, and is provided at **Appendix M**. A summary of the assessment and proposed mitigation measures are provided below.

13.1 Methodology

The following greenhouse gasses have been identified as significant contributors to global warming:

- Carbon dioxide (CO₂);
- Methane (CH₄);
- Nitrous oxide (N₂O);
- Synthetic gases; and
- Hydro fluorocarbons HFCs, SF₆, CF₄, C₂F₆.

The following types of greenhouse gas emissions and energy consumption activities associated with the Proposal:

- Scope 1 Direct Emissions: including combustion of fuel in the facility owned stationary and mobile plant and equipment and methane emissions associated with the operation of landfill.
- Scope 2 Indirect Emissions: including electricity generated off-site that is consumed on the Proposal Site.

Scope 3 emissions are not assessed in relation to this Proposal.

Greenhouse gas emissions are based on estimates provided by the Applicant and published emissions factors. The relevant emission factors were adopted from the *National Greenhouse Accounts Factors, August 2019*.

Scope 1 emission factors for transport fuels are outlined in **Table 38** below.

Table 38 Scope 1 emission factors (transport fuels)

Fuel type	Energy content (GJ/kL)	Emission factor (kg CO _{2-e} /GJ)		
		CO ₂	CH ₄	N ₂ O
Diesel oil	38.6	69.9	0.1	0.6

Source: Air Quality Assessment, Wilkinson Murray (Appendix M)

Scope 1 emissions associated with the operation of the landfill were estimated using an emission factor of 1.2 (t CO_{2-e}/t waste) for commercial and industrial (C&I) waste and 0.2 (t CO_{2-e}/t waste) for construction and demolition (C&D) waste.

Scope 2 emissions were calculated using an emission factor of 0.81 (kg CO_{2-e}/kWh), applicable to electricity produced in New South Wales.

13.2 Assessment of Impacts

Construction greenhouse gas emissions

The main source of greenhouse gas emissions during construction will be the bulk earthworks associated with construction of the Embellished Marang Parklands, resulting from diesel fuel combusted in mobile plant and in generators used to power construction site offices. Emissions associated with the construction of the New Resource Recovery Facility will be small compared to those associated with the construction of the Embellished Marang Parklands and were therefore not assessed. The total diesel fuel consumption associated with the construction of the Proposal would be 2,842 kL and the associated CO_{2-e} emissions would be 7,744 tonnes.

Operational greenhouse gas emissions

Greenhouse gas emissions associated with the operation of the Proposal will result from:

- Fuel combusted in mobile plant;
- Landfill methane emissions; and,
- Electricity used to power the processing equipment, and in offices.

The estimated annual operation CO₂-e emissions are summarised in **Table 39** below.

Table 39 Summary of estimated operational CO₂-e emissions

Source	CO ₂ -e emissions
Diesel	422
Landfill	40,500
Electricity	5,694
Total	46,616

Source: Air Quality Assessment, Wilkinson Murray (Appendix M)

It is noted that the estimation of CO₂-e emissions from landfill is a conservative worst-case scenario as it assumes that the 65,000 tonnes of landfill waste will be entirely comprised of C&I waste. If a significant portion of landfill is C&D waste as proposed, then Greenhouse gas emissions will be lower as greenhouse gas emissions from C&D waste is approximately 80% lower than C&I waste.

Moreover, the Proposal will replace existing diesel-powered plant with electrically powered plant, which will reduce greenhouse gas emissions compared to existing levels.

Overall emissions

The total estimated annual GHG emissions for the Proposal are summarised in **Table 40** below.

Table 40 Summary of estimated overall CO₂-e emissions

Source	CO ₂ -e emissions
Operations	46,616
Parkland construction	3,872
Total	50,488

Source: Air Quality Assessment, Wilkinson Murray (Appendix M)

Wilkinson Murray note that Australia's total greenhouse gas emissions in 2017 amounted to 533.7 million tonnes of carbon dioxide equivalent (MtCO₂-e) according to the Quarterly Update of Australia's National Greenhouse Gas Inventory (December 2017), whilst New South Wales, in 2017, accounted for 128.87 Mt of the total. Therefore, operation of the Proposal will account for an insignificant amount of approximately 0.04% of current NSW emissions.

Moreover, the proposed Resource Recovery Facility will result in a positive impact on overall greenhouse gas emissions by diverting waste from landfill and reducing the need for new raw material generation.

13.3 Mitigation Measures

In order to reduce greenhouse gas emissions, the following mitigation measures for the operation of the proposal are provided in **Table 41**.

Table 41 Summary of mitigation measures relating to greenhouse gas emissions

Impact	Environmental Safeguard	Responsibility	Timing
Greenhouse gas emissions	• Utilise energy efficient building design features such as natural ventilation and lighting, and insulation; and, • Consider on-site renewable energy, such as solar power.	Breen	Operation

14.0 Noise and Vibration

A Noise and Vibration Impact Assessment has been prepared by Wilkinson Murray, in accordance with the EPA's Noise Policy for Industry ('NPfI'), and is provided at **Appendix N**. A summary of the assessment and proposed mitigation measures are provided below.

14.1 Existing Environment

The nearest and most potentially affected residential receivers near the Proposal Site are located in Greenhills Beach, approximately 1.5 km south west of the New Resource Recovery Facility and Kurnell, approximately 2 km to the north east. There are also a small number of dwellings located at Boat Harbour approximately 1.7km south-east of the Proposal Site. Additionally, a number of recreational facilities, hockey fields and a soccer field, are located immediately north of the Proposal Site and several commercial land uses are located approximately 750 metres north east of the Proposal Site (**Figure 60**).

Noise logging was carried out at Greenhills Beach in May 2018 to determine the existing ambient noise levels. Existing ambient noise levels at the closest residential receptors are 33dBA (day), 38 dBA (evening) and 32 dBA (night).

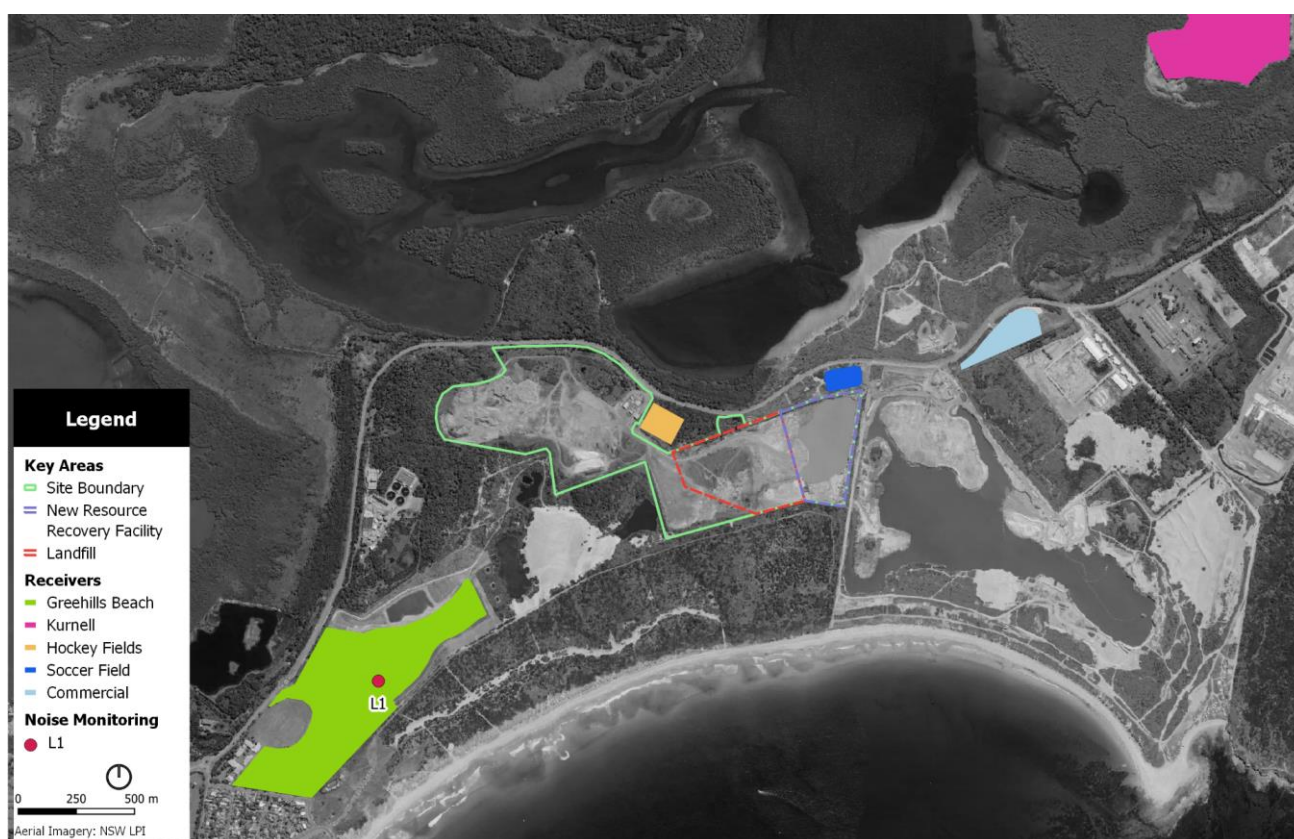


Figure 60 Nearby sensitive receivers and noise monitoring location

Source: Noise and Vibration Impact Assessment, Wilkinson Murray (Appendix N)

14.2 Methodology

Construction of the New Resource Recovery Facility and Embellished Marang Parklands

Project specific noise management levels have been established in accordance with the *Interim Construction Noise Guideline*. They are based on the established Rating Background Level and construction activities being conducted within standard construction hours.

The project specific construction noise management levels for residential receivers near the Proposal Site are outlined in **Table 42**.

Table 42 Project specific construction noise management levels

Receiver	Acceptable LAeq,15min Noise Level (Standard daytime construction hours)	Highly Affected Noise Level (dBA)
All residences	45	75
Playing fields	65	75
Commercial	70	75

Source: Noise and Vibration Impact Assessment, Wilkinson Murray (Appendix N)

Site-related noise emissions were modelled with the “CadnaA” noise prediction software using the CONCAWE noise prediction algorithms. Factors that are addressed in the noise model are:

- Equipment noise level emissions and locations;
- Shielding from ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption; and,
- Atmospheric absorption.
- Wilkinson Murray’s noise modelling considered the worst-case construction noise impacts, which assumes that most of the relevant plant would be operating during most of the 15-minute assessment period.

Operation of New Resource Recovery Facility and Landfill

Project specific noise trigger levels have been established in accordance with the NPfl as being the lower of the Intrusive Noise Level, and the recommended Amenity Noise Level for each sensitive receptor. It is noted that the NPfl stipulates that project intrusiveness noise levels should not be set below 40 dBA during the daytime, and further recommends that the project intrusiveness noise level for evening is set at no greater than that for the daytime. The project specific noise trigger levels for residential receptors calculated for the noise impact assessment are provided below in **Table 43**, with project noise trigger levels shown in bold.

Table 43 Project Noise Trigger Levels

Receiver	Time of Day	Project Intrusiveness Noise Levels (LAeq, 15-min dBA)	Project Amenity Noise Levels (LAeq, 15-min dBA)
All residences	Day (7.00am – 6.00pm)	40	53
	Evening (6.00pm – 10.00pm)	40	43
	Night (10.00pm – 7.00am)	37	38
Soccer and Hockey Fields	When in use	N/A	58
Commercial	When in use	N/A	63

Source: Noise and Vibration Impact Assessment, Wilkinson Murray (Appendix N)

For the playing fields, the project specific noise trigger levels are based on the Amenity Noise Levels set out in the NPfl, and have been adjusted where appropriate to account for existing and other industrial noise sources in the vicinity, as well as to adjust between the LAeq,period noise level, and the LAeq,15min equivalent. A project specific noise trigger level of 55 dBA LAeq, 15-min has been established for the soccer field and 58 dBA LAeq, 15-min for the hockey field.

Operational noise emissions associated with the Proposal were modelled by Wilkinson Murray using the CadnaA acoustic noise prediction software and the CONCAWE noise prediction algorithm. The computer noise model accounted for:

- Equipment noise level emissions and locations;

- Shielding from ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption; and,
- Atmospheric absorption.

The noise modelling takes into account a proposed 4 metre high earthen bund along the northern boundary of the Resource Recovery Facility that will provide acoustic and visual screening to the Playing Fields to the north.

The noise modelling also accounts for temperature inversions during night times by adopting the default temperature inversion parameters recommended in the NPfI. The assessment has found that gradient winds do not affect the Proposal Site and are therefore not included in the assessment.

The Existing Breen Resources Facility is already subject of existing noise management measures, and it is highlighted that in the most recent annual return to the EPA, no noise complaints were reported.

14.2.1 Assessment of Impacts

Construction of the New Resource Recovery Facility and Embellished Marang Parklands

Wilkinson Murray have assessed the predicted $L_{Aeq, 15-min}$ noise levels in the worst-case scenario for the construction of the New Resource Recovery Facility (**Table 44**), and conclude that predicted noise levels associated with the construction of the resource recovery facility can comply with the construction noise management levels at residential receivers. No exceedances of the highly affected level are predicted at any receivers.

Table 44 Predicted $L_{Aeq, 15min}$ Construction Noise Levels for the New Resource Recovery Facility

Receiver	Predicted Noise Level		NML	Highly Affected Level	Exceedance
	Earthworks	Buildings			
Greenhills Beach	<20	<20	45	75	-
Kurnell	24	22	45		-
Soccer Field	61	62	65		-
Hockey Fields	30	31	65		-
Commercial	42	43	70		-

Source: Noise and Vibration Impact Assessment, Wilkinson Murray (Appendix N)

Wilkinson Murray have also assessed the predicted $L_{Aeq, 15-min}$ noise levels in the worst-case scenario for the construction of the Embellished Marang Parklands (**Table 45**), and conclude that predicted noise levels associated with the construction of the parklands can comply with the construction noise management levels at residential receivers. No exceedances of the highly affected level are predicted at any receivers.

Table 45 Predicted $L_{Aeq, 15min}$ Construction Noise Levels for the Embellished Marang Parklands

Receiver	Predicted Noise Level	NML	Highly Affected Level	Exceedance
Greenhills Beach	39	45	75	-
Kurnell	23	45		-
Soccer Field	47	N/A		-
Hockey Fields	60	N/A		-
Commercial	30	N/A		-

Source: Noise and Vibration Impact Assessment, Wilkinson Murray (Appendix N)

Operation

Sources of operational noise from the Proposal will primarily be from the fixed and mobile plant associated with the various waste management activities and heavy customer vehicles such as trucks accessing the Proposal Site. Approximately 53 trucks are expected to enter the Proposal Site in the typical busiest one-hour period.

Wilkinson Murray have assessed the predicted $L_{Aeq, 15-min}$ noise levels in the worst-case operating scenario (**Table 46**), and conclude that the operation of the Proposal can comply with the project noise trigger levels at all sensitive receivers.

Table 46 Predicted $L_{Aeq, 15-min}$ Operational Noise Levels at Sensitive Receivers

Receiver	Predicted $L_{Aeq, 15-min}$ Noise Level (dBA)		Project Noise Trigger Level (dBA)			Compliance
	Calm ²	NE ³	Day ¹	Evening ¹	Night ¹	
Greenhills Beach	<20	24	40	40	37	Yes
Kurnell	26	31	40	40	37	Yes
Soccer Field	54	56	-	58	-	Yes
Hockey Fields	46	51	-	58	-	Yes
Commercial	44	49	-	63	-	Yes

1. Daytime = 7.00am–6.00pm; Evening = 6.00pm – 10.00pm; Night = 10.00pm–7.00am.

2. CONCAWE Category 4

3. CONCAWE Category 6

Source: Noise and Vibration Impact Assessment, Wilkinson Murray (Appendix N)

Wilkinson Murray have also assessed the predicted L_{Amax} operating noise levels. Pneumatic parking brakes on trucks are considered the most likely potential source of maximum noise levels during night time operation. The results of noise modelling conclude that the predicted L_{Amax} operating noise levels at residential receivers can comply with the maximum noise trigger level at all times. As such, no assessment of potential sleep disturbance impacts was required.

Cumulative Noise Levels

Wilkinson Murray have assessed the predicted cumulative $L_{Aeq, 15-min}$ noise levels in the worst-case scenario of concurrent operation of the New Resource Recovery Facility and landfill and the construction of the Embellished Marang Parklands, which are outlined in **Table 47**.

Table 47 Predicted cumulative $L_{Aeq, 15-min}$ noise levels

Receiver	Predicted noise level
Greenhills Beach	39
Kurnell	28
Soccer Field	55
Hockey Fields	60
Commercial	44

Source: Noise and Vibration Impact Assessment, Wilkinson Murray (Appendix N)

As shown above, the predicted cumulative noise impacts remain below the project noise trigger levels and construction noise management levels for the most sensitive residential receivers. Therefore, the Proposal does not result in an unacceptable acoustic impact to surrounding sensitive receivers.

Vibration Assessment

When assessing vibration there are two components that require consideration:

- Human exposure to vibration.

- The potential for building damage from vibration.

DECCW's Assessing Vibration: A Technical Guideline provides guidance for assessing human exposure to vibration is based on British Standard BS6472:1992. Under the guideline a preferred human comfort vibration goal is established for residential property during the daytime as a peak particle velocity (PPV) of 0.28 (8.6 mm/second), with a maximum PPV of 0.56 (17.0 mm/second).

There are currently no Australian Standards or guidelines to provide guidance on assessing the potential for building damage from vibration. It is common practice to derive goal levels from international standards such as British Standard BS7385:1993, which recommends limits for transient vibration to ensure minimal risk of cosmetic damage based on the frequency of the vibration and the nature of the impacted building. The more conservative goals of 20 mm/s for residential buildings and 50 mm/s for commercial and industrial buildings have been adopted for the Proposal.

In addition to the above goals, the recommended safe working distances for vibration intensive plant is identified in the Transport Construction Authority's Construction Noise Strategy. Under this strategy, the safe working distances for building damage and human comfort applicable to the largest foreseeable vibratory roller are 25 metres and 100 metres, respectively. During the construction of the New Resource Recovery Facility and the Embellished Marang Parklands, vibratory rollers are unlikely to be operated within 25 meters of off-site buildings or within 100 metres of residential receivers. Therefore, vibration impacts during construction are considered unlikely.

14.3 Mitigation Measures

The Breen Resources Facility is already subject of existing noise management measures, and it is highlighted that in the most recent annual return to the EPA, no noise complaints were reported.

As such, **Appendix N** concludes that the Proposal is able to comply with all relevant project-specific construction and operational noise criteria, and additional mitigation measures are not required.

15.0 Traffic and Transport

A Traffic and Transport Technical Study has been prepared by Cardno and is included at **Appendix O**. A summary of the assessment and proposed mitigation measures are provided below.

15.1 Methodology

The assessment methodology included undertaking a physical inspection of the Proposal Site and broader locality, traffic data collection, review of alternate transport modes and review of road safety conditions.

Data collection

Due to the impact of the COVID-19 Pandemic on travel behaviour, the assessment relies on traffic data collected in 2018 and 2016. The benefit of the 2018 traffic surveys is it aligns with the site-specific weighbridge data for the Existing Breen Resources Facility. This data is considered to be appropriate in defining baseline conditions, unaffected by COVID-19. Traffic data was collected in the form of intersection and midblock surveys. The midblock traffic survey was undertaken for 7 consecutive days from Wednesday 9 May 2018 to Wednesday 16 May 2018, whilst intersection survey counts were obtained on Wednesday 9 May 2018 from 7.00am to 10.00am and 4.00pm to 7.00pm. The location of the traffic surveys is shown in **Figure 61**. In addition, traffic data has been sourced from other approved developments in the regional, namely the Woollooware Bay town centre (Cronulla Sharks development) located to the west of the Proposal Site to cover the entire traffic modelling study area.

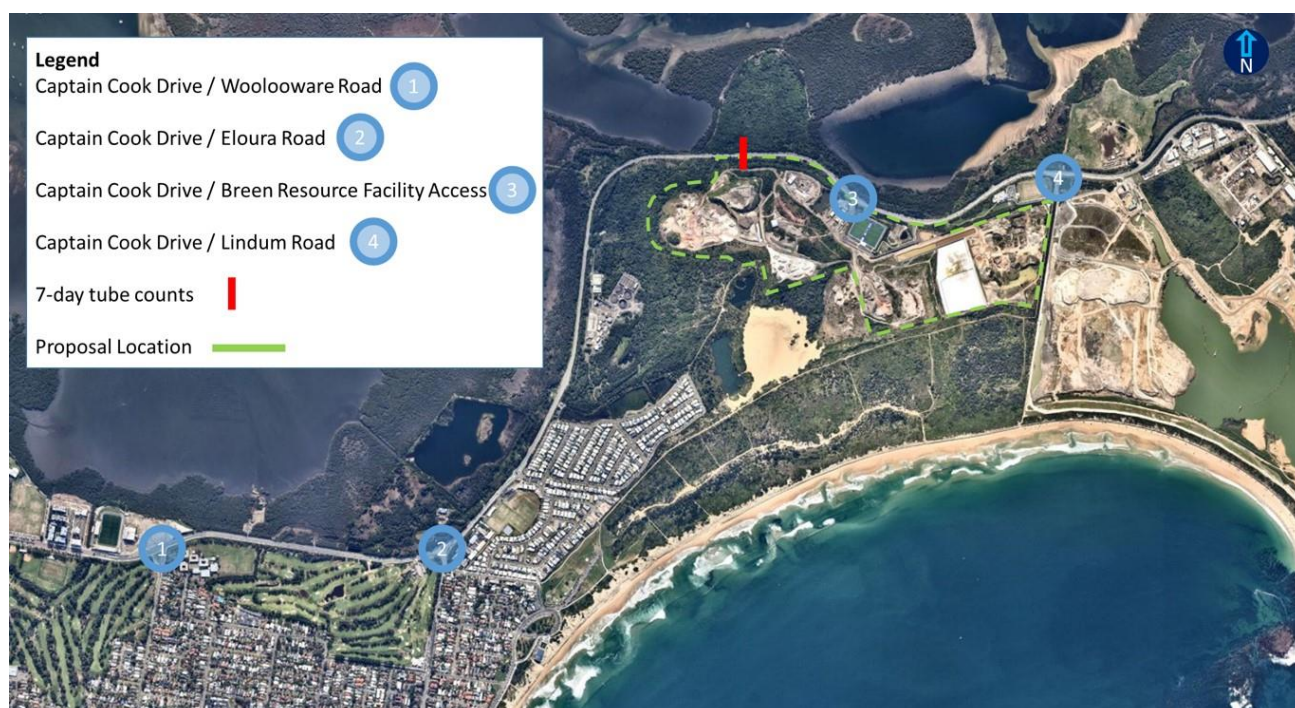


Figure 61 Traffic survey volume locations

Source: Traffic and Transport Technical Study, Cardno (Appendix O)

Parking analysis

Cardno have assessed the on-site parking requirement in accordance with Sutherland Shire Council Development Control Plan 2015 (DCP). However, in this instance Cardno has considered it more appropriate to review the current operations and staffing levels for the Existing Breen Resources Facility, whilst adopting a first principles approach to parking for the Embellished Marang Parklands (consistent with the 2011 assessment for the Playing Fields), rather than adopting Council's DCP which is considered to be generic for the whole Local Government Area and not specific for the Proposal.

With regard to the New Resource Recovery Facility, as it will, in part, replace the Existing Breen Resources Facility, the parking demand from the Proposal can be benchmarked against the existing operation. The adoption of a first principles approach with respect to the Embellished Marang Parklands also offers a more plausible parking assessment and practical outcome to ensure sufficient parking is provided for the parkland demands.

Cardno's assessment of the internal circulation and roadways has been prepared with regard to the DCP, RMS (now TfNSW) Guide to Traffic Generating Developments, Austroads Guide to Traffic Management and Australian Standard for Parking Facilities. This ensures the Proposal sufficiently satisfies design requirements and minimises operational impacts to the Resource Management Facility and its visitors.

The assessment of parking demand also considers the construction phase of the Proposal to ensure there will be no detrimental impact on parking availability and locations during construction of the Proposal

Traffic Modelling

In order to assess the traffic impacts of the Proposal, Cardno have identified the suitable criteria to be the capacity and performance of key intersections along Captain Cook Drive. The potential impacts have been assessed using SIDRA which is a software widely accepted by Council and TfNSW and is suitable for the Proposal Site's locality.

The following traffic scenarios have been assessed for the weekday morning and afternoon peak hour:

- 2018 Base;
- 2021 Base (assumed year of opening but with no Proposal);
- 2021 Base plus Proposal;
- 2031 Base (10 year design horizon but with no Proposal); and
- 2031 Base plus Proposal

The assessment of traffic scenarios in future years accounts for cumulative traffic impact generated by the sport fields from 2021 and completed Woollooware Bay Town Centre Sharks Redevelopment from 2031. By considering the regional traffic, the Proposal and other nearby development, the assessment sufficiently considers the cumulative traffic impact on Captain Cook Drive and key intersections.

Intersection performance is primarily assessed based on the Degree of Saturation (DoS), Average Delay in seconds, Level of Service (LoS) and 95% Back of Queue distance in metres. Level of Service (LoS) is the standard measure used to assess the operational performance of the network and intersections. Level of Service is ranked from LoS A to LoS F, with LoS A representing the best performance and LoS F the worst (**Table 48**).

Table 48 Level of Service Criteria for intersections

Level of Service	Average Delay per Vehicle (seconds/vehicle)	Traffic Signals, Roundabout	Giveway & Stop Signs
A	< 14	Good Operation	Good Operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near Capacity & accident study required
E	57 to 70	At Capacity, at signals incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode
F	> 70	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires additional capacity.

Source: Traffic and Transport Technical Study, Cardno (Appendix O)

15.2 Existing Environment

Captain Cook Drive is a local, unclassified road under the care and maintenance of Council, linking between Taren Point Rd-The Boulevard and Torres Street. The road is configured as two lane total with one lane in each direction separated by a dividing line and a posted speed limit of 80 km/hour. It is an approved heavy vehicle route for vehicles up to and including 26m B-Double.

Lindum Road is a local, unclassified road under the care and maintenance of the Council. This road connects Captain Cook Drive at an existing round-about, and provides access to Playing Field No. 1 as well as the existing sand mining operation on the site to the east (access to Boat Harbour is also via the sand mining site, and is also currently accessed via Lindum Road). The road is configured as two lane which is not separated by a dividing line, and a speed limit of 50 km/hour. It is accessible for general access vehicles including 19m semi-trailers.

Elouera Road is a Local Road under the care and maintenance of Council, connecting Captain Cook Drive with Kingsway at North Cronulla Beach. The road is configured as two lanes with one in each direction separated by a dividing line. The speed limit is 50km/hour, and the school zone speed limit of 40km/hour is applicable near Cronulla High School. Restricted kerbside parking is available on both sides of the road with parallel parking permitted on the east side and parallel and perpendicular parking available on the west side.

Woolooware Road is a Local Road under the care and maintenance of the local council, linking Captain Cook Drive and Denman Avenue. The road is configured as two lanes with one in each direction separated by dividing line. The speed limit is 50km/hour, and the school zone speed limit of 40km/hour is applicable near Woolooware High School. Unrestricted kerbside parking is available on both sides of the road.

The traffic survey results show that during an average weekday, some 10,850 two-way vehicles travel along Captain Cook Drive. This is inclusive of heavy vehicles, which make up some 10% of the total traffic volume. The peak two-way traffic volume recorded was 928 vehicles at 5pm on a Wednesday, whilst the weekend peak occurred on Saturday with 745 vehicles (being approximately 20% lower than the weekday peak).

Intersection surveys have also been undertaken at the Existing Breen Resources Facility site access on Captain Cook Drive, as well as at the Lindum Road intersection, during the morning and afternoon weekday peak hour periods. SIDRA modelling was completed for the nearby intersections to the Proposal Site:

- Woolooware Road/Captain Cook Drive;
- Elouera Road/Captain Cook Drive;
- Site Access 1/Captain Cook Drive;
- Hockey Field Access/Captain Cook Drive; and
- Lindum Road/Captain Cook Drive.

Important to note is the change to the intersection type from a roundabout to signals for Woolooware Road/Captain Cook Drive, in June 2020, with updated traffic surveys not being completed since that change due to the COVID-19 Pandemic. As such, Cardno adopted previous 2016 survey data results and updated these within the SIDRA program. All other intersections were modelled using the 2018 survey data as indicated above, excluding the Hockey Field Access/Captain Cook Drive, which is currently only used when games are being held, which are infrequent. At other times the access is gated, and therefore no 2018 base model has been developed.

The weekday peak hour typically occurs at 8:00-9:00am and 5:00-6:00pm, which are typically identified as the 'commuter' peak hours.

Table 49 Base intersection performance on current survey information

Intersection	Peak	Degree of Saturation	Average Delay per Vehicle (seconds/vehicle)	Level of Service
Woollooware Road/Captain Cook Drive	AM	0.855	26.9	B
	PM	0.855	26.9	B
	Saturday	0.779	27.6	B
Elouera Road/Captain Cook Drive	AM	0.427	15.1	B
	PM	0.456	14.3	A
	Saturday	0.365	13.7	A
Site Access 1/Captain Cook Drive	AM	0.258	30.2	C
	PM	0.329	20.3	B
	Saturday	0.22	11.4	B
Lindum Road/Captain Cook Drive	AM	0.291	9	A
	PM	0.368	8.1	A
	Saturday	0.286	10.3	A

Source: Traffic and Transport Technical Study, Cardno (Appendix O)

15.3 Assessment of Impacts

15.3.1 Parking Assessment

The number of car parking spaces to be provided on the New Resource Recovery Facility site has been established based on a review of the Existing Breen Resources Facility operations and staffing levels. Currently, the Existing Breen Resources Facility operates with 52 staff on-site at any one time, with (on average) 4 visitors throughout the day. A number of staff carpool to the Existing Breen Resources Facility, and are encouraged to do so. The worst case scenario is to assume that all staff and visitors drive, and are parked on-site at the same time. This is a total of 56 parked vehicles. In the future the maximum number of staff and visitors expected to be on-site at any one time is 80. The New Resource Recovery Facility site has sufficient space to cater for some 88 car parking spaces. This level of parking is highly unlikely to be fully utilised, however, does allow for atypical operations and is considered appropriate for the purposes of this assessment.

Similar to the car parking requirement, it is best practice to establish the service vehicle parking requirements based on the existing operation. Currently, the facility requires layover parking for contractors and customers to uncover their load prior to entering the weighbridge. It is proposed to provide four truck layover spaces, one for car and trailer, and three car / utility vehicle layover spaces in the relocated 'depot' area. Internally there are a number of loading bays, wheel wash zones and other ancillary requirements.

In accordance with the DCP, motorcycle parking should be provided at the rate of 1 motorcycle space per 25 car spaces. Therefore, based on the 88 car parking spaces, a total of 4 motorcycle parking spaces are required. There is adequate space within the car parking areas to provide these spaces.

In accordance with the DCP, bicycle parking should be provided at a rate of 1 bicycle parking space per 10 car parking spaces. Therefore, based on the 88 car parking spaces, a total of 9 bicycle parking spaces are required. There is adequate space within the car parking areas to provide these spaces.

15.3.2 Traffic Impact Assessment

Traffic generation from New Resource Recovery Facility

The Proposal will result in an approximate 37% increase in C&D and C&I material on the 2017/2018 intake. Moreover, the future potential export from the New Resource Recovery Facility is some 3.6 times greater than the recorded 2017/18 year. As a result, there is an expected increase in daily traffic movements from 585 to 1070 two-way vehicles on weekdays, and from 227 to 422 two-way vehicles on Saturdays. There will be a forecast increase of 53 two-way vehicles during the morning peak from 8:30am to 9:30am and 34 trips on Saturdays. However, the

New Resource Recovery Facility is highly unlikely to contribute any heavy vehicle movements to the evening peak hour from 5:00pm to 6:00pm as there is little to no activity that overlaps with the evening peak hour.

Traffic generation from Future Embellished Marang Parklands

The Embellished Marang Parklands will have 200 car parking spaces. A first principles assessment has been undertaken to determine the traffic generation potential of the Embellished Marang Parklands area. The following trip generation assumptions have been made:

- 170 spaces utilised, being a 0.85 design limit, with 0.5 vehicle trip movements per car space.
- A factor of 0.5 for AM peak, leading to the generation of 43 trips during AM peak.
- A factor of 0.75 for PM Peak, leading to the generation of 64 trips during PM peak.
- A factor of 1.0 for Saturdays leading to the generation of 85 trips during on Saturdays.

Additional surrounding traffic generation

As the New Resource Recovery Facility proposes to have its main entry / exit point onto Lindum Road, an assessment of the Lindum Road roundabout has been undertaken. In order to comprehensively assess the roundabouts performance, the traffic generation associated with the recreational playing fields has also been considered. The traffic assessment prepared for the playing fields, identifies that there will be an additional 60 vehicle trips turning into and out of the Lindum Road roundabout during the Saturday midday peak hour with an additional 160 peak hour vehicle trips travelling east and west through the roundabout on Captain Cook Drive during the same period. However, the peak hour for the recreational fields is limited to a weekend and weekday evening, and not the weekday morning period. For this reason, a nominal 50% reduction in the weekend trip generation associated with the playing fields has been applied to the weekday morning peak hour.

Additional trips generated by the Boat Harbour Access Relocation to Lindum Road, which is yet to be completed, has also been considered. It is expected to generate 3 trips in AM peak, 13 trips in PM Peak and 25 trips on Saturdays. As such, additional trips generated by the Boat Harbour Access Relocation is negligible. Additional trips generated by Woollooware Bay Town Centre redevelopment, which is yet to be completed, has also been considered.

To account for other developments in the region and increased traffic generation associate with population growth, a 1% background traffic growth along Captain Cook Drive and Elouera Road has been included.

Intersection Performance

Based on the expected traffic generation as a result of the Proposal and cumulative traffic generation, Cardno's SIDRA modelling has generated the following conclusions for the intersection performance of the following intersections:

- Woollooware Road/Captain Cook Drive;
- Elouera Road/Captain Cook Drive;
- Site Access 1/Captain Cook Drive;
- Hockey Field Access/Captain Cook Drive; and
- Lindum Road/Captain Cook Drive.

The base conditions for 2021 are summarised below for each of these intersections:

- the signalised intersection of Captain Cook Drive/Woollooware Road is estimated to operate at LoS "C" during base conditions, which is reflective of good operation with acceptable delays;
- the roundabout intersection of Captain Cook Drive/Elouera Road is estimated to operate at LoS "B" or better during the base conditions, which is reflective of good operation with acceptable delays;
- The priority controlled intersection of the Site Access Road/Captain Cook Drive is estimated to operate at LoS "B" during the base conditions, which is reflective of good operation with minimal delays;

- The priority controlled intersection of Captain Cook Drive / Hockey Field access is estimated to operate at LoS “B” or better during the base conditions, which is reflective of good operation with acceptable delays; and
- The roundabout intersection of Captain Cook Drive / Lindum Road is estimated to operate at LoS “A” during the base conditions, which is reflective of good operation with minimal delays.

Base conditions for 2031 modelling is summarised below for each of these intersections:

- The signalised intersection of Captain Cook Drive / Woollooware Road is estimated to operate at LoS “C” in the AM and LoS “E/F” in the PM / Saturday period under baseline conditions. The LoS “E/F” is considered to be unsatisfactory and reflective of increased delays and queuing;
- The roundabout intersection of Captain Cook Drive / Elouera Road is estimated to operate at LoS “C” or better during the base conditions, which is reflective of satisfactory operation;
- The priority controlled intersection of Captain Cook Drive / Existing Breen Resource Facility access is estimated to operate at LoS “C” during the base conditions, which is reflective of good operation with minimal delays;
- The priority controlled intersection of Captain Cook Drive / Hockey Field access is estimated to operate at LoS “C” or better during the base conditions, which is reflective of satisfactory operation; and
- The roundabout intersection of Captain Cook Drive / Lindum Road is estimated to operate at LoS “A” during the base conditions, which is reflective of good operation with minimal delays.

A summary of the modelled results for 2021 and 2031 is provided in **Table 50**. This also assumes a regional traffic growth rate of 1% background growth, plus the proposal being operational.

Table 50 Intersection performance on current survey information with the proposal being operational

Intersection	Peak	Degree of Saturation		Average Delay per Vehicle (seconds/vehicle)		Level of Service	
		2021	2031	2021	2031	2021	2031
Woollooware Road/Captain Cook Drive	AM	0.892	0.94	28.4	35.1	B	C
	PM	0.882	1.068	25.6	64.2	B	E
	Saturday	0.774	1.09	29.6	92.4	C	F
Elouera Road/Captain Cook Drive	AM	0.493	0.501	17.1	17.4	B	B
	PM	0.501	0.881	17.4	28.4	B	C
	Saturday	0.566	0.757	18.6	26.6	B	B
Site Access 1/Captain Cook Drive	AM	0.357	0.428	30.1	45.1	C	D
	PM	0.351	0.387	27.7	34.1	B	C
	Saturday	0.336	0.307	26	26.7	B	B
Hockey Field Access/Captain Cook Drive	AM	-	-	-	-	-	-
	PM	0.351	0.387	27.2	35.2	B	C
	Saturday	0.383	0.407	26.1	28	B	B
Lindum Road/Captain Cook Drive	AM	0.388	0.423	13	13.5	A	A
	PM	0.424	0.454	11.6	12.1	A	A
	Saturday	0.403	0.41	11.2	11.4	A	A

Source: Traffic and Transport Technical Study, Cardno (Appendix O)

Based on the modelling of the base scenario plus the operation of the Proposal as outlined in **Table 50**, the following changes to traffic in year 2021 are anticipated:

- The intersection of Woollooware Road / Captain Cook Drive will have a negligible impact from the Proposal, with little to no change in delay across the peak hours. It is noted that the Saturday result shifts from LoS “B” to LoS “C”, however the delay increase is some 2 seconds where the baseline condition for 2021 is on the cusp of LoS

“B” and LoS “C” without the Proposal generated from the traffic. In any case, LoS “C” is a satisfactory performance for this intersection;

- The traffic generated by the proposal results in little to no change in intersection performance for Elouera Road/Captain Cook Drive, with LoS “B” retained across all peak hours;
- The Existing Breen Resources Facility site access intersection on Captain Cook Drive has little impact occurring from the Proposal. It is however noted that the LoS “C” reported in the AM peak hour is based on the worst movement which results in the LoS C. This is associated with the right turn from the Proposal Site onto Captain Cook Drive, which in most cases is 1-2 vehicles in the hour. The more critical left turn out and right turn into the Proposal Site operate satisfactorily at LoS A;
- There is minimal impact on the Captain Cook Drive/Hockey Field access intersection performance as a result of traffic generated by the Proposal; and
- There is minimal impact on the Lindum Road/Captain Cook Drive intersection performance as a result of the Proposal. Delays to through movements along Captain Cook Drive will remain relatively unchanged and will have minimal queueing as a result.

In 2031, modelling indicates the impacts of the base scenario plus the operation of the Proposal, as summarised below:

- The intersection of Woollooware Road / Captain Cook Drive is subject to minor performance changes due to the additional traffic associated with the Proposal in the AM period, however this is largely due to the SIDRA program balancing the phasing time for all approaches. The LoS C reported in the baseline condition is retained under the Proposal scenario. With regard to the PM and Saturday, the Proposal impact results in relatively minor change to delays with the LoS “E/F” being retained. The LoS “F” identified for the Saturday performance is not triggered as a result of the Proposal given it occurs in the forecasted baseline condition. The additional traffic at this location as a result of the Proposal is some 3.7% increase above what is estimated to occur in the year 2031. This is a relatively minor increase which supports the increase in delay of some 10 seconds;
- The traffic generated by the Proposal results in little to no change in intersection performance for Elouera Road/Captain Cook Drive, with LoS “C” or better being retained;
- With the inclusion of traffic associated with the Proposal for the Existing Breen Resources Facility site access intersection on Captain Cook Drive, the performance changes from LoS C to LoS D. It is however noted that the worst movement which results in the LoS D is associated with the right turn from the Proposal Site onto Captain Cook Drive, which in most cases is 1-2 vehicles in the hour. The more critical left turn out and right turn into the Proposal Site operate satisfactorily at LoS A;
- There is minimal impact on the Captain Cook Drive/Hockey Field access intersection’s performance as a result of traffic generated by the Proposal; and
- There is minimal impact on the Lindum Road/Captain Cook Drive intersections performance as a result of the Proposal. Delays to through movements along Captain Cook Drive will remain relatively unchanged and will have minimal queueing as a result.

In relation to queueing, Cardno has concluded that the proposed weighbridge and on-site setup will operate efficiently such that queueing to the public domain will not occur.

Road safety considerations

Cardno has assessed the proposed driveway and internal circulation and determined that there is negligible to no risk of truck rollovers on-site. This is due to flat grades throughout the New Resource Recovery Facility site (being no more than 2%) and due to the small and contained nature of the facility. As such, no additional protections such as barriers are required.

Impacts on pavement condition

The majority of Captain Cook Drive’s pavement condition is considered to be average or above, where more noticeable defects are limited to the Existing Breen Resources Facility access and on approach to the roundabout intersection at Trinity Street. It is expected that additional heavy vehicle movements associated with the Proposal

would result in some deterioration in the pavement condition, however, would not necessarily require additional treatment beyond the current maintenance procedures that are undertaken by Council.

There is the potential to improve the pavement condition at the Existing Breen Resources Facility access on Captain Cook Drive when the playing fields are constructed, and formalised access is created in this location.

Conclusion

Cardno's analysis of all transport related impacts has found that the traffic generated by the Proposal is expected to have a minimal impact to the surrounding road network in terms of traffic flow efficiency and road safety. In particular, the Proposal, which provides for a 650,000 tonnes per annum intake, is actually less than what has previously been accepted at the Existing Breen Resources Facility historically, and therefore this would be a beneficial outcome for the general public as it will limit the number of vehicular movements to and from the Proposal Site.

However, Cardno acknowledge that the road environment will significantly change from the current industrial setting to a more active roadside with completion of the playing fields and creation of the Embellished Marang Parklands.

15.3.3 Construction Transport Assessment

Construction hours are proposed to be in accordance with the NSW Interim Construction Noise Guideline, with construction between 7am and 6pm weekdays and 8am to 1pm on Saturdays.

During the various construction phases, it is expected that up to 80 personnel may be required on-site at any one time. There may be instances where some of these personnel consist of existing Breen employees in association with the Existing Breen Resources Facility. Travelling to / from the Proposal Site for construction contractors is likely to be dominated by private vehicle based on the relatively low level of public transport and proximity to other transport services and facilities. Given the large area of the Proposal Site, as well as the concurrent activities associated with the playing field construction, it is expected there will be adequate on-site parking to facilitate parking of contractor vehicles.

The construction vehicle types are expected to be consistent with those previously used for the construction of the existing Playing Fields, including 25m B-doubles, 19m Semi-trailers, 19m Truck & Dogs and Rigid Trucks. On-site, the use of excavators, graders, watercarts and other specialised machinery will be required.

Whilst most of the required fill and other materials will be processed through, and supplied from, the New Resource Recovery Facility, and thus limiting the amount of fill material from external sources, there will still be the need for large vehicles to visit the Embellished Marang Parklands site during construction. The Existing Breen Resources Facility site access on Captain Cook Drive will be retained for use during construction. Once the new Lindum Road access is constructed it could be used as the main access for construction of the Embellished Marang Parklands, although access arrangements to the Proposal Site will vary through the life of the construction program depending on the location of construction activity and staging.

Based on the construction detail proposed and the reuse of existing haulage routes (being along Captain Cook Drive) and the proposed reuse of recovered material on the Proposal Site, Cardno envisage that construction will have negligible impact on traffic conditions on Captain Cook Drive. The proposed works are not expected to introduce any considerable additional construction vehicles to Captain Cook Drive. No alterations to the Existing Breen Resources Facility site access from Captain Cook Drive will be required. There is likely to be movements associated with the delivery of machinery as well as contracted employees. Delivery of machinery is expected to add 2-4 movements per day in early stages of the construction program. The estimated contracted employees are forecast to add 80 inbound trips in the morning and 80 outbound trips in the afternoon (progressively leaving the Proposal Site once on-site work slows down).

Overall, Cardno's assessment concludes that the traffic generation during the construction phase would be less than what has been modelled and assessed during the operation of the proposal. Further, most of the required fill and other materials will be processed through, and supplied from, the New Resource Recovery Facility, and thus limiting the amount of fill material from external sources, further reducing the construction traffic impacts of the Proposal. As such, the construction of the Proposal will have a negligible impact on the surrounding road network.

15.4 Mitigation Measures

In respect of the traffic and transport assessment above, the Report recommends the following mitigation measures that are summarised below in **Table 51**.

It is also highlighted that the completion of the approved sport fields and the development Embellished Marang Parklands will result in a significant change from the current industrial setting to a more active road side with. Cardno therefore suggest that Transport for NSW should consider reducing the speed limit from 80km/h to 60-70km/h along the Captain Cook Drive frontage.

Table 51 Summary of mitigation measures relating to traffic and transport

Impact / Issue	Environmental Safeguard	Responsibility	Timing
Operation of New Resource Recovery Facility			
Operational Traffic Management Plan	A traffic management plan that details the traffic operation and control of all on-site activities. As a minimum, the OTMP is to provide details and assessment of: • Site signage and wayfinding; • Loading procedures and hazard identification; • Internal and external pedestrian movement plans; • Internal and external vehicular movement plans; • Parking locations and requirements; • Employee and visitor induction requirements; • General traffic procedures and rules to be adhered to; • Site specific traffic information not listed above.	Breen	Pre-operation
Workplace Travel Plan	A workplace travel plan is recommended to promote sustainable travel trends, such as car pooling or public transport. The travel plan should provide the following details and assessment: • Bus routes and service timetables, inclusive of the nearest bus stop location and pathways. Subsidised OPAL trips may also be considered as an incentive for employees; • Incentives for carpooling of employees where possible, and the appropriate mechanism to enable employees to connect with each other to promote carpooling; • Provision of secure bicycle parking and end-of-trip facilities such as changeroom facilities (i.e. showers) • Promotion of sustainable travel modes through engaging activities / competitions (e.g. STEPtember).	Breen	Pre-operation
Signage and pedestrian priority measures at the New Resource Recovery Facility site driveway / Lindum Road extension	Signage (e.g. give-way to pedestrians), traffic calming (e.g. speed humps or raised thresholds) and line marking (e.g. zebra crossing) are to be considered	Breen	Pre-operation
Operation of future Embellished Marang Parklands			
Signage and Wayfinding Strategy	Development of a comprehensive signage plan that integrates with the approved sport fields (which are not part of this SSD). This is to ensure sufficient level of detail is provided to visitors on parking locations, facilities, emergency access points, loading and disabled parking. This will seek to minimise the level of internal traffic movements associated with circulation and parking	Breen	Pre-operation
Construction			
Construction Traffic Management Plan (CTMP)	A Construction Traffic Management Plan (CTMP) shall be prepared by suitably qualified professional to manage and mitigate potential traffic impacts during the construction program. The CTMP provide specific details on the construction program, once known, and include the following:	Contractor	Pre-construction

Impact / Issue	Environmental Safeguard	Responsibility	Timing
	- temporary traffic controls, including detours and signage; - notifying the local community about construction-related traffic impacts; - minimising potential conflict between construction-related traffic and: - Sports clubs - Adjacent land owners - implementing measures to minimise construction-related traffic on the public road network outside of standard construction hours; - ensuring construction-related traffic does not track dirt onto the public road network; - ensuring loaded vehicles entering or leaving the site have their loads covered or contained; - providing sufficient parking on site for all construction-related traffic; - responding to any emergency repair requirements or maintenance during construction - a traffic management system for managing over-dimensional vehicles; - fatigue management include a drivers code of conduct that addresses: - travelling speeds; - procedures to ensure that drivers to and from the site adhere to the designated over dimensional and heavy vehicle routes; and - procedures to ensure that drivers to and from the site implement safe driving practices; and - include a detailed program to monitor and report on the effectiveness of these measures and the code of conduct.		
Internal Management Strategy	An internal management strategy shall be established within the construction site. This strategy shall form part of the site's induction that will be undertaken by all personnel on-site. It shall include the following key items to be implemented: 10 km/h speed limit on internal access roads; - Radio communication between construction vehicles available at all times; - All loads to be correctly restrained; and - Warning signage to be provided at critical areas and intersection points.	Contractor	Pre-construction
On-site parking during construction	The on-site parking within the construction compound is required to provide a dedicated safe area where personnel can access their vehicles.	Contractor	Construction

16.0 Fire and Incident Management

16.1 Bushfire

A Bushfire Assessment Report has been prepared by GHD and is included at **Appendix P**. A summary of the assessment and proposed mitigation measures are provided below.

16.1.1 Existing Environment

Bushfire prone land classification

The Proposal Site is classified as bushfire prone land due to the presence within parts of the Proposal Site of bushfire-prone Vegetation Category 2, and also the proximity of the Proposal Site to bushfire-prone Vegetation Category 2 on adjacent land. Bushfire prone land mapping for the Proposal Site (accessed via ePlanning Spatial Viewer, 2020), is depicted at **Figure 62**.

In **Figure 62**, it can be seen that bush fire prone vegetation within the Proposal Site is largely restricted to Vegetation Category 2 in the western part of the Proposal Site on Lot 1122 and Lot 1123, and near the southern boundary of Lots 5 and 6, and near the northern boundary of Lot 5. Vegetation Buffers applying to Vegetation Category 2 on adjacent land also extend within all Lots.

Vegetation Category 2 is considered to be a lower bush fire risk, being lower than both Category 1 and Category 3. It is represented as light orange on a bush fire prone land map and has been given a 30 metre buffer. This vegetation category includes patches of remnant vegetation which have lower combustibility and/or limited potential fire size due to the vegetation area shape and size.

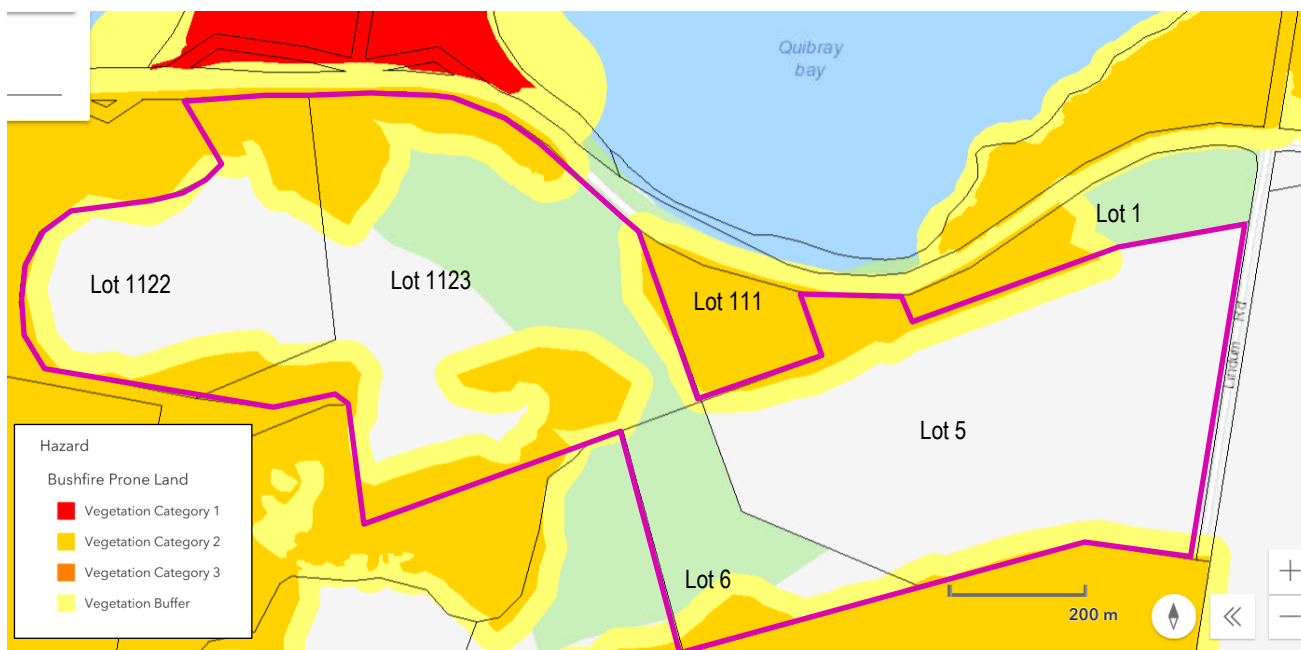


Figure 62 Bushfire Prone Land Mapping

Source: ePlanning Spatial Viewer, 2020

Bushfire-prone vegetation clearance

Since the bushfire-prone land mapping at **Figure 62** was undertaken, further changes to vegetation cover have occurred, and further clearance of degraded vegetation is planned for the Proposal Site:

- All the Category 2 vegetation in Lot 111 DP777967 has been cleared previously to make way for the Greenhills Hockey Centre which is already in place.

- There is no classifiable bushfire prone vegetation within Lot 5 DP1158627. Vegetation strips adjacent to the northern boundary of Lot 5 are excludable from classification due to being less than 20 m wide (noting also that a cleared, actively managed High Voltage Transmission Line easement occupies land immediately adjacent to the northern boundary of Lot 5).
- All Category 2 vegetation within Lot 1123 DP794114 (except along the southern boundary of Lot 1123) is to be cleared, reprofiled and landscaped to provide clear open maintained lawn areas containing an amphitheatre, village green, picnic and barbeque facilities and playground.

Vegetation

The Proposal Site has been extensively cleared of native vegetation with only a very small proportion of the Proposal Site occupied by remnant or regenerating vegetation, as can be seen in the recent aerial photograph in **Figure 61**.

Remnant vegetation patches immediately adjacent to the Proposal Site (to the west and south) are comprised principally of coastal heathland vegetation on dunes and revegetating on land previously the subject of sand mining. Much of the remnant coastal heathland is in a degraded condition, colonised by numerous weed species. Under the 2019 Planning for Bushfire Protection guidelines (PBP 2019), the vegetation is classifiable as Tall Heath vegetation (and some is Low Heath potentially in transition to Tall Heath).



Figure 63 Aerial photograph showing the extent of vegetation clearance

Effective slope

Effective slope was assessed using contour mapping from Nearmap (**Table 52**). The Proposal Site can be characterised as low lying level land, having historically been the subject of sand mining.

Table 52 Effective Slope

Lot/DP	Slope class
Lot 1122	Upslope/Flat
Lot 1123	Upslope/Flat
Lot 6	Flat
Lot 5	Flat

Bushfire attack level

To achieve deemed-to-satisfy acceptable solutions for Asset Protection Zones and building construction, buildings within a development are to be positioned such that building can achieve a radiant heat exposure not exceeding 29 kW/m².

No proposed buildings within the New Resource Recovery Facility would be located within the bushfire prone area of Lot 5.

No amenities buildings for the Embellished Marang Parklands are proposed.

16.1.2 Assessment of Impacts

The bush fire assessment identifies that the Proposal can provide bush fire protection measures meeting the objectives of PBP 19 and meet all Acceptable Solutions.

Asset protection zones

All proposed buildings within the New Resource Recovery Facility would not be located on bush fire prone sections of the Proposal Site and therefore no requirement for an Asset Protection Zone is triggered.

Construction requirements for buildings in bush fire prone areas

None of the proposed buildings in the New Resource Recovery Facility would be located in bush fire prone areas of the Proposal Site. Therefore, compliance with AS3959 or the National Association of Steel Framed Housing (2014) Steel Framed Construction in Bush Fire Areas Standard (NASH Standard) is not required.

Access

In line with PBP 2019, any new development should design public roads and property access roads to ensure safe access, egress and defensible space for emergency services. The Proposal Site access requirements would be met for both the New Resource Recovery Facility and Embellished Marang Parklands.

PBP 2019 Performance Criteria

The bush fire protection measures and standards for the Proposal would be aligned to the acceptable solutions for each performance measure within Chapter 5 of PBP 2019. A summary of these performance criteria is provided in **Table 53**.

Table 53 Summary of recommendations for compliance with PBP 2019 Performance Criteria

Measures	
Access	General: - All access roads are to be two-wheel drive, all-weather roads - Traffic management devices are constructed to not prohibit access by emergency services vehicles - Maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient - A through road is not necessary as the site entrance, main entrance road and the majority of the road network is not within bush fire prone sections of the site land, however, those sections of internal roads which access bush fire prone sections of the site are to be provided with loop road access providing two exit routes to the main access road Adequacy of access roads for firefighting vehicles: - The capacity of all road surfaces is to be sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes) - There are no bridges or causeways Adequacy of access to water for firefighting provisions: - Hydrants for the New Resource Recovery Facility are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression - Hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005 - Fire hydrant installations System design, installation and commissioning Main access roads: - The main access road for the New Resource Recovery Facility is a two-way sealed road

Measures	
	- Minimum 8 m carriageway width kerb to kerb is provided; parking is provided outside of the carriageway width - Hydrants are located clear of parking areas - Curves of roads have a minimum inner radius of 6 m - Maximum grades are well within requirements noting the generally level nature of the New Resource Recovery Facility site - The road crossfall does not exceed 3 degrees - A minimum vertical clearance of 4 m to any overhanging obstructions, including tree branches, is provided. Internal roads: - A minimum 5.5 m carriageway width kerb to kerb is provided - Parking is provided outside of the carriageway width - Hydrants are located clear of parking areas - Roads/carpark access are through loop design roads - Curves of roads have a minimum inner radius of 6 m - The road crossfall does not exceed 3 degrees - A minimum vertical clearance of 4 m to any overhanging obstructions, including tree branches, is provided.
Services – water, electricity and gas	Water: - Reticulated water is provided to the Proposal Site. - Fire hydrant, spacing, design and sizing comply with the relevant clauses of Australian Standard AS 2419.1:2005; hydrants are not located within any road carriageway - Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005 - All above-ground water service pipes are metal, including and up to any taps; and above-ground water storage tanks are concrete or metal Electricity: - Electrical services lines are provided underground Gas: - Reticulated or bottled gas are installed and maintained in accordance with AS/NZS 1596:2014 - <i>The storage and handling of LP Gas</i>, the requirements of relevant authorities, and metal piping is used - All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 m and shielded on the hazard side - Connections to and from gas cylinders are metal - Polymer-sheathed flexible gas supply lines are not to be used - Above-ground gas service pipes are metal, including and up to any outlets.

Source: Bushfire Assessment Report, GHD (Appendix P)

16.1.3 Mitigation measures

The proposed bushfire mitigation measures are summarised below in **Table 54**.

Table 54 Bushfire management measures

Impact/issue	Mitigation measure	Timing
Bushfire protection	The bush fire protection measures for the Proposal would be refined during detailed design and would comply with the acceptable solutions defined in PBP 2019 in relation to asset protection zones, public roads and accessibility and provision of services.	Detailed design
	The recommendations for compliance with PBP 2019 Performance Criteria listed in Table 53 would be adopted.	Detailed design
Operational bush fire safety	Prior to commencement of operation of the New Resource Recovery Facility an emergency plan would be developed for staff and other persons at the facility in the event of fire.	Operation

16.2 Fire safety

A Fire Safety Review has been prepared by GHD and is included at **Appendix Q**. A preliminary assessment of compliance with Volume One of the National Construction Code (NCC)/Building Code of Australia (BCA) has been prepared by DPC Group Pty Ltd and is included at **Appendix R**. A summary of the assessments and proposed mitigation measures are provided below.

16.2.1 Preliminary stockpile details

Table 55 provides an overview of the proposed preliminary sizes, locations and contents of stockpiles at the New Resource Recovery Facility.

Table 55 Preliminary stockpile information

Stockpile name	Stockpile location	Stockpile dimensions (L/W/H)	Stockpile contents
Shredded Timber	External, near Waste Processing Building	45 m x 12 m x 2.5 m ~1,400 m ³	>95% Timber
Containerised Bale Storage	External, near Waste Processing Building	50 m x 20 m x 3 m ~3,000 m ³	44% Timber/timber fines 25% Plastic 13% Textiles 11% Combustible fines 7% Cardboard
FE/Agg/Non FE	Adjacent Waste Processing Building, small areas	10 m x 6 m x 2 m (each, 3 of). ~360 m ³ total	Non-combustible materials – metals/aggregate.
PVC/Combustible Waste/Fines	Adjacent Waste Processing Building, small areas	10 m x 3 m x 1 m (each, 9 of) ~270 m ³ total	PVC >95% Plastic Combustible waste & fines to be mixed combustible materials, including plastic/timber and fines.
Light Waste #1 & #2	Internal to Waste Processing Building, in sorting bays	10 m x 18 m x 5 m ~900 m ³ each	40% Timber/timber fines 22% Plastic 11% Textiles 10% Low calorific 9% Combustible fines 6% Cardboard 2% Metal <1% PVC
Timber #1 & #2	Internal to Waste Processing Building in sorting bays	10 m x 18 m x 4 m ~720 m ³ each	>95% Timber
Brick/Soil C&D Heavy Waste #1 & #2	Internal to Waste Processing Building	15 m x 20 m x 5 m ~1,500 m ³ each	Limited contamination of combustible materials, otherwise non-combustible (brick/soil).
Floc	Floc store	15 m x 20 m x 4.25 m ~1,280 m ³	44% Timber/timber fines 25% Plastic 13% Textiles 11% Combustible fines 7% Cardboard
Bales	Floc store	15 m x 20 m x 4.25 m ~1,280 m ³	44% Timber/timber fines 25% Plastic 13% Textiles 11% Combustible fines 7% Cardboard
Concrete recycling stockpiles	Not indicated, assumed near Concrete Processing Building	Not currently specified	Non-combustible materials only – concrete.
Soil stockpiles	Not indicated, assumed near Soil Processing Building	Not currently specified	Non-combustible materials only – soil.

Figure 64 shows indicative locations of external combustible stockpiles as well as proposed (6 m wide) perimeter access for fire appliance use for each building (processing, concrete recycling, soil processing and workshop).

Figure 65 shows the indicative internal stockpile configuration and separating walls within the proposed Processing Building.

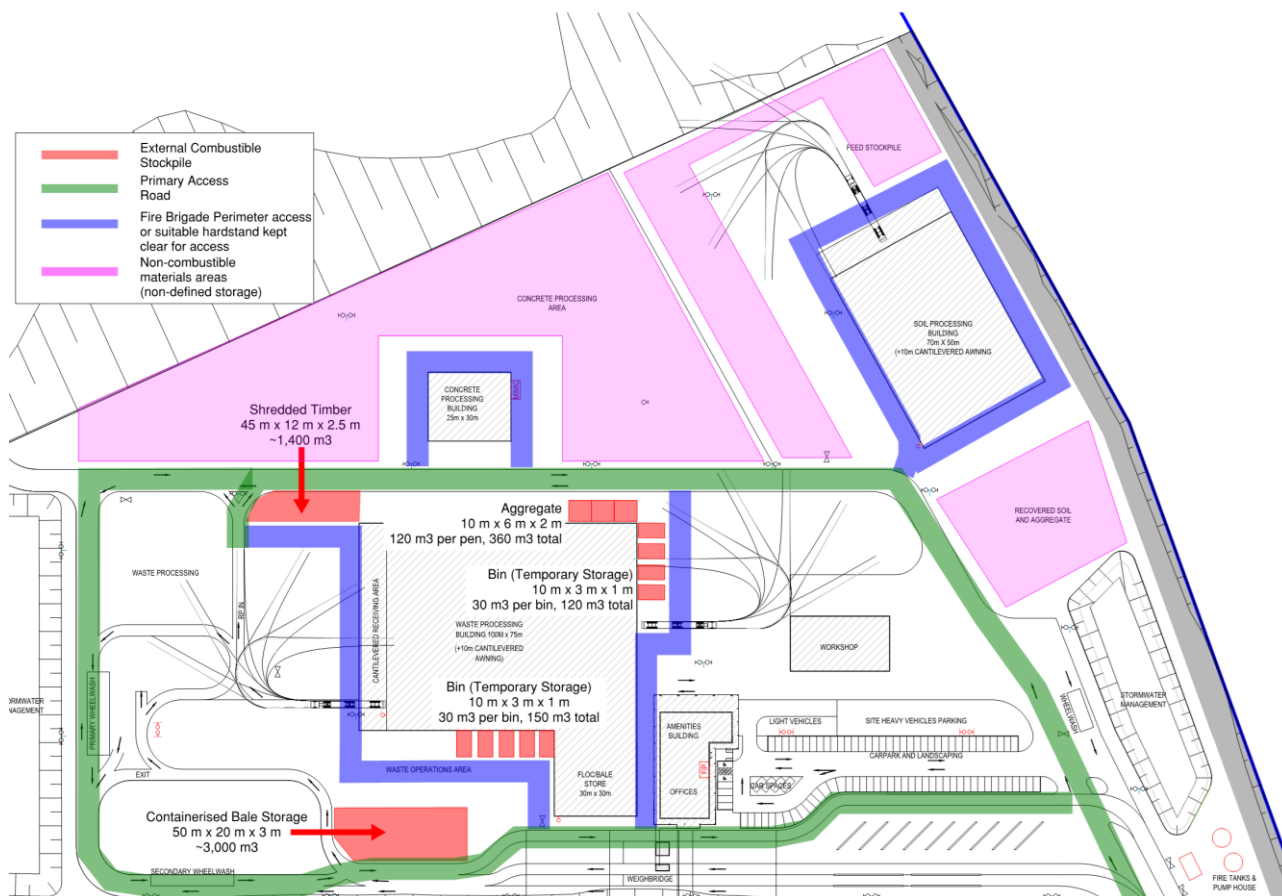


Figure 64 Proposed external combustible stockpile locations and access for FRNSW vehicles

Source: Fire Safety Review, GHD (Appendix Q)

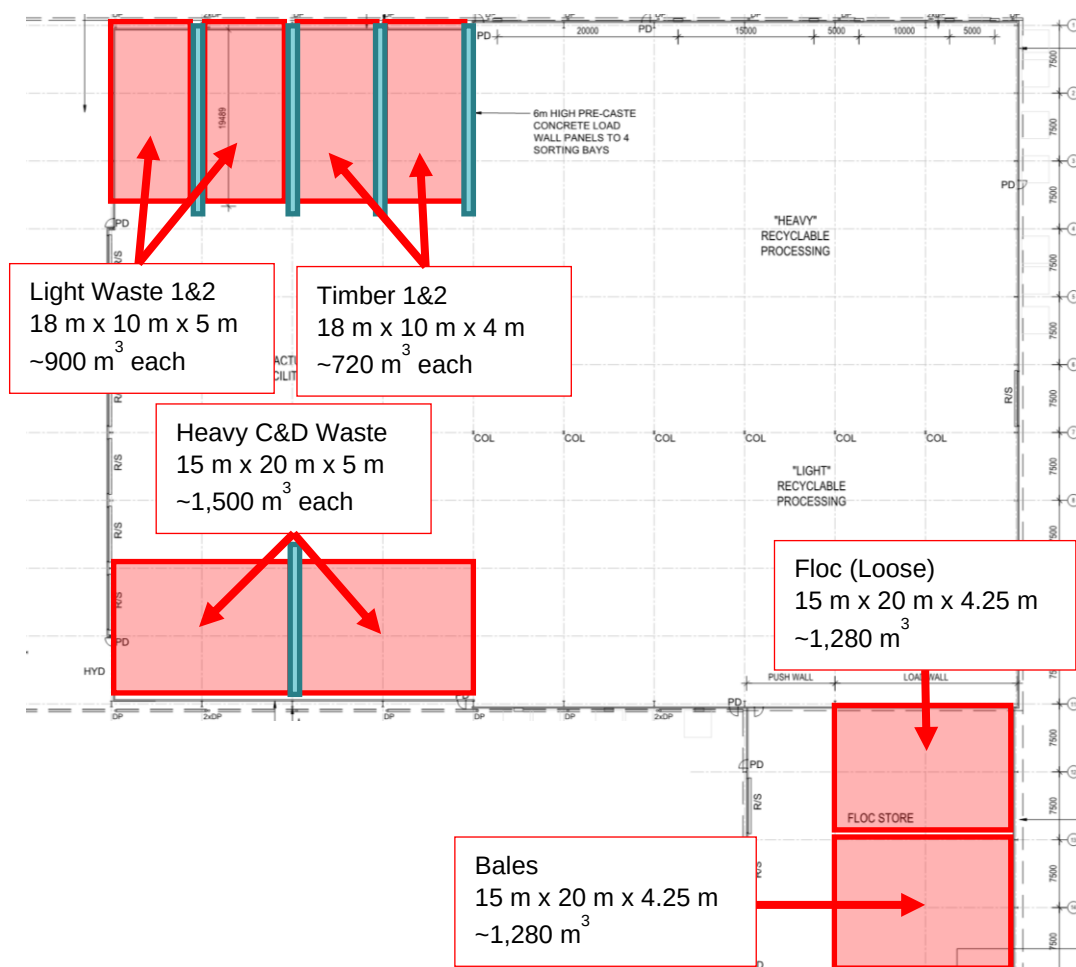


Figure 65 Proposed internal stockpile configuration and indicative separating walls (Processing Building)

Source: Fire Safety Review, GHD (Appendix Q)

16.2.2 Proposed fire protection equipment

The fire protection equipment for the New Resource Recovery Facility would include:

- Fire hydrant system;
- Fire hose reel system;
- Automatic fire sprinkler system for the Processing Building and adjacent buildings (floc/bale store, offices and amenities);
- Fire brigade booster connection for automatic fire sprinkler system, co-located with hydrant system booster;
- Fire detection and alarm system for the Processing Building and adjacent buildings (floc/bale store, offices and amenities);
- An automatic smoke hazard management system for the Processing Building; and
- Roller shutters for the Processing Building and floc/bale store for venting smoke.

Details of the proposed air, water, noise and spill risk and mitigation measures are provided in the respective sections within this EIS, and at **Section 21.0**.

A fire hydrant system would be installed in accordance with Australian Standard AS 2419.1 which would provide coverage for both internal and external stockpiles. It would be designed for at least three fire hydrants simultaneously flowing and would provide 30 litres per second simultaneous flow rate for a minimum four hours duration.

It is anticipated that in order to provide internal coverage throughout the building, the hydrant system would utilise external hydrants placed in the proximity to buildings and a complying two-hose length design. For the Waste Processing Building in particular, it is anticipated that external hydrants at multiple exits would be required in order to provide this coverage.

The internal layout will directly impact coverage requirements. The internal layout would be refined during detailed design and the hydrant system would also be developed further to ensure compliance as the design progresses.

Figure 66 shows a preliminary drawing which provides a proof of concept at this time.

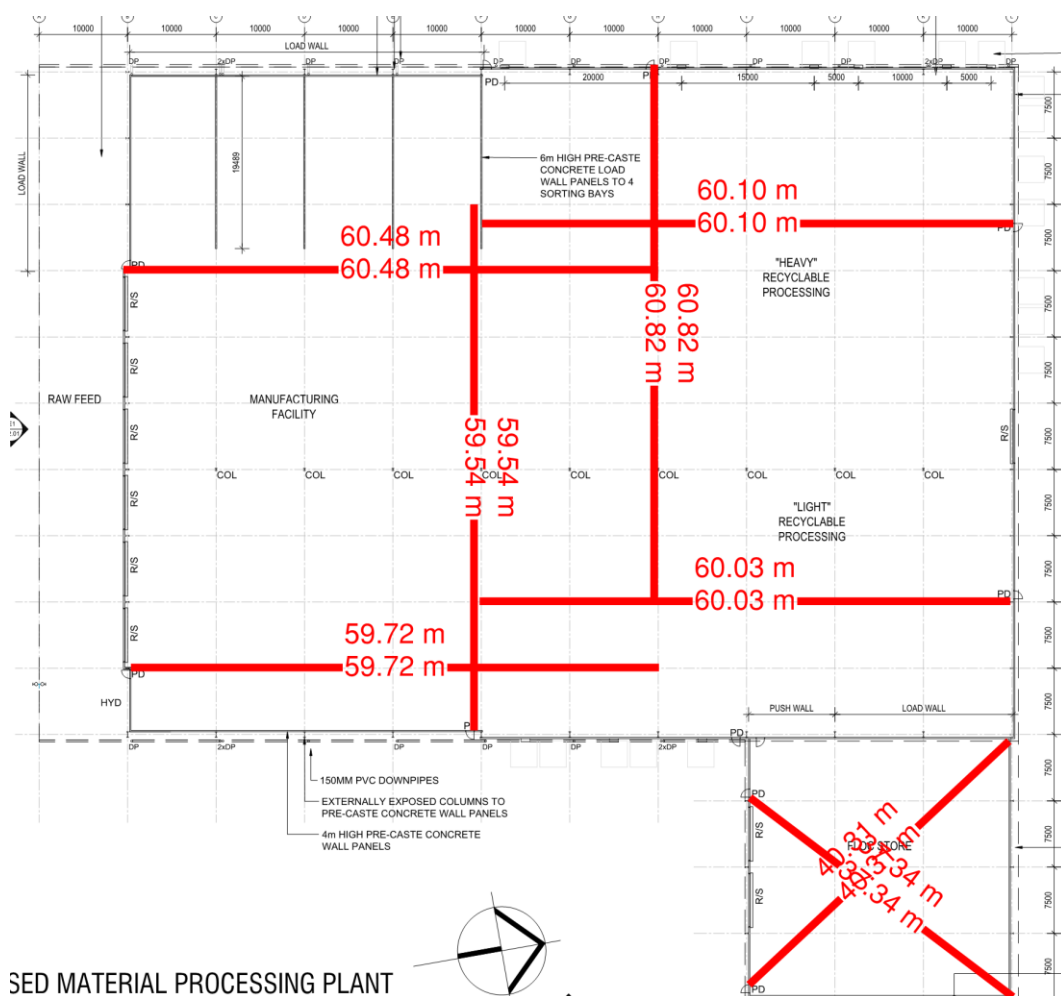


Figure 66 Concept design indicating coverage overlap via external hydrants (Processing Building)

Source: Fire Safety Review, GHD (Appendix Q)

External combustible stockpiles are required to be provided with coverage from hydrants placed at least 10 m from the combustible stockpile.

Figure 67 provides a proof of concept that this coverage requirement would be met for the preliminary combustible stockpile locations.

It is expected that the hydrant design would be confirmed during detailed design, however the requirements of the Fore and Rescue NSW *Fire Safety in Waste Facilities Guidelines* ('FRNSW Guidelines') for coverage would be adhered to.

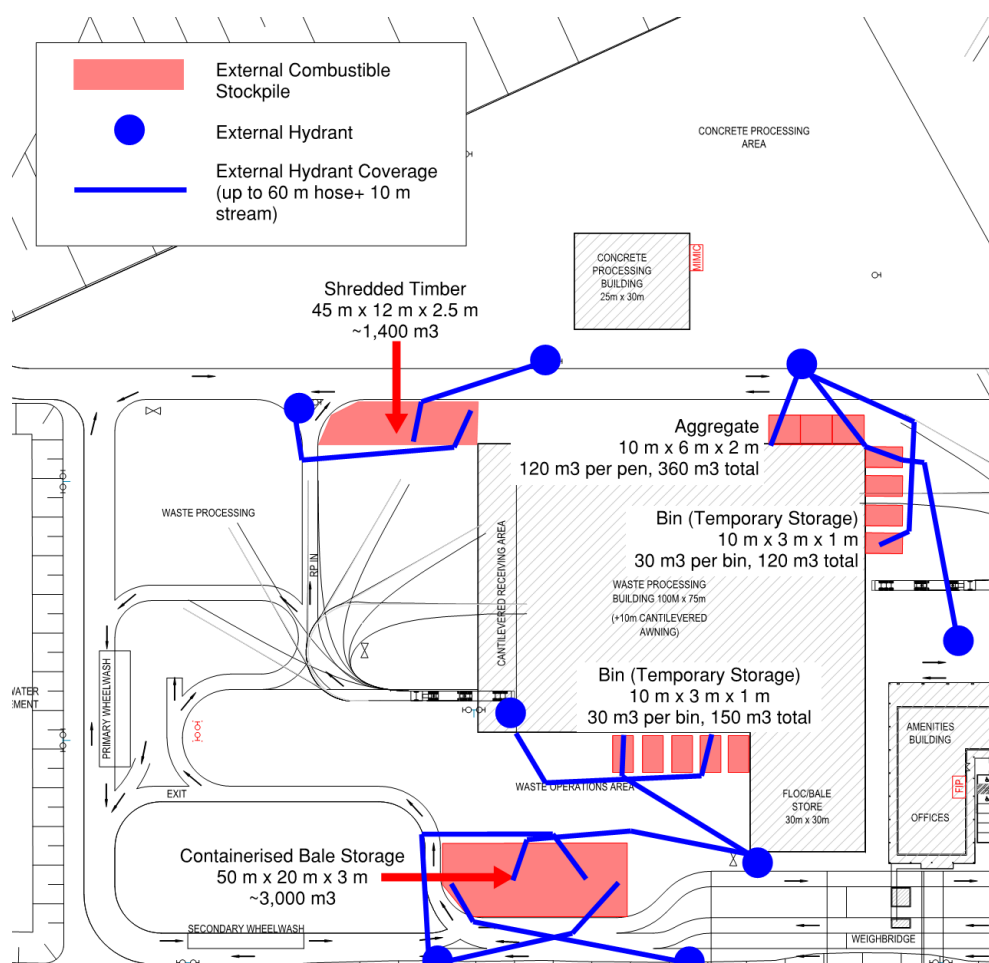


Figure 67 Indicative hydrant coverage to combustible external stockpiles

Source: Fire Safety Review, GHD (Appendix Q)

A fire brigade booster is proposed to be located adjacent to the designated site entry point for the New Resource Recovery Facility, as shown in **Figure 68**. The fire brigade booster connection would incorporate the automatic fire sprinkler system and be co-located with the hydrant system booster.

A fire hose reel system would be installed with fire hose reels located adjacent to hydrant locations to provide coverage. Additional hose reels, where required for coverage, would be provided. The fire hose reel system would be developed further during detailed design and in consultation with FRNSW where required.

An automatic fire sprinkler system would be installed in the Waste Processing Building and adjoining buildings (floc/bale store, offices and amenities) which would be designed for high hazard classification, a minimum supply time of two hours and in accordance with AS2218.1-2017 and requirements of the BCA.

An automatic fire water run-off containment system would be provided and designed to contain the total combined hydraulic demand of the fire hydrant and fire sprinkler systems – approximately 3,000 m³.

The Waste Processing Building would be provided with roller doors on two separate walls which would assist with venting de-stratified smoke, as shown in **Figure 69**.

A fire detection and alarm system in accordance with AS1670.1 and a smoke hazard management system would be installed in the Waste Processing Building and adjoining buildings (floc/bale store, offices and amenities).

The requirement for fire detection, automatic fire sprinkler and smoke hazard management systems for other buildings (soil processing, concrete processing, workshop) would be a determination of the detailed BCA/NCC review for these buildings during detailed design as they would not house combustible stockpiles.

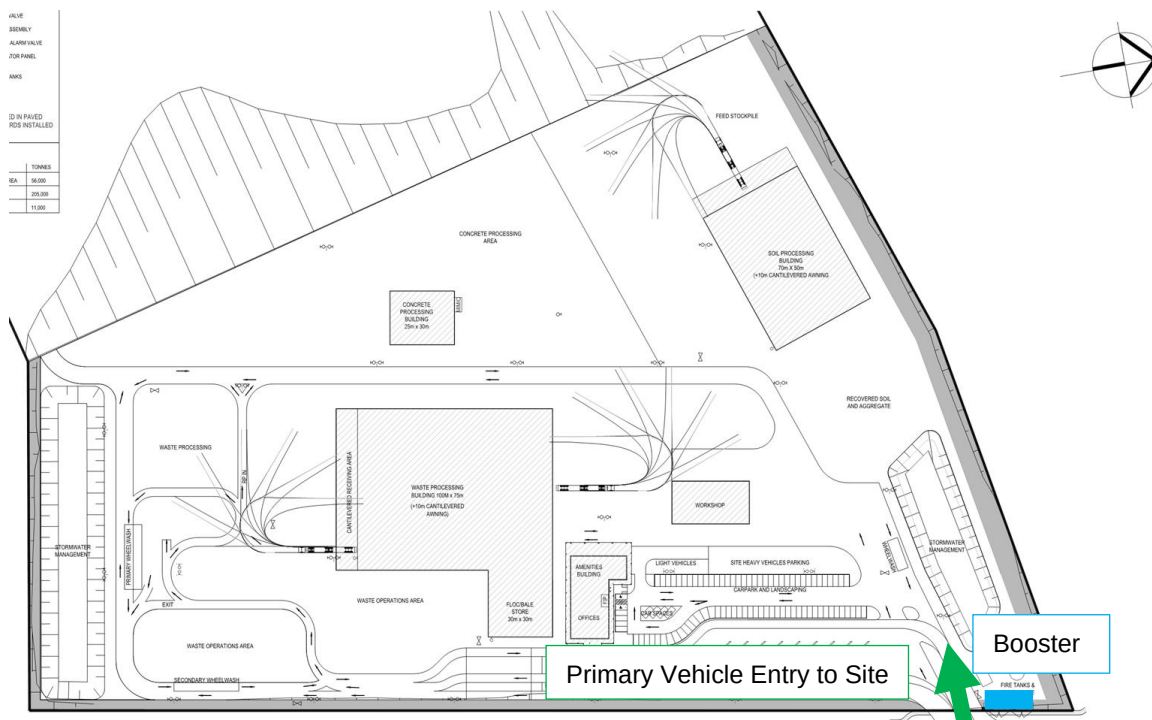


Figure 68 Proposed booster location

Source: Fire Safety Review, GHD (Appendix Q)

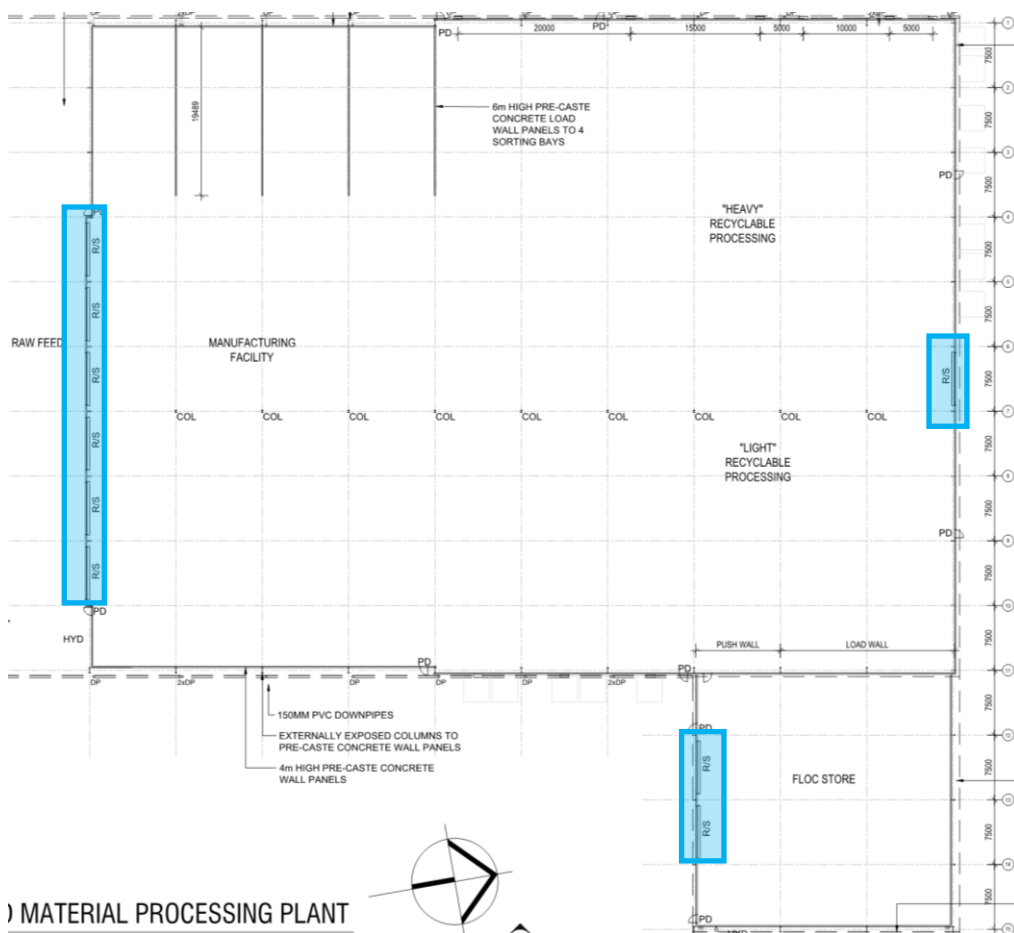


Figure 69 Indicative locations of roller shutters available for venting smoke (Processing Building)

Source: Fire Safety Review, GHD (Appendix Q)

16.2.3 Assessment against FRNSW Guidelines

The FRNSW Guidelines have been developed to “provide guidance on fire safety in waste facilities that receive combustible waste material, including adequate provision for fire safety and facilitate safe fire brigade intervention to protect life, property and the environment”.

The FRNSW Guidelines provide two development pathways for waste facilities, with respect to fire safety. They can be to design as per an ‘Acceptable Solution’, or a ‘Performance Solution’ (refer **Figure 70**). The Performance Solution pathway requires referral to FRNSW for consultation.

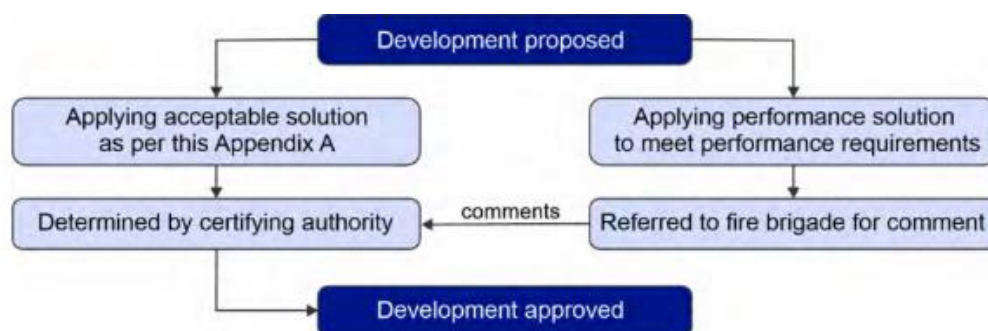


Figure 10 Pathways involving acceptable solution or performance solution

Figure 70 Excerpt from FRNSW Fire Safety in Waste Facilities Guidelines

Source: FRNSW Guidelines

Table 56 provides a summary of the results of the proposed fire safety measures for the New Resource Recovery Facility based on a preliminary assessment of the proposal against the FRNSW Guidelines. The full assessment is provided in **Appendix Q**. The assessment and identified measures have been based on the preliminary design. As the design is refined it is expected that the fire safety system would also be refined and developed further in consultation with FRNSW where appropriate.

Table 56 Summary of proposed measures to meet the requirements of FRNSW Guideline

Requirement	Proposed measures
General	If not specifically mentioned the following fire safety measures would be provided in accordance with the Deemed-to-Satisfy provisions
Fire hydrant system	- A fire hydrant system would be provided in accordance with BCA Clause E1.3 and would be designed to AS2419.1-2005 - In addition to internal coverage requirements, hydrant coverage would be provided to all external (combustible) stockpiles - The fire hydrant system would be designed for at least 3 fire hydrants simultaneously flowing (30 L/s) - The fire hydrant system would provide the above simultaneous flow rate for at least 4 hours minimum duration - Hydrants would not be located within 10 m of any stockpiled storage (internal or external).
Fire hose reels	- Hose reels would be provided in accordance with BCA Clause E1.4 - The fire hose reels would be capable of coverage to internal and external combustible stockpiles - Coverage to combustible stockpiles for fire hose reels would be calculated based upon the edge of the stockpiles, not the centre 50 m hose reels would be proposed to be addressed by Performance Solution
Fire sprinklers	- The automatic fire sprinkler system for the Processing Building and adjoining buildings would be in accordance with BCA Clause E1.5 and be designed to AS2118.1-2017 - The sprinkler system to the Processing Building would be designed for high hazard classification - The sprinkler water supply time would be at least two hours - Any awnings attached to the Processing Building which cover storage areas, or are adjacent to stockpiles, would be sprinkler protected, regardless of any exemptions in AS2118.1-2017

Requirement	Proposed measures
Fire detection	A fire detection system complying with AS1670.1-2018 and BCA Clause E2.2 would be installed for the Processing Building and adjoining buildings
Smoke hazard management	- An automatic smoke exhaust system would be provided for the Processing Building - Exhaust rates would be determined depending on CFD modelling results, but shall be demonstrated to maintain a smoke layer height above 4 m - Initiation switches would be located at the FIP for any power-driven fans - Signs and text alerting the Fire Brigade to the operation of the smoke exhaust system would be provided at the FIP in accordance with Clause 4.15 of AS1668.1 - The fans, fan cabling and the cabling of any doors required for make-up air would be fire rated so fans are capable of operating at 200 °C for 2 hours - On activation of the fans make up air is to be drawn via permanent openings or automatic opening doors at low levels. These openings would be on at least two or more separate walls
Automatic fire water run-off containment system	The containment system on-site by the stormwater system would contain at least 3,000 m³, with an automatic isolation valve such that the fire water is contained on the New Resource Recovery Facility site
Building occupant warning system	- A building occupant warning system for the Processing Building and adjoining buildings would be provided in accordance with AS1670.1-2018 and BCA Clause E2.2 - Manual alarms would be installed throughout the Processing Building, adjacent to each exit door
Perimeter access	Perimeter road access of at least 6 m in width, capable of supporting specialist fire appliance use, would be provided around each building and external stockpile
Combustible stockpile requirements	External (combustible) stockpiles (see Figure 64): - Two primary external (combustible) stockpiles are proposed: - Shredded Timber - Containerised Bail Storage - Additional secondary external (combustible) stockpiles would be located adjacent to the Processing Building (multiple) - External (combustible) stockpiles would be limited in size to 50 m in length and 20 m in width (so long as perimeter access is provided on both sides), except where varied through consultation with FRNSW. No variations are currently proposed. - Spacing and location of the external (combustible) stockpiles would adhere to Section 2.4.22 of the FRNSW Guidelines. - Note: these requirements do not apply to non-combustible stockpiles (concrete recycling or soil processing areas) Internal (combustible) stockpiles (see Figure 65): - Multiple internal (combustible) stockpiles are proposed within the Processing Building - Each internal (combustible) stockpile would be limited in volume to 1,000 m³, except where varied through consultation with FRNSW. The following variations are currently proposed: - Heavy C&D Waste Stockpiles, 1,500 m³ each - Floc (Loose) Stockpile, 1,280 m³ - Floc (Baled) Stockpile, 1,280 m³ - Each internal (combustible) stockpile would be limited in height to 4 m, except where varied through consultation with FRNSW. The following variations are currently proposed: - Light Waste Stockpiles, 5 m - Heavy C&D Waste Stockpiles, 5 m - Floc (Loose) Stockpile, 4.25 m - Floc (Baled) Stockpile, 4.25 m - Separating construction between stockpiles would be of fire-resistant construction and extend at least 1 m above maximum stockpile heights - Each internal (combustible) stockpile would maintain a minimum of 6 m unobstructed access on accessible sides.
Fire water containment	An automatic fire water run-off containment system would be provided and designed to contain the total combined hydraulic demand of the fire hydrant and fire sprinkler systems – approximately 3,000 m ³ .
Operational requirements	Prior to commencement of operation of the New Resource Recovery Facility, the following would be developed: - An operations plan for stockpile management with a copy to be included within the Emergency Services Information Package (ESIP) - An emergency plan for staff and other persons at the facility in the event of fire - An ESIP for firefighters in accordance with FRNSW Guideline Emergency services information package and tactical fire plans

16.2.4 Compliance with Volume One of the National Construction Code (NCC)

An assessment has been completed (see **Appendix R**) on the current architectural design to determine the capacity of the New Resource Recovery Facility to achieve compliance with the provisions of the BCA. The assessment confirmed that the current architectural design (provided in **Appendix A**) is capable of achieving compliance with the BCA and referenced Australian Standards.

A detailed BCA review and assessment would also be undertaken as part of the detailed design to confirm compliance and to identify the requirement for fire detection, automatic fire sprinkler and smoke hazard management systems for buildings that would not contain combustible stockpiles.

16.2.5 Mitigation measures

Table 57 provides a summary of the proposed fire safety management measures.

Table 57 Fire safety management measures

Impact/issue	Mitigation measure	Responsibility	Timing
Fire safety system design	The fire safety system for the New Resource Recovery Facility would be refined during detailed design and developed in consultation with FRNSW.	Design Contractor	Detailed design
	A detailed review and assessment of the New Resource Recovery Facility would be undertaken during detailed design to confirm BCA compliance and to identify the requirement for fire detection, automatic fire sprinkler and smoke hazard management systems for buildings that would not contain combustible stockpiles.	Design Contractor	Detailed design
Operational fire safety	Prior to commencement of operation of the New Resource Recovery Facility, the following would be developed: • An operations plan for stockpile management with a copy to be included within the ESIP • An emergency plan for staff and other persons at the facility in the event of fire • An ESIP for firefighters in accordance with FRNSW Guideline Emergency services information package and tactical fire plans	Breen	Operation

17.0 Hazards

This section provides consideration and assessment of hazards and risks associated with storage and handling of chemicals and other dangerous goods, and hazards and risks associated with the proposal's construction and operation.

17.1 Hazardous Materials Assessment

17.1.1 Screening Thresholds

The Department's guideline Applying SEPP 33 sets out the screening thresholds for different classes of dangerous goods. The relevant thresholds are set out in **Table 58**. It is noted that the waste industry, for landfilling and processing, is considered 'potentially offensive'

The purpose of the initial *State Environmental Planning Policy No. 33 – Offensive and Hazardous Development* (SEPP 33) risk screening is to determine if more detailed assessment is required given a certain quality of each type of dangerous good. If storage and transportation of dangerous goods is below these risk screening thresholds then, under SEPP 33, the facility is not considered to be potentially offensive development and a Preliminary Hazards Analysis is not required.

It is not known at this stage the actual quantities of dangerous goods that will be stored on-site. As such, an assessment of the thresholds at which storage and transportation of these dangerous goods would be expected to result in the potential for impacts has been carried out. The New Resource Recovery Facility will be operated such that these thresholds are not exceeded.

Table 58 Hazardous materials screening analysis at the New Resource Recovery Facility

Class of Dangerous Good	Description of Dangerous Good Class	Use at the New Resource Recovery Facility	Threshold for Storage at the New Resource Recovery Facility	Threshold for Transportation at the New Resource Recovery Facility
1. Explosives	Substances or articles used to produce explosions or pyrotechnic effects.	Not present	NA	NA
2 Compressed or liquefied gases, or gases dissolved under pressure	Class 2.1 — flammable gases (gases which ignite on contact with an ignition source).	Not present	10 tonnes (or 16m ³ if stored above ground)	Over 30 movements per week or more than 2 tonnes per load.
	Class 2.2 — non-flammable, non-toxic gases: gases which are neither flammable nor poisonous whether compressed or cryogenic.	Class 2.2 materials are not considered to be hazardous materials under SEPP 33.	No screening threshold	No screening threshold
	Class 2.3 — poisonous gases: gases liable to cause death or serious injury if inhaled.	Not present	NA	NA
3 Flammable liquids	PGI — highly flammable liquids: boiling point below 35°C.	Not present	NA	NA
	PGII — flammable liquids: flashpoint of less than 23°C and boiling point above 35°C.	Substances such as acetone, and methylated spirits may be stored on site as solvents and degreasing agents. Petrol will also be stored for use in landscape management appliances (lawn mowers etc.).	5 tonnes (at 2 m from the site boundary) ¹	Over 45 movements per week or more than 3 tonnes per load.

Class of Dangerous Good	Description of Dangerous Good Class	Use at the New Resource Recovery Facility	Threshold for Storage at the New Resource Recovery Facility	Threshold for Transportation at the New Resource Recovery Facility
	PGIII — liquids: flashpoint above 23° C but not exceeding 61°C and boiling point greater than 35°C.	Substances such as kerosene, mineral turpentine may be stored on site as solvents and degreasing agents.	2 m ³ (at 5 m from the site boundary) ¹ .	Over 60 movements per week or more than 10 tonnes per load.
4 Flammable solids	Substances liable to spontaneous combustion and substances which in contact with water emit flammable gases.	Not present	NA	NA
5 Oxidising agents and organic peroxides	Class 5.1 — oxidising agents.	Some cleaning products (including bleach) contain Class 5.1 materials.	2t	Over 30 movements per week or more than 2 tonnes per load.
	Class 5.2 — organic peroxides.	Not present	NA	NA
6 Poisonous (toxic) and infectious substances	Class 6.1(a) — poisonous (toxic) substances.	Pesticides may be stored at the New Resource Recovery Facility for weed control in the landscaped areas.	0.5 tonnes	NA
	Class 6.1(b) — harmful (toxic) substances.	Not present	NA	NA
	Class 6.2 — infectious substances.	Not present	NA	NA
7 Radioactive substances	Materials or combinations of materials which spontaneously emit radiation.	Not present	NA	NA
8 Corrosive Substances	Substances which by chemical action, will cause severe damage when in contact with living tissue, or in the case of leakage will materially damage or even destroy other goods.	Acids and alkali products can be present in some cleaning products	NAPG(I)- 5 tonnes / 5m ³ PG(II)- 25 tonnes / 25m ³ PG(I)- 50 tonnes / 50m ³	Over 30 movements per week or more than 2 tonnes per load.
9 Miscellaneous Dangerous Goods	Substances and articles which present dangers not covered by other classes.	Not present	NA	NA

Note 1: The table shows the minimum volume to be stored at a minimum distance from the boundary of the New Resource Recovery Facility as specified in Applying SEPP 33. The threshold increases via a logarithmic relationship setting a larger non-hazardous volume as distance from the boundary increases.

17.1.2 Potential Impacts

Construction

Hazardous Materials

The construction activities across the Proposal Site may require the temporary storage of oils and diesel. Oils are not classified as dangerous goods under the Australian Dangerous Goods Code. Diesel is classified as a Class C1 Combustible Liquid. Combustible Liquids are not considered hazardous unless they are stored with Class 3 Flammable Liquids. If diesel is stored together with petrol, then it is treated as a Class 3 Flammable Liquid. There may be storage of petrol and diesel on the New Resource Recovery Facility site, however these will be stored

separately and therefore will not be classified as hazardous materials. It is noted only a small volume of petrol will be stored on the New Resource Recovery Facility site.

Minor quantities of other chemicals may be required during construction; however these would be well below the screening thresholds. These would be stored in bunded areas, and site-specific controls would be developed to reduce the environmental release of potentially harmful chemicals and to reduce the risk of any such releases entering local waterways.

Construction Hazards

Construction hazards would be present across the entire construction footprint and the haulage routes across the Proposal Site. These hazards are summarised in **Table 59**.

Table 59 Construction hazard identification and consequence assessment

Hazard	Potential Consequence	Key Locations
Accidental fuel and chemical spill due to poor management, equipment failure or construction vehicle incident	Water pollution and ground contamination	All construction works across the Proposal Site, however the risks would be potentially greater in works near the eastern boundary and Lindum Road, and the northern boundary and Captain Cook Drive, where spills could enter the existing drainage network
Accidental discharge of sediment laden/contaminated runoff		
Hazardous material and dangerous goods transportation		
Worksite and road traffic accidents (workforce and pedestrian safety)	Human health impacts (injury or death through vehicle strikes)	All construction works across the entire Proposal Site, however the risks would be greater near site access and exit points
Fire and/or explosion through poor materials handling, storage and management	Water/air pollution and/or ground contamination	All construction works across the Proposal Site
Restricted or delayed emergency access to site for essential maintenance		
Emergency vehicle access delays	Human health impact as a result of delayed access times	All construction works across the Proposal Site
Dust and pollutant emissions	Air pollution and nuisance	All construction works across the Proposal Site
Underground utility or services strike	- Human health and biodiversity impact - Injury or death - Water pollution and/or ground contamination - Damage to property - Loss of service (socioeconomic impact)	All construction works across the Proposal Site

Operation

Hazardous Materials

Only small quantities of dangerous goods would be stored at the Proposal Site at the completion of construction. Dangerous Goods that would be stored are solvents, paints, cleaning fluids, greases, acids and alkali materials – which would be used for cleaning (and disinfecting) buildings and surfaces, minor repairs and maintenance. These dangerous goods are identified where relevant in **Table 58** and are discussed further below.

All dangerous goods will be stored inside buildings or other appropriate storage facilities at the New Resource Recovery Facility. Given the small quantities of Dangerous Goods materials to be stored, and the commitment to store Dangerous Goods at volumes below the thresholds set out in *Applying SEPP 33*, the Proposal is not considered to be potentially hazardous, and a PHA is not considered to be necessary.

Class 3 Flammable Liquids

Substances such as acetone, kerosene, mineral turpentine and methylated spirits may be stored at the New Resource Recovery Facility as solvents and degreasing agents. These substances are within Packaging Groups II and III. In addition, up to 400L (0.4m³) of petrol would be stored for the purposes of operating landscaping appliance such as lawn mowers and whipper snippers. This volume of petrol equates to approximately 0.3 tonnes. Under the Applying SEPP 33 Guideline, total volumes of Class 3 Flammable Liquids less 5 tonnes (in aggregate) is not within the potentially hazardous threshold irrespective of where it is stored on-site. The New Resource Recovery Facility would store significantly less than the screening threshold quantities of Class 3 Flammable Liquids, and so would not be considered to be potentially hazardous.

Class 5 Oxidising Agents

Applying SEPP 33 sets a screening threshold for all Class 5.1 Oxidising Agents of 5 tonnes except for dry pool chlorine at a dedicated pool supply shop and ammonium nitrate at land where a rural industry is carried out, neither of which apply to the New Resource Recovery Facility. Class 5.1 Oxidising Agents are found in some commercial cleaning products (e.g. bleach) and may be stored at the New Resource Recovery Facility. The New Resource Recovery Facility will also need to store small quantities of chlorine for general cleaning purposes. In total, Breen will ensure that storage of all Class 5.1 Oxidising Agents on-site, if combined, would not exceed 4.9 tonnes. As such, the New Resource Recovery Facility would not be considered to be potentially hazardous.

Class 6 Poisonous Substances

Breen will use only small amounts of commercial pesticides for managing on-site landscaping. Breen would not store more than 0.45 m³ at any one time, and so would not be considered to be potentially hazardous.

Class 8 Corrosive Substances

Acids and alkali materials may be used at the New Resource Recovery Facility for cleaning purposes. Applying SEPP 33 sets a different screening threshold for each different packaging group as shown in **Table 58**, with the lowest minimum threshold relating to Packaging Group I materials at 5 tonnes. Breen would ensure that the volumes of Class 8 Corrosive Substances stored on-site, in aggregate, would not exceed 4.9 tonnes, and so would not exceed the lowest threshold for Class 8 Corrosive Substances. As such, the New Resource Recovery Facility would not be considered to be potentially hazardous.

Transportation Thresholds

Because of the small volumes of dangerous goods to be stored at the New Resource Recovery Facility, the transportation thresholds set out in Applying SEPP 33 will not be exceeded.

Applying SEPP 33 does not contain a threshold for the transportation of Class 6.1(a) Poisonous Substances (i.e. pesticides). It is not expected that more than one movement per week would be required for the delivery of small quantities of pesticide to the New Resource Recovery Facility would be required.

Operational Hazards

Hazards during operation would be limited to those associated with the operation and maintenance of the New Resource Recovery Facility and the Waste Disposal Facility. These potential hazards include the movement of vehicles on the Site between disposal areas, slip and trip hazards on pedestrian pathways, and car park vehicle incidents. These would be managed through the standard operating procedure protocols of Breen.

17.2 Assessing Offensiveness

Applying SEPP 33 provides guidance as to what should be considered 'potentially offensive industry'. It recommends that the consent authority consider whether the proposal require an Environment Protection Licence, and if so, then a proposal should be considered potentially offensive.

The Existing Breen Resources Facility operates under two EPLs issued from the EPA, and as such would be considered potentially offensive industry. It is however not 'offensive' as it has and can operate in compliance with these existing EPLs. The proposed Resources Management Facility (including the New Resource Recovery Facility and the Waste Disposal Facility) would also require an EPL, and it is expected that the existing EPL(s) will continue to apply (or be varied) to the account for the waste management operations of Lot 5. This EIS includes

assessments of water discharges, air (odour) discharges and noise, and the potential impacts arising from these discharges. The assessments in all cases conclude that there is not likely to be any discharge that would cause a significant level of offence, and that the facility will continue to be able to be licenced by the EPA, ensuring that it is not 'offensive' for the purposes of SEPP 33.

17.3 Conclusion

The volumes to be stored at the New Resource Recovery Facility will be managed to be substantially less than the relevant minimum threshold set out in *Applying SEPP 33*.

The New Resource Recovery Facility will require an EPL (or a variation of the existing EPLs, noting these relate to the acceptance of waste material). As such, while the proposed Resources Management Facility is, under SEPP33, considered to be potentially offensive, the assessments prepared as part of this EIS indicate that the potential discharges would not be considered to be potentially hazardous or potentially offensive and no further assessment under SEPP 33 (such as a PHA) is required.

17.4 Mitigation Measures

The management measures that would be implemented to address the hazards identified above are outlined in **Table 60** below. A number of these, including air pollution and nuisance and water pollution or ground contamination would be managed under measures identified in the relevant sections of this EIS.

Table 60 Hazards and risks safeguards and management measures

Impact	Environmental Safeguard	Responsibility	Timing
Construction hazard and risk management across the proposal	Prepare a hazard and risk management plan (HRMP) as a sub-plan of the CEMP. As a minimum, the plan would: • Include an emergency response plan • Be prepared by a suitably qualified hazard management specialist • Provide for the implementation, monitoring and maintenance of the identified hazard controls.	Construction contractor	Pre-construction
Accidental spillage and discharge across the proposal during construction	Keep wet and dry spill kit, sand-filled/gravel-filled socks and geotextile matting on the Proposal Site at all times. Train staff in the appropriate deployment, use, removal and disposal of spill kit.	Construction contractor	Construction
Workforce and public safety during construction across the Proposal	Fence off and secure the Proposal Site to prevent public access.	Construction contractor	Construction
Workforce and public safety during construction across the Proposal	Use terracing excavation methods where applicable. Backfill or cover all open excavations with boards/plates outside of working hours.	Construction contractor	Construction
Workforce and public safety during construction across the Proposal	Inspect the entry connection into the Proposal Site ahead of any required demobilisation to ensure there are no road-user or pedestrian hazards.	Construction contractor	Construction
Hazardous material and dangerous goods transportation to the construction site during construction	Handle and use dangerous goods and hazardous materials in accordance with: • the NSW Work Health and Safety Act 2011 and associated regulations; • the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005); • NSW Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998; and • Australian Government's Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2008).	Construction contractor	Construction

Impact	Environmental Safeguard	Responsibility	Timing
Utility or services strike across the Proposal during construction	Undertake detailed utility surveys as part of the detailed design along with utility-provider consultation.	Construction contractor	Construction
Utility or services strike across the Proposal during construction	Prepare and work to a utility and services plan. No work would take place outside of this plan without additional consultation and utility searches.	Construction contractor	Construction
Hazardous material and dangerous goods transportation and storage across the site during operation	Handle, store and use dangerous goods and hazardous materials in accordance with: - the NSW Work Health and Safety Act 2011 and associated regulations; - the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005); - NSW Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998; and - Australian Government's Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2008). All storage and transport of dangerous goods to remain below the Applying SEPP 33 screening thresholds.	Breen	Operation
Hazardous material and dangerous goods storage during operation	Hazardous materials and dangerous goods will be store within a bunded and secure storage facility on the New Resource Recovery Facility site.	Breen	Operation
Driver safety across the Proposal during operation	Incorporate car park signage to indicate direction of travel and traffic calming devices including speed humps and speed limits.	Breen	Detailed design/Operation

18.0 Coastal Management

This section provides an assessment relating to coastal management, and specifically an assessment of the potential impacts on coastal wetlands and littoral rainforests in accordance with *State Environmental Planning Policy (Coastal Management) 2018* (Coastal Management SEPP), as required by the SEARs. It has been informed by the Surface Water Report prepared by Cardno (see **Appendix H**) and the BDAR prepared by Eco Logical (see **Appendix S**). A summary of the assessments and proposed mitigation measures are provided below.

18.1 Existing Environment

The Proposal Site is not located on land mapped as coastal wetland or littoral rainforest in the Coastal Management SEPP. However, the Proposal Site includes land mapped as Littoral Rainforest Proximity Area, Coastal Wetland Proximity Area, Coastal Use Area, and Coastal Environment Area under the Land Application Map of the Coastal Management SEPP. These areas are shown below in **Figure 71**.



Figure 71 Coastal Management SEPP map areas in relation to the Proposal Site

Source: BDAR, Eco Logical (Appendix S)

18.2 Assessment of Impacts

An assessment of the Proposal against the relevant clauses of the Coastal Management SEPP is provided in **Table 61** below.

Table 61 Assessment against Coastal Management SEPP

Costal Management Zone	Clause	Assessment
Proximity to Coastal Wetland and Littoral Rainforest	11(1) Development consent must not be granted to development on land identified as “proximity area for coastal wetlands” or “proximity area for littoral rainforest” on the Coastal Wetlands and Littoral Rainforests Area Map unless the consent authority is satisfied that the proposed development will not significantly impact on:	The Proposal will not be carried out in or immediately adjacent to the vegetation considered to be coastal wetland. No vegetation within the mapped Coastal Wetlands or Littoral Rainforests is proposed for removal.
	(a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest (b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest	<i>Surface Water</i> As discussed above in Section 8.3 of the EIS, the quantity of surface run-off will be reduced due to additional pit and pipe networks, swales, bunds and infiltration basins that will reduce surface flows beyond the Proposal Site boundary. Moreover, the catchment discharging north towards the coastal wetlands will decrease in area, reducing surface water runoff, while the catchment discharging west towards the Littoral Rainforest will not be changed. The quality of surface water run-off can be readily managed by the mitigation measures proposed in the Surface Water Assessment Report prepared by Cardno and summarised in Section 8.3. As such, it is unlikely that the Proposal would impact on the adjacent coastal wetland and littoral forest from a surface water perspective, especially if mitigation measures are implemented. <i>Groundwater</i> As discussed in Section 8.4 of the EIS, the proposal will result in a gradual improvement in water quality migrating off-site, associated with a reduction in the generation of leachate from the Proposal Site. As such the beneficial use potential of groundwater is expected to improve or be maintained at the coastal wetlands and littoral rainforest down gradient from the Proposal Site. In relation to groundwater drawdown impacts, the amount of groundwater level change is unlikely to represent an adverse impact to down gradient coastal wetlands and littoral rainforests as these are tidally influenced systems where changes in groundwater elevations would be tidally dominated. It is also unlikely that coastal wetlands and littoral rainforests sitting up-gradient of the high tide mark will be affected by the change in groundwater elevations as it is unlikely to result in a downward movement of groundwater elevations beyond the vegetation root zones. As such, it is unlikely that the Proposal will impact on the adjacent coastal wetland and littoral forest from a groundwater perspective
Coastal Environment Area	13(1) Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following—	As discussed in Section 18.0 of the EIS, the native vegetation on the Proposal Site is heavily degraded and does not meet the thresholds that deem them unacceptable to remove. Mitigation measures have been proposed to ensure that threatened species such as the Green and Gold Bell Frog, that lives in adjacent coastal wetlands and littoral rainforests, is not put at risk.

Costal Management Zone	Clause	Assessment
	(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,	Refer to assessment above on surface water and groundwater impacts.
	(b) coastal environmental values and natural coastal processes	The Proposal does not result in disruption or harm to coastal environmental values and natural coastal processes. Upon completion of the Proposal, the new parklands will contribute to restoring the coastal environmental values and natural coastal values in the Kurnell area.
	(c) the water quality of the marine estate (within the meaning of the <i>Marine Estate Management Act 2014</i>), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,	As discussed above, the Proposal will not result in adverse impacts to the water quality of the marine estate and conversely, may improve the water quality. There are no sensitive coastal lakes surrounding the Proposal Site that are listed in Schedule 1 of the Coastal Management SEPP.
	(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,	The Proposal Site is located upstream from marine environments and does not contain any habitat features for marine fauna or any marine vegetation.
	(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	The proposed development is located solely on the Breen Site, of which a portion is proposed to be dedicated to Sutherland Shire Council as part of a VPA. Once complete, the proposed development will provide increased safe public access to the proposed Embellished Marang Parklands.
	(f) Aboriginal cultural heritage, practices and places,	The proposed development is not anticipated to impact on matters of Aboriginal cultural significance as outlined in Section 10.0 .
	(g) the use of the surf zone.	The Proposal Site is located inland from the surf zone and therefore there is not considered to be an impact to the use of the surf zone of this beach as a result of the proposed works.
Coastal Use Area	14(1) Development consent must not be granted to development on land that is within the coastal use area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following— (a) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	The proposed development is located solely on the Breen Site, of which a portion is proposed to be dedicated to Sutherland Shire Council as part of a VPA. Once complete, part of the proposed development will provide increased safe public access to the proposed parklands.
	(b) overshadowing, wind funnelling and the loss of views from public places to foreshores,	The Proposal is to take place inland from foreshore areas and within an area already subject to significant clearing and development through the operation of the existing waste facility. As part of the proposed development, a public reserve will be reinstated in turn, improving views in the long-term.
	(c) the visual amenity and scenic qualities of the coast, including coastal headlands,	The Proposal is located upstream from coast and foreshore areas and therefore any additional buildings would not affect the visual amenity of coastal areas. Regardless, as part of the proposed development, a public reserve will be reinstated in turn, improving the visual amenity of the headland.
	(d) Aboriginal cultural heritage, practices and places,	The proposed development is not anticipated to impact on matters of Aboriginal cultural significance as outlined in Section 10.0 .
	(e) cultural and built environment heritage	The Proposal will not affect any surrounding cultural or built environmental heritage.

19.0 Biodiversity

A Biodiversity Development Assessment Report (BDAR) has been prepared by Eco Logical and is included at **Appendix S**. A summary of the assessment and proposed mitigation measures are provided below.

19.1 Existing Environment

The Proposal will be carried out on land that has been subject of extensive landform modification from historical sand mining activities. As such, the majority of the Proposal Site consists of cleared land or exotic vegetation cover. However, native vegetation on the Proposal Site is present in scattered areas of regeneration comprised of opportunistic species, including two Plant Community Types (PCT):

- PCT 661: *Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion* (Coastal Sand Littoral Forest) which forms part of the Kurnell Dune Forest which is a threatened ecological community listed as endangered under the Biodiversity Conservation Act; and
- PCT 772: *Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion* (Coastal foredune wattle scrub).

No threatened flora or fauna species have been identified by the surveys of the Proposal Site. However, suitable dispersal habitat for the *Litoria aurea* (Green and Golden Bell Frog) is present within the Proposal Site in the form of artificial dams and surrounding native vegetation. The species was also recorded within the Proposal Site 25 times between 1995 and 2009 according to the BioNet Atlas. As such, its presence has been assumed within the BDAR.

19.2 Methodology

Eco Logical's assessment methodology included literature and data reviews and field surveys. Prior to undertaking field surveys, Eco Logical reviewed a range of government biodiversity assessment method publications, biodiversity maps, state and national biodiversity databases and Geographic Information Systems datasets such as soil, topography, geology and drainage. Through these reviews, a list of credit species and Matters of National Environmental Significance (MNES), either known or considered likely to occur, was compiled to guide the field survey methodology.

Two field surveys were undertaken on 14 August 2020 and 17 August 2020. A native vegetation survey was undertaken by surveying four full-floristic vegetation plots to identify Plant Community Types and threatened ecological communities. This survey also involved vegetation mapping of the entire Proposal Site.

Habitat assessments were also undertaken to determine the likelihood of threatened species occurring within the Proposal Site on an intermittent or permanent basis. Based on the results of the habitat assessments, vegetation condition and Biodiversity Assessment Method survey times, targeted surveys were not conducted as part of this assessment.

19.3 Assessment of Impacts

19.3.1 Locating the Proposal to avoid impacts

The Proposal will impact on the limited native vegetation and potential endangered species habitat on the Proposal Site. These impacts to native vegetation and threatened species habitat are unavoidable given that the entire Proposal Site must be capped to comply with the existing EPL(s). The endangered ecological community present within the Proposal Site is substantially degraded. The potential habitat within the Proposal Site is limited to use for potential dispersal, not breeding. As such, the Proposal is considered to be appropriately located from a biodiversity perspective.

19.3.2 Direct impacts

Native vegetation

The following native vegetation PCTs, as shown in **Figure 72** will be directly impacted due to their proposed removal:

- 5.88 hectares of PCT 661: Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion (Coastal Sand Littoral Forest); and
- 1.65 hectares of PCT 772: Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion (Coastal foredune wattle scrub).

(Note: **Figure 72** refers to the Development Site which reflects the expected extent of works for assessment of biodiversity impacts, and does not cover the entire Proposal Site in some instances.)

However, both PCTs have been assessed to be in heavily degraded condition. Offsets are not required for their removal as:

- PCT 661 has a vegetation integrity score below the minimum threshold (15) above which an offset is required where the PCT is representative of an endangered ecological community; and
- PCT 772 has a vegetation integrity score below the minimum threshold (20) above which an offset is required where the PCT is not representative of a threatened ecological community.

Therefore, the removal of these native vegetation PCTs is considered to be acceptable.

Threatened species

The removal of the existing artificial dams servicing the Existing Breen Resources Facility and 7.53 hectares of surrounding native vegetation will directly impact on the endangered Green and Golden Bell Frog species, which has been historically observed within the Proposal Site and has habitat on surrounding sites. The nature of the impact is the reduction of connectivity of stepping-stone dispersal habitat for the Golden and Green Bell Frog species. The affected areas are shown in **Figure 73**.

(Note: **Figure 73** refers to the Development Site which reflects the expected extent of works for assessment of biodiversity impacts, and does not cover the entire Proposal Site in some instances.)

The capping of former landfill cells will be carried out in accordance with DA/269/90 and the EPL requirements. This will require remove all vegetation within the area to be capped, with the vegetation to be reinstated as part of the VPA between Breen and Sutherland Shire Council. As such, it is considered that the biodiversity impacts associated with the removal of vegetation for landfill capping are not a direct impact attributable to the Proposal.

However, if these impacts are considered as direct impacts from the Proposal, they would require an offset of 11 credits for removal of vegetation for landfill capping. Further, once parts of the Proposal Site are revegetated as part of the VPA works, connectivity of the stepping stone dispersal habitats will be partially restored.



Figure 72 Native vegetation impacts not requiring Ecosystem Credit offsets

Source: BDAR, Eco Logical (Appendix S)

Note: The Development Site reflects the expected extent of works for assessment of biodiversity impacts, and does not cover the entire Proposal Site in some instances



Figure 73 Threatened species impacts requiring Species Credits offsets

Source: BDAR, Eco Logical (Appendix S)

Note: The Development Site reflects the expected extent of works for assessment of biodiversity impacts, and does not cover the entire Proposal Site in some instances

19.3.3 Indirect impacts

The construction and operation associated with the Proposal may result in both short term and long term indirect biodiversity impacts.

Short term impacts include:

- Sedimentation and contaminated and/or nutrient rich run-off within the Proposal Site from construction during heavy rainfall events;
- Noise, dust or light spill affecting the Proposal Site and surrounding land created by machinery during daily construction works;
- Inadvertent impacts on adjacent habitat or vegetation from daily construction works;
- Trampling of non-threatened flora species during construction and operation when works are carried adjacent to retained bushland areas;
- Vehicle strikes on native fauna from working machinery or moving vehicles throughout construction and operation;
- Illegal rubbish dumping by local residents or construction crews that can spread via wind to adjacent vegetation during construction and operation; and
- Disturbance to specialist breeding and foraging habitats from runoff generating by construction during heavy rainfall events.

A potential long term impact is the transportation of weeds and pathogens from the Proposal Site to adjacent vegetation and habitats from daily construction works.

Eco Logical have concluded that these indirect impacts can be mitigated by the recommended mitigation and management measures, which are outlined in **Section 19.4**.

19.3.4 Assessment of Matters of National Environmental Significance (MNES)

The Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) establishes a process for assessing and regulating the environmental impacts of activities and developments where Matters of National Environmental Significance (MNES) may be affected. Under the EPBC Act, any action which has, will have, or is likely to have a significant impact on an MNES is defined as a “controlled action” and requires approval from the Federal Minister for the Environment.

The following MNES, listed under the EPBC Act were identified as having the potential to be adversely affected by the proposed works:

- *Litoria aurea* (Green and Golden Bell Frog), listed as vulnerable. This species was not identified within the Proposal Site during surveys. However, a Key Population of the species exists at Kurnell and dams within the Proposal Site may be used as dispersal habitat.
- *Pteropus poliocephalus* (Grey-headed Flying-fox), listed as vulnerable. This species was not identified within the Proposal Site during surveys, however native vegetation within the Proposal Site may provide marginal foraging habitat.

Eco Logical have assessed these species against the Significant Impact Criteria contained within the EPBC Act.

Green and Golden Bell Frog

Eco Logical have concluded that the Proposal is unlikely to have a significant impact on the Green and Golden Bell Frog for the following reasons:

- The portion of potential Green and Golden Bell Frog habitat to be removed (7.53 ha of native vegetation and associated dams) are substantially degraded and located on the fringes of a larger area of connective habitat provided by native vegetation and established habitat; and
- No breeding habitat will be removed by the Proposal.

Grey-headed Flying Fox

Eco Logical have concluded that the Proposal is unlikely to have a significant impact on the Grey-headed Flying Fox for the following reasons:

- No camps will be removed by the proposed action; and
- More suitable foraging habitat for this highly mobile species is available adjacent to the Proposal Site and throughout the region.

19.4 Mitigation Measures

In respect of the potential indirect biodiversity impacts described above, the Report recommends the following mitigation measures that are summarised below in **Table 62**.

Table 62 Summary of mitigation measures relating to biodiversity

Impact	Environmental Safeguard	Responsibility	Timing
Sedimentation and contaminated and/or nutrient rich run-off	Sediment barriers or sedimentation ponds will be installed to control the quality of water released from the Proposal Site into the receiving environment. Appropriate controls will be utilised and maintained to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways.	Project Manager	For the duration of construction works
Noise impacts on biodiversity	Daily construction hours implemented for construction activities to reduce impacts of noise.	Project manager	Construction/
Dust impacts on biodiversity	Adaptive dust monitoring programs shall be undertaken to control air quality. Dust suppression measures will be implemented during construction works to limit dust from the Proposal Site.	Project Manager	For the duration of construction works
Inadvertent impacts on adjacent habitat or vegetation	Temporary fencing shall be installed to protect significant environmental features such as riparian zones. Fencing is to be installed prior to the commencement of any construction works.	Project Manager	For the duration of construction works
	Staff training and site briefing shall be implemented to communicate environmental features to be protected and measures to be implemented. All staff working on the Proposal Site will undertake an environmental induction as part of their site familiarisation. This induction will include items such as: • Avoiding indirect impacts to off-site adjacent vegetation. • Correct storage of chemicals to prevent runoff into adjacent vegetation.	Project Manager	To occur for all staff entering / working at the Proposal Site. Site briefings should be updated based on phase of the work and when environmental issues become apparent.

Impact	Environmental Safeguard	Responsibility	Timing
Transportation of weeds and pathogens	Hygiene protocols shall be implemented to prevent the spread of weeds or pathogens between infected areas and uninfected areas. Vehicles, machinery and building refuse associated with construction would remain only within construction footprint areas, avoiding weed or pathogen related impacts to vegetation outside of the Proposal Site. Phytophthora control measures would be undertaken from the commencement of the Proposal to minimise the risk of spread to and from the Proposal Site, in accordance with guidelines from Royal Botanical Gardens and the Department of Planning, Industry and Environment. If water trucks are being used for dust control, implement procedures to manage Phytophthora such as daily cleaning of the water truck and equipment. Off road earth moving and excavation plant would be inspected before entering and exiting the Proposal Site and washed down if required to prevent the spread of weeds to or from adjacent vegetation. In particular, machinery working on or nearby dams are required to be washed down in order to prevent the spread of chytrid fungus into or from the Proposal Site.	Project Manager	For the duration of construction works
Impacts to retained vegetation	Provision shall be made for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the Proposal Site. Any landscape plantings in the Proposal Site is to use locality derived native species and those found within the region.	Project Manager	Following completion of construction works
Clearing impacts on Green and Golden Bell Frogs	Pre-clearing surveys of areas of potential refuge habitat and protocol for the management of Green and Golden Bell Frogs detected in construction areas. Pre-clearance surveys should be undertaken by a suitably qualified ecologist. If tadpoles are observed in areas of pooled water, an ecologist should be contacted to confirm the species of the tadpoles. If a Green and Golden Bell Frog is detected during the works, a qualified ecologist should be contacted. If the frog needs to be collected from the works area prior to the ecologist arriving on-site they can be captured using disposable gloves and placed in a suitable container/plastic bag with a small amount of distilled water or small handful of moistened grass/leaves and then moved to the designated relocation site by the project ecologist only after consultation with DPIE.	Project Manager	Prior to and for the duration of construction

20.0 Social and Economic Impact

A Social and Economic Impact Assessment has been prepared by Ethos Urban and is included at **Appendix B**. A summary of the assessment and proposed mitigation measures are provided below.

20.1 Existing Social and Economic Context

For the purposes of the social and economic assessment, a study area has been defined using ABS Statistical Area 1 (SA1) boundaries that align with the suburbs of Kurnell and Greenhills Beach. For much of the analysis undertaken, the relevant characteristics of the Study Area are compared to the broader Greater Sydney region.

A map outlining the Study Area for this assessment is shown in **Figure 74**.

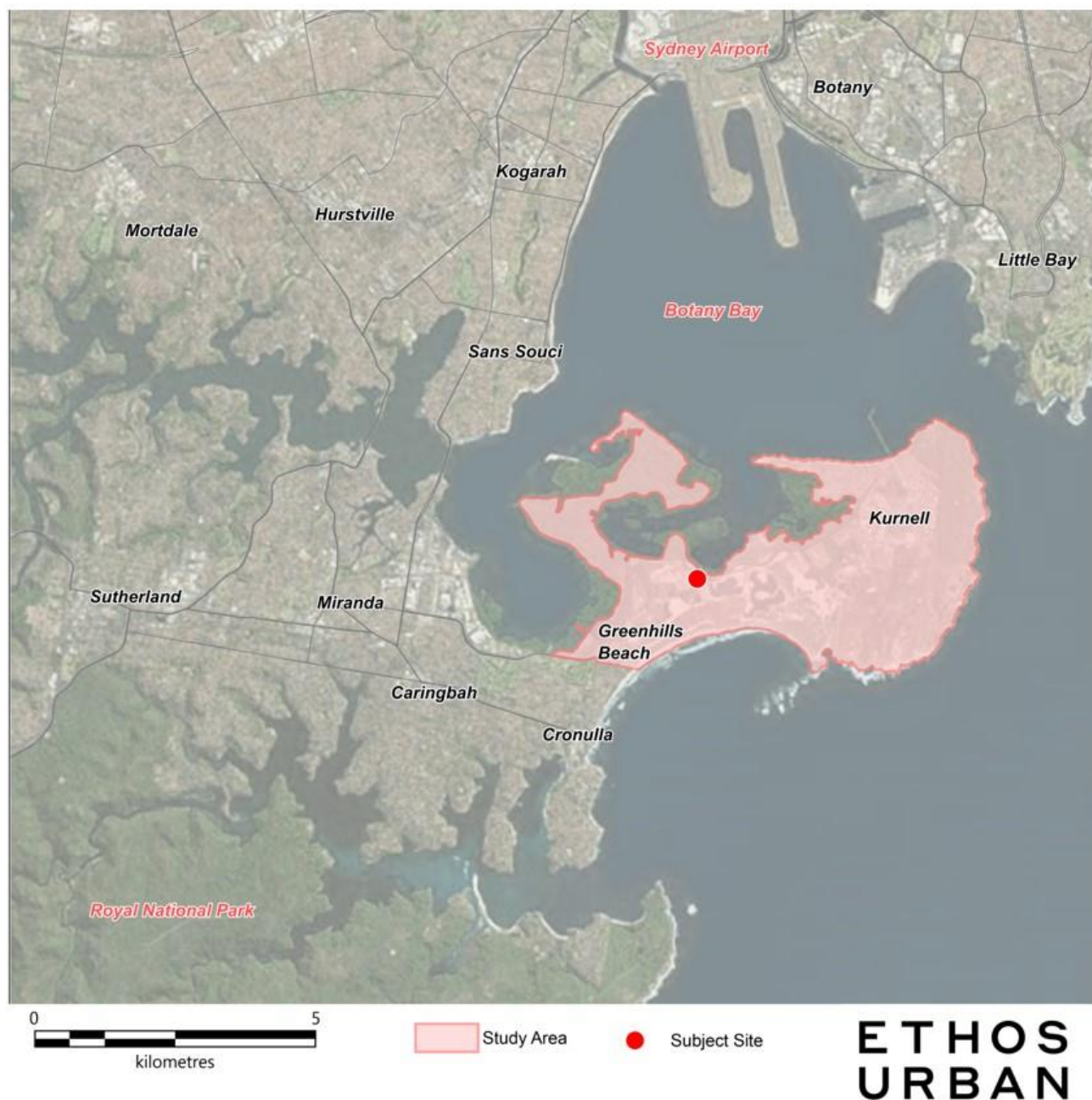


Figure 74 Social and Economic Impact Assessment Study Area

Source: Map Info, Ethos Urban

For the purposes of the Social and Economic Impact Assessment, demographic data has been sourced from the Australian Bureau of Statistics (ABS) 2016 Census of Population and Housing. Resident and worker population forecasts have been estimated taking into account data sourced from the ABS, .id Consulting and the NSW Government.

The key social-economic characteristics are the following:

- The 2019 Estimated Resident Population (ERP) within the study area was 3,363, with this population projected to remain relatively stable over the period to 2036.
- There is a high proportion of middle-aged and young persons who reside in the study area, and a small share of elderly persons. As such, the study area can be classified as comprising a number of traditional family households.
- Study area residents earn higher household incomes as compared to the Greater Sydney median.
- There are currently no planned residential growth areas within the study area, largely due to locational and environmental constraints, and the role of the study area as a key industrial activity centre. However, in the longer term, the area may shift away from these uses.
- Separate dwellings are the primary household typology in the study area, with no flats, units or apartments currently accommodated. It is expected that this share of household typology will remain relatively unchanged over the medium to long term.
- Currently, employment within the study area is primarily within the tertiary services sector, accounting for 54.5% of jobs. Secondary sector jobs, including manufacturing, accounted for 42.7% of all employment. The high share of secondary sector jobs and producer service activities outlines the prominent role of Kurnell as a major industrial and business activity centre. This is further evidenced in the Sutherland Shire Local Strategic Planning Statement (LSPS), which outlines that Kurnell currently supports over half of the population serving industries in the LGA, and has the most land availability to support the growth for industrial and urban service facilities in the future. The existing Breen Site reflects this, by providing a key service in recycling and waste management services.
- While not a tertiary sector job, manufacturing was the largest industry of employment (24.3% of all jobs) in the Study Area based on results from the latest ABS Census (2016).

A number of social trends and issues have also been identified. In relation to the future of waste and resource recovery, it is noted that China's new restrictions on the type and quality of recyclable material it imports since 2018 have accelerated the pursuit enhancements to the efficiency and capacity of the materials recycling industry. There is a need for waste recycling facilities to reduce emissions from waste is critical to help deliver the NSW Government's goal of net zero emissions by 2050. This is reflected in the broad community awareness of increasing waste recycling to reduce carbon emissions. Innovations in waste recovery are continuing to develop, with increasing materials able to be recovered. There is also a need for expanded landfill capacity in metropolitan NSW.

20.2 Social Impact Assessment

Social Impact Assessment involves the analysis of social changes and impacts on communities that are likely to occur as a result of a particular development, planning scheme, or government policy decision.

Ethos Urban has considered the Proposal against the *Social Impact Assessment Guideline for state significant mining, petroleum production and extractive industry development*, September 2017 (NSW DPIE). The assessment has also drawn upon guidelines published by the International Association for Impact Assessment (IAIA), *International principles for social impact assessment*.

In preparing the Social Impact Assessment, the following key communities potentially affected by the Proposal were identified:

- Local residents in Greenhills Beach and Kurnell;
- Workers on the Proposal Site – during construction and operational phases;
- The broader community of the locality, including community members using the Playing Fields, and
- Community members from the wider locality, district and region who will utilise the waste and recycling facility, and those who will access the proposed district-scale parklands.

A summary of the social impact assessment against the factors set out in the *Social Impact Assessment Guideline for state significant mining, petroleum production and extractive industry development*, September 2017, is provided below in **Table 63**. Recommended enhancements and mitigation measures are provided in **Section 21.0** of the EIS.

Table 63 Summary of Social Impact Statement

Factor	Potential Impacts During Construction	Potential Impacts During Operation
Way of Life	The Proposal will generate approximate 80 direct and indirect temporary construction jobs. Likely negative social impacts of increased traffic in the local area, particularly along Captain Cook Drive, during the construction phase, including increase noise and vibration from construction vehicles accessing the Proposal Site. It is considered that this will result in minimal adverse impact to the functioning of the community given the distance large distances between the Proposal Site and residential areas.	The Proposal will generate approximately 80 full time jobs that are well-suited to the large proportion of the population of Kurnell who are employed in the manufacturing industry. The New Resource Recovery Facility will also result in better working conditions. The operation of the New Resource Recovery Facility is unlikely to affect the way people live, especially as it is being relocated further away from the Greenhills Beach residential area. The creation of the Embellished Marang Parklands will provide significant recreational and social gathering opportunities, and improve connections to the sand dunes and Cronulla Beach from the Greenhills Beach residential area.
Community, including its composition, cohesion, character, how it functions and sense of place	The construction period may result in some minor disruption to the existing nearby Greenhills residential population, including a temporary increase in numbers of construction workers in the community, a perceived loss of 'sense of place' due to construction works, and potential increase in traffic and construction vehicle noise.	The redevelopment of the Existing Breen Resources Facility will not result in a change to the existing character of the area as there is an existing resources management facility on the Proposal Site. However, the proposed Embellished Marang Parklands are a district level park, which will result in an improved visual amenity, 'sense of place' and social connectedness and cohesion for local residents and the broader Sutherland Shire community. However, there is likely to be some potential negative impacts that relate to the visual impact of the waste stored and processed on Proposal Site, in terms of height, bulk and scale, being located approximately 1.8km from existing residential population.
Access to and use of infrastructure, services and facilities, whether provided by local, state, or federal governments, or by for-profit or not-for-profit organisations or volunteer groups	There may be potential minor negative impacts associated with the increase of traffic generated by vehicles accessing the Proposal Site during the construction phase. There may also be potential impacts on the effective operation of the facility during construction, given it will remain operational throughout, providing an important waste management service	The Proposal will cater to the Sutherland Shire's demand for open space and sporting fields that are nearing capacity. Improved access to a resource recovery facility will enable local residents and the broader Sydney community to reuse and recycle a wider range of materials, and will offer an educational opportunity relating to recycling. While recycling facilities and waste storage can have potential amenity impacts on residential populations, these impacts should be minimal as this use of the Proposal Site is not fundamentally changing, but is becoming less extensive.

Factor	Potential Impacts During Construction	Potential Impacts During Operation
Culture, including shared beliefs, customs, values and stories, and connections to land, places, and buildings (including Aboriginal culture and connection to country)	There are no perceived impacts on community values as it is the redevelopment of the Existing Breen Resources Facility.	The New Resource Recovery Facility will promote sustainability values in reducing, recycling and recovering waste to reduce landfill and greenhouse gas emissions. Similarly, the Embellished Marang Parklands will help to mitigate urban heat island effect and address climate change, which has been identified as an important issue in the community. The future Embellished Marang Parklands will provide the community with more opportunity to connect with nature. Sutherland Shire has a rich Aboriginal heritage. The creation of the future Embellished Marang Parklands has the potential to highlight historical narrative through planting and storytelling elements.
Health and wellbeing, including physical and mental health	Potential noise, air quality and amenity impacts for residents close to the Proposal Site or who live on roads with most significant truck movements. However, they will be managed during the construction phase.	The operation of the Proposal will not generate noise impact. However, air quality and leachate impacts will need to be mitigated and monitored. The Embellished Marang Parklands will result in improved mental and physical well-being outcomes as there will be greater access to open space and recreational opportunities
Surroundings, including access to and use of ecosystem services, public safety and security, access to and use of the natural and built environment, and its aesthetic value and/or amenity	Potential noise, air quality and amenity impacts for residents close to the Proposal Site or who live on roads with most significant truck movements. However, they will be managed during the construction phase.	The Embellished Marang Parklands will generate positive social impacts including health and wellbeing benefits from increased open space, improved amenity and visual aesthetic value of the locality, and mitigation of the urban heat island effect. Positive social impacts associated with the New Resource Recovery Facility include, decreasing waste going to landfill, improved waste storage which will help to minimise noise and dust and recycling material which would otherwise be sent to landfill. However, the final landform may result in adverse visual impact from public areas around the Proposal Site.
Personal and property rights, including whether their economic livelihoods are affected, and whether they experience personal disadvantage or have their civil liberties affected	The redevelopment of the facility will positively impact on the economic livelihood of Sutherland Shire through the creation of at least 30 jobs during the construction phase, both directly and indirectly	There will be a positive impact to economic livelihoods of local residents through the forecast creation (or retention) of around 80 full time jobs. There will be minimal or no impacts to personal and property rights associated with the upgrade to the Existing Breen Resources Facility. The creation of the Embellished Marang Parklands will increase the provision of public owned land that is set aside for public recreation, passive outdoor enjoyment, nature conservation
Decision-making systems particularly the extent to which they can have a say in decisions that affect their lives, and have access to complaint, remedy and grievance mechanisms	Pre-lodgement consultation and public exhibition of the EIS has and will allow for ongoing community consultation. Mechanisms and channels for people to communicate and find out information will be provided during construction.	Mechanisms for members of public to get in touch if they have any issues with amenity or other issues arising from the operation of the facility will be provided during operation.

Factor	Potential Impacts During Construction	Potential Impacts During Operation
Fears and aspirations related to one or a combination of the above, or about the future of their community	Nearby Greenhill residents may experience concern in relation to amenity impacts associated with the construction of the new facility	Nearby Greenhill residents may experience concern in relation to the expansion of the resource management activities and impact to amenity. There will be positive social impact associated with the creation of a new Embellished Marang Parklands which will support the community's aspirations for access to green spaces and enhanced natural environments

Conclusion

Overall, the social impact assessment concludes that the Proposal will provide a social benefit to the community through the creation of jobs, modernisation and increased capacity for recycling, enhanced sustainability initiatives, and provision of expanded open space delivering benefits to health and wellbeing. The proposed mitigation measures are summarised in **Section 21.0** are considered to adequately mitigated the potential for any adverse amenity impacts to the community.

20.3 Economic Impact Assessment

Employment generation

The key positive economic impact as a result of the Proposal is employment generation. Additional jobs supported by the development will accrue through direct and indirect employment generated during both the construction phase and ongoing employment as part of the operational phase.

The construction and operational phases of the development will generate both direct and indirect employment opportunities. The provision of these employment opportunities is particularly important in the current economic environment and will help to support the local community by stimulating economic output.

During the construction phase, it is estimated that the development will support some 30 direct jobs in the construction industry and support a further 50 jobs in related (supplier) industries over the development period. As such, total employment generated during the construction phase is estimated at 80 jobs.

Once complete and fully operational, it is estimated that the New Resource Recovery Facility will support 80 ongoing jobs (full time equivalents), which includes approximately 5 full time equivalents to operate the landfill, and 10 administrative jobs for Breen located at the Breen head office on an ongoing basis.

Economic output

The activities and employment accommodated by the Proposal will generate significant regional economic output, support jobs growth in the local area, and reinforce the role of Kurnell as an industrial and employment activity centre in the Sutherland Shire.

Ongoing jobs supported by the proposed development will generate additional economic output, including significant contributions from industry sectors including Electricity, Gas, Water and Waste services. Total output (GRP) at full occupancy is estimated at \$34 million per annum (2019 dollars). Gross value added by industry is an indicator of business productivity, it shows the net economic uplift by excluding the value of production inputs. Gross value added is estimated at around \$10.7 million per annum (2019 dollars) at full occupancy of the development.

Any adverse impact from the proposed development is anticipated to be minimal and will not impact on the viability or continued operation of any other facility within the area. The Proposal will result in a redevelopment of the Proposal Site in a way for which there are already suitable buffers to adjoining owners and facilities.

Additional economic benefits

The Proposal will deliver an array of economic benefits. In particular, the Proposal will deliver a modern, efficient resource recovery facility and enable use of materials, landfill and land on the Proposal Site to deliver the Embellished Marang Parklands. Other benefits associated within the Proposal include:

- Support for the current role of Kurnell as a key industry and employment precinct serving the broader region.
- Allow development of underutilised land and reallocation of suitable recovered waste materials to create public benefit through recreational open space, and associated facilities.
- Additional employment through the creation of the Embellished Marang Parklands.
- Encourage transition to a more sustainable circular economy in a growing part of the city.
- Contribute to attracting and securing investment and high value tenants and businesses to Kurnell, particularly businesses associated with recycling, and/or waste management, or businesses that would service or support the Embellished Marang Parklands.
- Support the objectives of Sutherland Shire and the State Government through supporting employment growth, improved sustainability initiatives and creating improved public open space.

Potential adverse economic impacts

Any impact from the Proposal is anticipated to be minimal and will not impact on the viability or continued operation of any existing facility within the area. The Proposal will result in a redevelopment of the Proposal Site and the continuation of existing operational activities, rather than a new waste management facility altogether, with the Existing Breen Resources Facility already established with adequate buffers to adjoining owners and other surrounding community facilities. Amenity impacts will be strictly managed, mitigated and monitored. The composition of the Proposal to include a New Resource Recovery Facility, the Embellished Marang Parklands, and the continued use of the approved landfill area, is in line with existing and future character of Kurnell, and is well suited to support growth in this part of Sydney. Moreover, given the Proposal Site is located within a non-residential area, with adjoining industrial and non-residential uses, any impact from a redevelopment is likely to be minimal.

Conclusion

The Proposal provides a unique opportunity to deliver a range of benefits through the delivery of the Embellished Marang Parklands, a New Resource Recovery Facility, and improved landfilling activities, in order to create a modern, integrated activity that generates employment benefits as well as broader benefits to the local and regional community.

Overall, the assessment found that there are no detrimental economic impacts likely to result from the Proposal. Instead the Proposal is likely to result in significant positive economic benefits including the provision of additional direct and indirect employment opportunities, and generate benefits to the local and regional population through improved recycling and waste management practices, but also via the resulting creation of a regional park and associated outdoor facilities that will have a broad appeal to the community.

21.0 Mitigation Measures

The collective measures required to mitigate the impacts associated with the proposed works are detailed in **Table 64**. These measures have been derived from the previous assessments within this EIS and those detailed in appended consultants' reports.

Table 64 Proposed mitigation measures

Impact	Environmental Safeguards	Responsibility	Timing
Waste Management			
Waste generation and recycling	Detailed design will include measures to minimise excess spoil generation. This will include a focus on optimising the design to minimise spoil volumes, and the reuse of material on the Proposal Site.	Breen	Detailed Design
Construction waste and spoil management	A Construction Waste Management Plan will be prepared as part of the CEMP and implemented during construction. The plan will adopt the waste hierarchy principles contained in the Waste Avoidance and Resource Recovery Act 2001 and will detail processes, responsibilities and measures to manage waste and minimise the potential for impacts during construction.	Construction Contractor	Pre-construction / Construction
	Construction waste will be minimised by accurately calculating materials brought to the site and limiting materials packaging where possible.	Construction Contractor	Construction
	All waste disposal will be in accordance with the Waste Classification Guidelines.	Construction Contractor	Construction
Operational waste management (staff and maintenance)	Operational waste from personnel and maintenance activities, including general litter clean up, will be managed in accordance with existing operational practices. It will adopt the waste hierarchy principles contained in the Waste Avoidance and Resource Recovery Act 2001.	Breen	Operation
Waste impact	All waste received at the New Resource Recovery Facility will be managed in accordance with the OEMP, EPLs and EPA (2018) Standards for managing construction waste in NSW.	Breen	Operation
	An Energy from Waste Management Plan will be developed to address and manage compliance with the EPA (2015) NSW Energy from Waste Policy Statement.	Breen	Operation
Contamination			
Addressing identified data gaps	Additional environmental investigations could be carried out for the data gaps in Section 9.1 of the Contamination Status Report and in accordance with NEPM and other regulations.	Breen	Pre-construction
Ground gas management	- Procedures to manage hazardous ground gas should be developed as a component of the final site design and should be included in the Site Closure Plan. Procedures should include monitoring to be undertaken during construction and consider confined spaces and engineering controls where required, such as forced ventilation. - Ground gas (methane) levels are generally higher (above assessment criteria) in landfilled areas and lower (below assessment criteria) along the perimeter of the Proposal Site. - The final capping design should consider gas management systems, which should be approved by a qualified consultant.	Breen	Detailed Design

Impact	Environmental Safeguards	Responsibility	Timing
Managing potential risks posed during construction	A CEMP should be developed for construction works to outline how the Proposal will avoid, reduce or mitigate effects on the environment. The CEMP should consider a number of subjects applicable to the redevelopment such as – but not limited to – groundwater, surface water, soil quality, dust generation, noise and vibration, waste and drainage. The CEMP should include an unexpected contamination finds protocol to be implemented during construction. If signs of contamination are encountered during construction, such as odours, staining and ACM, work in the area should be stopped and contamination managed in accordance with an unexpected contamination finds procedure.	Contractor	Pre-construction / Construction
Acid sulfate soil	- While most of the Proposal Site has already been disturbed and mined, some ASS may be present in undisturbed areas and on site boundaries. Disturbance of these areas may be unlikely in the Proposal, but an acid sulfate soil management plan (ASSMP) should be developed in line with the Acid Sulfate Soil Manual as a precaution. - The ASSMAP should outline strategies to manage potential and actual acid sulfate sediments and soils that may be disturbed during construction. If required, acid sulfate soils may be disposed off-site in accordance with the NSW EPA (2014) Waste Classification Guidelines; Part 1 and Part 4: Acid sulfate soils.	Contractor	Pre-construction
Validation of the landfill capping system	Capping of the landfilled waste will need to meet NSW EPA landfill closure requirements and a Site Closure Plan will also be required to detail capping aspects.	Breen	Pre-construction
Long-term management plan, monitoring and containment of contaminated material	Long-term, ongoing environmental management requirements will need to be identified within a Site Closure Plan; to be prepared in accordance with NSW EPA Guidelines.	Breen	Operation
Surface Water and Groundwater			
Stormwater Quantity			
Stormwater quantity impacts from the Embellished Marang Parklands and Lot 5 Final Landform	- Provision of an infiltration trench to collect stormwater runoff from Catchment 1 and prevent runoff from discharging onto Captain Cook Drive in events up to the 1% AEP storm event. - Provision of a vegetated swale adjacent to the proposed Green Hills Parklands Stages 1B, 2 and 3 works (currently under construction), which will prevent concentrated flow from discharging across the boundary and towards the Playing Fields, car park and access road. The vegetated swale would discharge into the stormwater drainage system currently under construction for Stages 1B, 2 and 3. - Provision of an on-site stormwater detention (OSD) basin south of the proposed car park in Catchment 4C to ensure post-development flows towards the existing ponds and sand dunes adjacent to the Proposal Site are less than or equal to pre-development flows. - Provision of a level spreader and scour protection at the outlet of Catchment 5 to minimise the risk of scour and erosion adjacent to the boundary and towards the existing ponds external to the Proposal Site.	Breen	Operation
Stormwater quantity impacts from the New Resource Recovery Facility	- Provision of infiltration basins and vegetated swales/buffer strips adjacent to the northern and southern boundaries of the New Resource Recovery Facility to collect and treat surface water runoff prior to discharge to groundwater. - Provision of proprietary stormwater treatment devices to remove oils and grease, suspended solids, gross pollutants and some nutrients.	Breen	Operation

Impact	Environmental Safeguards	Responsibility	Timing
Stormwater Quality			
Stormwater quality impacts from the Embellished Marang Parklands and Lot 5 Final Landform	- A vegetated swale within the proposed car park to capture and treat surface water runoff from the majority of the car park (excluding the eastern portion of the access road that discharge towards Stages 1B / 2 / 3 of Green Hills Parklands. - An infiltration basin to collect flows from the Lot 5 Final Landform area.	Breen	Operation
Stormwater quality impacts from the New Resource Recovery Facility	- Infiltration basins to capture and contain flows for all storm events up to the 1% AEP peak flow, treating runoff from stockpiles and other areas. - Bioretention basins co-located with the infiltration basins to treat surface water runoff. - Vegetated swales around the perimeter of the bioretention and infiltration basins, which would collect surface water runoff and filter any suspended solids from runoff generated on material stockpiles and unsealed access roads prior to discharge towards the bioretention and infiltration basins. - Proprietary cartridge filters (StormFilter or equivalent) to capture and contain sediments and nutrients from sealed pavements and any roof areas. These devices also have capabilities to remove heavy metals and other contaminants from the stormwater runoff. Devices to be detailed during future design stages. - Hydrodynamic separators (Humes HumeCeptor® or equivalent) to capture and contain oil and grease runoff from the proposed car park and sealed access roads, with a treatable flow rate up to the 3 month ARI peak flow. Devices to be detailed during future design stages. - Wheel washing of vehicles in order to contain contaminated materials and dust on-site. - Bunding and silt traps to be considered during detailed design to capture heavy metals generated from stockpiles on-site, to be detailed during future design stages. - Dust suppression of stockpiles, in order to contain dust and materials on-site.	Breen	Operation
Construction Phase Surface Water			
Impacts from erosion and sediment during construction	During construction, erosion and sediment control measures shall be implemented in accordance with Managing Urban Stormwater – Soils and Construction (Landcom, 2004). An Erosion and Sediment Control Plan shall be prepared for the development prior to construction. This Plan will outline strategies to prevent migration of pollutants downstream during and immediately following construction. It is recommended that as a minimum the following measures be implemented: - Stabilised site access shall be constructed at all entry and exit points to the Proposal Site in order to prevent the migration of soil and sediments. - At the upstream end of works, clean water from undisturbed or fully rehabilitated areas shall be temporarily diverted around disturbed areas. - Runoff from disturbed areas and stockpiles should be kept separate and diverted to sediment basins. - Leachate from active cells should be kept separate from other runoff sources. - Any temporary water collection and conveyance systems installed on the Proposal Site shall be designed in a manner that minimises erosion. Steep channels should be avoided, and rip rap installed where appropriate. - Sediment fences shall be installed at the downstream end of any disturbed areas to prevent the migration of soil and sediments. - The area of soil disturbed at any one time shall be minimised where possible. Any stockpiled material shall be covered, kept moist or planted with hydromulch.	Contractor	Construction

Impact	Environmental Safeguards	Responsibility	Timing
	Any disturbed areas shall be rehabilitated as soon as practical, either temporarily or permanently.		
Impacts from Stockpiles	- Stockpiles of topsoil material should be located as close to the proposed rehabilitation area as possible to avoid movement of material which could be lost during transportation. The stockpile should be maintained in a moist condition for dust and be kept at a maximum height of 3m. Measures such as silt fences to be installed at the low side of the stockpile for erosion control. - The stockpile location to be designed in a later stage to incorporate proposed haulage road layout and site access to each stage.	Contractor	Construction
Ongoing maintenance	- Due to the extended operation life of landfill sites, additional effort is required for the implementation of maintenance regimes for the various sediment and erosion control measures installed on-site. - Erosion and sediment control measures should be inspected daily with more intense inspections and maintenance procedures to be undertaken during periods of wet weather. Repairs and maintenance following large storms should prioritise restoring high risk areas first. - Monitoring of surface water on-site is recommended to assess the effectiveness of the sediment and erosion control strategy. Monitoring will indicate the effectiveness of treatment measures, confirm that leachate is not entering the stormwater system and help to ensure regulatory requirements are being met.	Breen	Construction
Groundwater Monitoring			
A monitoring program is proposed to monitor for and respond to the emergence of potential adverse impacts	- Characterise/verify the improvement in groundwater quality associated with a reduction in leachate being generated from historical landfilling activities. - Characterise/verify the improvement in surface water quality infiltrating (via infiltration ponds) to groundwater associated with improved site practices and land cover. - Identify and respond to the potential for generation of acid sulphate soils on-site and off-site. - Characterise the emergence of potential impacts associated with the New Resource Recovery Facility located in the eastern portion of the Proposal Site.	Breen	Ongoing
Leachate			
Engineering controls and barriers	- Utilise the engineered barrier system in Landfill Cell B11 to trap and contain leachate within the landfill area. - Control, collect and manage leachate through the use of the Leachate Collection and Conveyance System installed over the floor of Landfill Cell B11. The leachate drainage layer comprises an aggregate drainage layer with collection pipes laid on the floor of the landfill cell that drains to leachate collection sumps. - Leachate from Landfill Cell B11 is conveyed by pumping to the leachate holding pond. The leachate holding pond is specifically designed and constructed for the purpose of holding and evaporating leachate. - The interface between Landfill Cell B10 and B11 has been constructed in such a manner that the leachate barrier of Landfill Cell B10 is connected to and drains to that of Landfill Cell B11 Stages A and B. The intention of which is to provide continuity with the leachate barrier in Landfill Cell B11. The collection system constructed in Landfill Cell B11 allows leachate generated in Landfill Cell B10 to drain into the leachate management infrastructure constructed in Landfill Cell B11 and then conveyed for disposal by evaporation from the leachate holding pond.	Breen	Ongoing

Impact	Environmental Safeguards	Responsibility	Timing
Minimisation of leachate generation	• Application of daily and intermediate cover over deposited waste to minimise rainfall infiltration. • Diversion of stormwater so it does not come into contact with leachate or waste. • Diversion of runoff from surrounding land away from the landfill; and • Minimise the size of the active tipping face.	Breen	Ongoing
Leachate disposal	• Evaporation from the leachate holding pond. • Controlled irrigation onto the active area tipping of Cell for dust suppression purposes. Active tipping area of the cell. • Re-injection into the waste mass of Cell, particularly following periods of high levels of leachate generation; • Discharge to sewer subject to approval by relevant authorities; and • Tanker transfer off-site for disposal at a suitably licensed facility	Breen	Ongoing
Leachate monitoring	• Daily measurement of leachate level within the leachate pond. • Daily recording of the volume of leachate transferred from each cell to the holding pond. • Daily recording of the volume of leachate removed from the storage pond by pumping and its method of disposal. • Daily inspections of the leachate sump and daily measurements of the leachate level in the sump following placement of waste in the cell. • Quarterly monitoring of leachate quality in the leachate holding pond should be undertaken. • Alternatively, the daily recording frequency may be reduced upon installation of an automated leachate level detection system.	Breen	Ongoing
Reduce the amount of leachate generated	• Progressive construction of the final capping for the Former Landfill Areas in accordance with the Updated Progressive Capping Plan (Appendix U).	Breen	Ongoing
Flooding			
Flood controls to be applied	• Proposed buildings are to be located outside of the 1% AEP flood extent • All buildings (habitable and non-habitable) are to have finished floor levels at a minimum of 150 mm above the ground to prevent nuisance ingress of stormwater. • Flood evacuation will be managed through the Breen Site Emergency Management Plan.	Engineer / Breen	Pre-construction

Impact	Environmental Safeguards	Responsibility	Timing
Flood controls to be investigated during detailed design	- The minimum surface level of open car parking spaces or carports shall be no lower than the 1% AEP flood or the level of the crest of the road at the location where the Proposal Site has access to the road. - The level of the driveway providing access between the road and parking space shall be no lower than 300 mm below the 1% AEP flood or such that the depth of inundation during a 1% AEP flood is not greater than either the depth at the road or the depth at the car parking space. - Reliable access for pedestrians or vehicles shall be provided from the building commencing at a minimum level equal to the lowest habitable floor level to an area of refuge above the PMF level. - Adequate flood warning systems, signage and exits shall be available to allow safe and orderly evacuation without increased reliance upon the SES or other authorised emergency services personnel. - No storage of materials which may cause pollution or be potentially hazardous during any flood is permitted below the 1% AEP plus 500mm.	Engineer / Breen	Pre-construction
Cultural Heritage			
Impact of future Embellished Marang Parklands on adjacent coastal dunes and nature reserves to the south/south-west of the Proposal Site	Preparation of a Landscape Management Plan by a suitably qualified landscape architect with experience in coastal-dunescape contexts should be undertaken to inform detailed parkland planning. The design and management of transition zones between the Embellished Marang Parklands and dunes and at the property margins should be central to this plan. The plan should consider ways of interpreting the shared history of the peninsula to parkland users. The detailed planning of the Embellished Marang Parklands should also address contouring, revegetation and infrastructure (such as security lighting and drainage) – especially on the approach to the dunescape, and more generally at property margins and where works will interface with extant bushland/reserves.	Landscape architect	Detailed design and planning of Embellished Marang Parklands prior to execution of final stage of VPA
	The SoHI should be reviewed (and possible amended) at such time as detailed planning of the Embellished Marang Parklands (and any allied works) is advanced.	Heritage consultant	Detailed design and planning of Embellished Marang Parklands prior to execution of final stage of VPA
Aboriginal Heritage			
Aboriginal heritage induction	An Aboriginal Heritage Induction should be prepared for the Proposal by an appropriately qualified archaeologist and/or representative of the La Perouse Local Aboriginal Land Council. The induction should highlight the legal protections afforded to Aboriginal objects under the National Parks & Wildlife Act 1974. It will also explain the nature of the dune sands, the types of buried landforms that may exist in parts of the study area and the types of archaeological remains that may be found within them. This will include 'stop work' procedures for dealing with unexpected finds (such as human or animal bone, shell material or stone artefacts) that may be exposed during construction. The Aboriginal Heritage Induction should initially be delivered on commencement of site works by an appropriately qualified archaeologist and/or representative of the La Perouse Local Aboriginal Land Council to the main contractor and other relevant management personnel.	Contractor	Pre-construction

Impact	Environmental Safeguards	Responsibility	Timing
	The Aboriginal Heritage Induction materials will also be incorporated into the general site induction materials for all workers and contractors involved in excavation works related to the New Resource Recovery Facility and elsewhere across the Proposal Site.		
Unexpected finds procedures	During any works not subject to archaeological monitoring, if any Aboriginal objects or bones suspected of being human are identified during construction, site workers must: • Not further disturb or move these remains. • Immediately cease all work at the location. In the case of Aboriginal objects: • notify the Heritage NSW Enviroline on 131 555 as soon as practicable and provide available details of the objects or remains and their location. Notify the La Perouse Local Aboriginal Land Council to assist in the determination of appropriate management for the objects or remains. • do not recommence any work at the location unless authorised in writing by Heritage NSW. In the case of any bone which may possibly be human: • all works will immediately cease in that area. • a specialist physical anthropologist will be called in to determine whether the remains are definitely human. • In the event that the bones are human, the NSW Police will be contacted, and any further investigations will be undertaken under their guidance. If the bone is found to be deposited within the last 100 years, whether of Aboriginal or non-Aboriginal origin, the NSW Police will determine further actions to be taken as it may be a coronial matter. If the NSW Police are satisfied that the bone is that of an Aboriginal person not suspected of being buried within the last 100 years, Heritage NSW will be notified, and a determination made in consultation with the La Perouse Local Aboriginal Land Council as to the appropriate management of the remains.	Contractor	Construction
Triggers for further Aboriginal heritage assessment	• Any proposed future additions or amendments to design should avoid subsurface impacts that may extend below the current ground level within the area of Aboriginal heritage sensitivity shown in Figure 55. If subsurface impacts within this area cannot be avoided, further Aboriginal heritage assessment in consultation with the Registered Aboriginal Parties to this project will be required. • As long as the procedures outlined above are implemented as part of project approval, there are considered to be no archaeological grounds for further Aboriginal heritage investigations in relation to the current proposal.	Breen	Ongoing
Aboriginal Parties	When finalised, a copy of this report should be forwarded to the Registered Aboriginal Parties and to: • The Registrar • Aboriginal Heritage Information Management System Heritage NSW • Locked Bag 5020 • Parramatta NSW 2220	Coast History and Heritage	Lodgement
Visual Impact			
Light spill from operation	Ensure that the design of lighting seeks to reduce light spill	Landscape architect	Pre-operation

Impact	Environmental Safeguards	Responsibility	Timing
Air Quality			
General dust impact	• Training all staff and personnel on the need to minimise dust. • Site induction to include details regarding measures to minimise dust impacts. • On-site vehicles and mobile plant engines switched off when not in use. • Visually monitor to ensure no dust plumes travel off site. • Review of complaints relating to dust. • Monitor weather conditions and ambient air quality to identify periods where off-site dust impacts may be exacerbated.	Project Manager and Breen	Construction and operation
Traffic movements	• Watering of unpaved haul roads. • Chemical suppressants on unpaved haul roads. • Regular cleaning of paved haul roads. • Restricting traffic to designated routes. • Enforcing on-site speed limits. • Keeping vehicle loads covered except when loading/unloading.	Project Manager and Breen	Construction and operation
Material handling	• Minimising drop heights. • Apply water sprays to loading/unloading activities and at active faces of stockpiles.	Breen	Operation
Wind erosion	• Minimise size of exposed areas. • Rehabilitate exposed areas as soon as practicable. • Cover stockpiles when not in use.	Project Manager and Breen	Construction and operation

Impact	Environmental Safeguards				Responsibility	Timing	
Reactive management	Implement a dust monitoring with reactive management system, with three trigger levels for PM _{2.5} and PM ₁₀ measured over 1-hour and 3-hour averaging periods, as set out below.				Breen	Operation	
	Trigger Stage		Averaging Period	Trigger Value (µg/m³)			Action Required
			PM _{2.5}	PM ₁₀			
	1 Investigate	1 hour	45	85			Site Manager to undertake review of possible dust sources operating during the average period. Identify possible measures for these activities; action if deemed necessary.
		3 hour	40	80			
	2 Action	1 hour	235	470			Site Manager to attend site and ensure implementation of the control. Effectiveness of control actions to be reviewed and escalate where appropriate.
		3 hour	80	160			
3 Stop Work	1 hour	470	940	Targeted shut down of dust-generating activities until the measured pollutant levels are below the stated trigger value. Identify long-term solutions to dust issues.			
Greenhouse Gas Emissions							
Greenhouse gas emissions	- Utilise energy efficient building design features such as natural ventilation and lighting, and insulation; and, - Consider on-site renewable energy, such as solar power.				Breen	Operation	
Traffic and Transport							
Operation of New Resource Recovery Facility							
Operational Traffic Management Plan	A traffic management plan that details the traffic operation and control of all on-site activities. As a minimum, the OTMP is to provide details and assessment of: - Site signage and wayfinding; - Loading procedures and hazard identification; - Internal and external pedestrian movement plans; - Internal and external vehicular movement plans; - Parking locations and requirements; - Employee and visitor induction requirements; - General traffic procedures and rules to be adhered to; - Site specific traffic information not listed above.				Breen	Pre-operation	

Impact	Environmental Safeguards	Responsibility	Timing
Workplace Travel Plan	- A workplace travel plan is recommended to promote sustainable travel trends, such as car pooling or public transport. The travel plan should provide the following details and assessment: - Bus routes and service timetables, inclusive of the nearest bus stop location and pathways. Subsidised OPAL trips may also be considered as an incentive for employees; - Incentives for carpooling of employees where possible, and the appropriate mechanism to enable employees to connect with each other to promote carpooling; - Provision of secure bicycle parking and end-of-trip facilities such as changeroom facilities (i.e. showers) - Promotion of sustainable travel modes through engaging activities / competitions (e.g. STEPtember).	Breen	Pre-operation
Signage and pedestrian priority measures at the New Resource Recovery Facility site driveway / Lindum Road extension	Signage (e.g. give-way to pedestrians), traffic calming (e.g. speed humps or raised thresholds) and line marking (e.g. zebra crossing) are to be considered	Breen	Pre-operation
Operation of future Embellished Marang Parklands			
Signage and Wayfinding Strategy	Development of a comprehensive signage plan that integrates with the approved sport fields. This is to ensure sufficient level of detail is provided to visitors on parking locations, facilities, emergency access points, loading and disabled parking. This will seek to minimise the level of internal traffic movements associated with circulation and parking	Breen	Pre-operation
Construction			
Construction Traffic Management Plan (CTMP)	A Construction Traffic Management Plan (CTMP) shall be prepared by suitably qualified professional to manage and mitigate potential traffic impacts during the construction program. The CTMP is to provide specific details on the construction program and include the following: - temporary traffic controls, including detours and signage; - notifying the local community about construction-related traffic impacts; - minimising potential conflict between construction-related traffic and: - Sports clubs - Adjacent land owners - implementing measures to minimise construction-related traffic on the public road network outside of standard construction hours; - ensuring construction-related traffic does not track dirt onto the public road network; - ensuring loaded vehicles entering or leaving the Proposal Site have their loads covered or contained; - providing sufficient parking on-site for all construction-related traffic; - responding to any emergency repair requirements or maintenance during construction - a traffic management system for managing over-dimensional vehicles; - fatigue management include a drivers code of conduct that addresses:	Contractor	Pre-construction

Impact	Environmental Safeguards	Responsibility	Timing
	– travelling speeds; – procedures to ensure that drivers to and from the Proposal Site adhere to the designated over dimensional and heavy vehicle routes; and – procedures to ensure that drivers to and from the Proposal Site implement safe driving practices; and • include a detailed program to monitor and report on the effectiveness of these measures and the code of conduct.		
Internal Management Strategy	• An internal management strategy shall be established within the construction site. This strategy shall form part of the site's induction that will be undertaken by all personnel on-site. It shall include the following key items to be implemented: • 10 km/h speed limit on internal access roads; • Radio communication between construction vehicles available at all times; • All loads to be correctly restrained; and • Warning signage to be provided at critical areas and intersection points.	Contractor	Pre-construction
On-site parking during construction	• The on-site parking within the construction compound is required to provide a dedicated safe area where personnel can access their vehicles.	Contractor	Construction
Bushfire			
Bushfire protection	• The bush fire protection measures for the proposal would be refined during detailed design and would comply with the acceptable solutions defined in PBP 2019 in relation to asset protection zones, public roads and accessibility and provision of services.	Detailed design	
	• The recommendations for compliance with PBP 2019 Performance Criteria listed in Table 53 would be adopted.	Detailed design	
Operational bush fire safety	• Prior to commencement of operation of the New Resource Recovery Facility an emergency plan would be developed for staff and other persons at the facility in the event of fire.	Operation	
Fire safety			
Fire safety system design	• The fire safety system for the new Resource Recovery Facility would be refined during detailed design and developed in consultation with FRNSW. • A detailed review and assessment of the New Resource Recovery Facility would be undertaken during detailed design to confirm BCA compliance and to identify the requirement for fire detection, automatic fire sprinkler and smoke hazard management systems for buildings that would not contain combustible stockpiles	Detailed design	
Operational fire safety	Prior to commencement of operation of the New Resource Recovery Facility, the following would be developed: • An operations plan for stockpile management with a copy to be included within the ESIP	Operation	

Impact	Environmental Safeguards	Responsibility	Timing
	- An emergency plan for staff and other persons at the facility in the event of fire - An ESIP for firefighters in accordance with FRNSW Guideline Emergency services information package and tactical fire plans		
Hazards and risks			
Construction hazard and risk management	Prepare a hazard and risk management plan (HRMP) as a sub-plan of the CEMP. As a minimum, the plan would: - Include an emergency response plan - Be prepared by a suitably qualified hazard management specialist - Provide for the implementation, monitoring and maintenance of the identified hazard controls.	Construction contractor	Pre-construction
Accidental spillage and discharge during construction	- Keep wet and dry spill kit, sand-filled/gravel-filled socks and geotextile matting on-site at all times. - Train staff in the appropriate deployment, use, removal and disposal of spill kit.	Construction contractor	Construction
Workforce and public safety during construction	Fence off and secure the Proposal Site to prevent public access.	Construction contractor	Construction
Workforce and public safety during construction	- Use terracing excavation methods where applicable. - Backfill or cover all open excavations with boards/plates outside of working hours.	Construction contractor	Construction
Workforce and public safety during construction	Inspect the entry connection into the Proposal Site ahead of any required demobilisation to ensure there are no road-user or pedestrian hazards.	Construction contractor	Construction
Hazardous material and dangerous goods transportation to the construction site during construction	Handle and use dangerous goods and hazardous materials in accordance with: - the NSW Workplace Health and Safety Act 2011; - the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005); - NSW Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998; and - Australian Government's Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2008). All storage and transport of dangerous goods to remain below the Applying SEPP 33 screening thresholds.	Construction contractor	Construction
Utility or services strike during construction	Undertake detailed utility surveys as part of the detailed design along with utility-provider consultation.	Construction contractor	Construction
Utility or services strike during construction	Prepare and work to a utility and services plan. No work would take place outside of this plan without additional consultation and utility searches.	Construction contractor	Construction
Hazardous material and dangerous goods transportation and storage during operation	Handle, store and use dangerous goods and hazardous materials in accordance with: - the NSW Workplace Health and Safety Act 2011; - the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005); - NSW Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998; and - Australian Government's Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2008).	Breen	Operation

Impact	Environmental Safeguards	Responsibility	Timing
Hazardous material and dangerous goods storage during operation	Hazardous materials and dangerous goods will be store within a bunded and secure storage facility on the New Resource Recovery Facility site.	Breen	Operation
Driver safety during operation	Incorporate car park signage to indicate direction of travel and traffic calming devices including speed humps and speed limits.	Breen	Detailed design/Operation
Biodiversity			
Sedimentation and contaminated and/or nutrient rich run-off	- Sediment barriers or sedimentation ponds shall be installed to control the quality of water released from the Proposal Site into the receiving environment. - Appropriate controls will be utilised and maintained to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways.	Project Manager	For the duration of construction works
Noise impacts on biodiversity	Noise barriers shall be installed, or daily/seasonal timing of construction and operational activities shall be undertaken, to reduce impacts of noise. Daily timing of construction activities is recommended in accordance with Table 1 of Interim Noise Guidelines (2009)	Project manager	Construction/ Operation
Dust impacts on biodiversity	Adaptive dust monitoring programs shall be undertaken to control air quality. Dust suppression measures will be implemented during construction works to limit dust from the Proposal Site	Project Manager	For the duration of construction works
Inadvertent impacts on adjacent habitat or vegetation	Temporary fencing shall be installed to protect significant environmental features such as riparian zones. Fencing is to be installed prior to the commencement of any construction works.	Project Manager	For the duration of construction works
	- Staff training and site briefing shall be implemented to communicate environmental features to be protected and measures to be implemented. - All staff working on the development will undertake an environmental induction as part of their site familiarisation. This induction will include items such as: - avoiding indirect impacts to off-site adjacent vegetation - correct storage of chemicals to prevent runoff into adjacent vegetation	Breen	To occur for all staff entering / working at the Proposal Site. Site briefings should be updated based on phase of the work and when environmental issues become apparent.

Impact	Environmental Safeguards	Responsibility	Timing
Transportation of weeds and pathogens	- Hygiene protocols shall be implemented to prevent the spread of weeds or pathogens between infected areas and uninfected areas. - Vehicles, machinery and building refuse associated with construction would remain only within construction footprint areas, avoiding weed or pathogen related impacts to vegetation outside of the Proposal Site. - Phytophthora control measures would be undertaken from the commencement of the Proposal to minimise the risk of spread to and from the Proposal Site, in accordance with guidelines from Royal Botanical Gardens and the Department of Planning, Industry and Environment. - If water trucks are being used for dust control, implement procedures to manage Phytophthora such as daily cleaning of the water truck and equipment. - Off road earth moving and excavation plant would be inspected before entering and exiting the Proposal Site and washed down if required to prevent the spread of weeds to or from adjacent vegetation. In particular, machinery working on or nearby dams are required to be washed down in order to prevent the spread of chytrid fungus into or from the Proposal Site .	Project Manager	For the duration of construction works
Impacts to retained vegetation on or adjacent to the Proposal Site	- Provision shall be made for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the Proposal Site. - Any landscape plantings in the Proposal Site is to use locality derived native species and those found within the region.	Project Manager	Following completion of construction works
Clearing impacts on Green and Golden Bell Frogs	Pre-clearing surveys of areas of potential refuge habitat and protocol for the management of Green and Golden Bell Frogs detected in construction areas. Pre-clearance surveys should be undertaken by a suitably qualified ecologist. If tadpoles are observed in areas of pooled water, an ecologist should be contacted to confirm the species of the tadpoles. If a Green and Golden Bell Frog is detected during the works, a qualified ecologist should be contacted. If the frog needs to be collected from the works area prior to the ecologist arriving on-site they can be captured using disposable gloves and placed in a suitable container/plastic bag with a small amount of distilled water or small handful of moistened grass/leaves and then moved to the designated relocation site by the project ecologist only after consultation with DPIE.	Project Manager	Prior to and for the duration of construction

22.0 Justification of the Proposal

In general, investment in major projects can only be justified if the benefits of doing so exceed the costs. Such an assessment must consider all costs and benefits, and not simply those that can be easily quantified. As a result, the EP&A Act specifies that such a justification must be made having regard to biophysical, economic and social considerations and the principles of ecologically sustainable development.

This means that the decision on whether a project can proceed or not needs to be made in the full knowledge of its effects, both positive and negative, whether those impacts can be quantified or not.

The proposed development involves the following key integrated components, being:

- Construction and operation of a New Resource Recovery Facility on the eastern part of the Proposal Site (Lot 5), including consolidation of existing waste management activities within this part of the Proposal Site;
- Continuation of land restoration, landfilling and contouring operations at the Proposal Site by permanent application of some of the residual waste materials from the New Resource Recovery Facility to land on Lot 5;
- Demolition and/or relocation to Lot 5 (as required) of the Existing Breen Resources Facility on Lots 1122, 1123 and 6 (this includes those parts of Lots 1122, 1123 and 6 that will comprise the Playing Fields);
- Capping and contouring areas of the Proposal Site within Lots 1122 and 1123, and Lot 6, with suitable material recovered from the New Resource Recovery Facility and some existing materials, with some specific material imported to the Proposal Site for capping and covering, such as low permeability clay; and
- Delivery of activated community space in the form of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6.

The assessment should therefore focus on the identification and appraisal of the effects of the proposed change over the Proposal Site's existing condition.

Various components of the biophysical, social and economic environments have been examined in this EIS and are summarised below.

22.1 Environmental Risk Assessment

The Environmental Risk Assessment (ERA) establishes a residual risk by reviewing the significance of environmental impacts and the ability to manage those impacts. The ERA for the Proposal has been adapted from Australian Standard AS4369.1999 Risk Management and Environmental Risk Tools.

In accordance with the SEARs, the ERA addresses the following significant risk issues:

- the adequacy of baseline data;
- the potential cumulative impacts arising from other developments in the vicinity of the Site; and
- measures to avoid, minimise, offset the predicted impacts where necessary involving the preparation of detailed contingency plans for managing any significant risk to the environment.

Figure 75 indicates the significance of environmental impacts and assigns a value between 1 and 10 based on:

- the receiving environment;
- the level of understanding of the type and extent of impacts; and
- the likely community response to the environmental consequence of the project;

The manageability of environmental impact is assigned a value between 1 and 5 based on:

- the complexity of mitigation measures;
- the known level of performance of the safeguards proposed; and

- the opportunity for adaptive management.

The sum of the values assigned provides an indicative ranking of potential residual impacts after the mitigation measures are implemented.

Significance of impact	Manageability of impact				
	5 Complex	4 Substantial	3 Elementary	2 Standard	1 Simple
1 – Low	6 (Medium)	5 (Low/Medium)	4 (Low/Medium)	3 (Low)	2 (Low)
2 – Minor	7 (High/Medium)	6 (Medium)	5 (Low/Medium)	4 (Low/Medium)	3 (Low)
3 – Moderate	8 (High/Medium)	7 (High/Medium)	6 (Medium)	5 (Low/Medium)	4 (Low/Medium)
4 – High	9 (High)	8 (High/Medium)	7 (High/Medium)	6 (Medium)	5 (Low/Medium)
5 – Extreme	10 (High)	9 (High)	8 (High/Medium)	7 (High/Medium)	6 (Medium)

Figure 75 Risk Assessment Matrix

The assessment completed in **Table 65** below includes reference to phases as follows:

- DD: Detailed Design;
- P/C: Pre-construction;
- C: Construction;
- P/O: Pre-operation; and
- O: Operation.

Table 65 Environmental Risk Assessment

Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Risk Assessment		
				Significance of Impact	Manageability of Impact	Residual Impact
Waste Management – Construction						
Waste generation and recycling	C	Excess spoil generation	Detailed design will include measures to minimise excess spoil generation. This will include a focus on optimising the design to minimise spoil volumes, and the reuse of material on-site.	Minor 2	Standard 2	Low/Medium 4
Construction waste and spoil management	C	Construction waste	- A Construction Waste Management Plan will be prepared as part of the CEMP and implemented during construction. The plan will adopt the waste hierarchy principles contained in the Waste Avoidance and Resource Recovery Act 2001 and will detail processes, responsibilities and measures to manage waste and minimise the potential for impacts during construction. - Construction waste will be minimised by accurately calculating materials brought to the site and limiting materials packaging where possible. - All waste disposal will be in accordance with the Waste Classification Guidelines.	Minor 2	Simple 1	Low 3
Waste Management – Operation						
Operational waste management (staff and maintenance)	O	General litter	Operational waste from on-site personnel and maintenance activities, including general litter clean up, will be managed in accordance with existing operational practices. It will adopt the waste hierarchy principles contained in the Waste Avoidance and Resource Recovery Act 2001.	Minor 2	Standard 2	Low/Medium 4
Operational Waste Impact	O	Waste impact	All waste received at the New Resource Recovery Facility will be managed in accordance with the OEMP, EPL(s) and EPA Standards for managing construction waste in NSW.	Minor 2	Simple 1	Low 3
Soil and Water – Contamination						
Addressing identified data gaps	P/C		Additional environmental investigations could be carried out for the data gaps in Section 9.1 of the Contamination Status Report and in accordance with NEPM and other regulations.	Low 1	Simple 1	Low 2
Ground gas management	C	Hazardous ground gas (methane) impacts	Procedures to manage hazardous ground gas should be developed as a component of the final Proposal design. Procedures should include monitoring to be undertaken during construction and consider confined spaces and engineering controls where required, such as forced ventilation.	Minor 2	Elementary 3	Low/Medium 5

Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Risk Assessment		
				Significance of Impact	Manageability of Impact	Residual Impact
Managing potential risks posed during construction	C	Construction contamination impacts	A CEMP should be developed for construction works to outline how the Proposal will avoid, reduce or mitigate effects on the environment.	Minor 2	Standard 2	Low/Medium 4
Acid sulfate soil	P/C	Disturbance of acid sulfate soils	An acid sulfate soil management plan (ASSMP) to be developed.	Minor 2	Standard 2	Low/Medium 4
Validation of the landfill capping system	P/C	Effectiveness of the capped areas	Capping of the landfilled waste will need to meet NSW EPA landfill closure requirements and a Site Closure Plan will also be required to detail capping aspects.	Minor 2	Standard 2	Low/Medium 4
Long-term management plan and containment of contaminated material	O	Long-term contamination impacts	Long-term, ongoing environmental management requirements will need to be identified within a Site Closure Plan; to be prepared in accordance with NSW EPA Guidelines.	Minor 2	Standard 2	Low/Medium 4
Soil and Water – Surface Water						
Stormwater quantity impacts – Embellished Marang Parklands and Lot 5 Final Landform	O	Stormwater run-off, concentrated flows across Proposal Site boundary, risk of scour and erosion adjacent to boundary and towards existing ponds external to the Proposal Site	Design provisions including infiltration trench, vegetated swale, on-site detention and level spreader with scour protection.	Moderate 3	Elementary 3	Medium 6
Stormwater quantity impacts – New Resource Recovery Facility	O	Surface water run-off requiring treatment prior to discharge to groundwater	- Provision of infiltration basins and vegetated swales/buffer strips adjacent to the northern and southern boundaries of the New Resource Recovery Facility to collect and treat surface water runoff prior to discharge to groundwater. - Provision of proprietary stormwater treatment devices to remove oils and grease, suspended solids, gross pollutants and some nutrients.	Moderate 3	Elementary 3	Medium 6
Stormwater quality impacts – Embellished Marang Parklands and Lot 5 Final Landform	O	Surface water requiring treatment	- A vegetated swale within the proposed car park to capture and treat surface water runoff from the majority of the car park (excluding the eastern portion of the access road that discharge towards Stages 1B / 2 / 3 of Green Hills Parklands. - An infiltration basin to collect flows from the Lot 5 Final Landform area.	Moderate 3	Elementary 3	Medium 6
Stormwater quality impacts – New Resource Recovery Facility	O	Surface water requiring treatment that contains sediment, nutrients, heavy metals, oil, grease and dust	Design provisions including infiltration trench, vegetated swale, on-site detention and level spreader with scour protection.	Moderate 3	Elementary 3	Medium 6

Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Risk Assessment		
				Significance of Impact	Manageability of Impact	Residual Impact
Surface water Construction Impacts	C	Impacts from erosion and sediment during construction of the New Resource Recovery Facility	An Erosion and Sediment Control Plan shall be prepared for the development prior to construction. This Plan will outline strategies to prevent migration of pollutants downstream during and immediately following construction	Minor 2	Simple 1	Low 3
	C	Impacts from Stockpiles	Stockpiles of topsoil material should be located as close to the proposed rehabilitation area as possible to avoid movement of material which could be lost during transportation. The stockpile should be maintained in a moist condition for dust and be kept at a maximum height of 3m. Measures such as silt fences to be installed at the low side of the stockpile for erosion control.	Minor 2	Simple 1	Low 3
	C	Ongoing maintenance	Due to the extended operation life of landfill sites, additional effort is required for the implementation of maintenance regimes for the various sediment and erosion control measures to be installed.	Minor 2	Simple 1	Low 3
Soil and Water – Groundwater and Leachate						
Groundwater impacts	C/O	Potential adverse impacts on groundwater resources.	Monitoring program to: - Characterise/verify the improvement in groundwater quality associated with a reduction in leachate being generated from historical landfilling activities. - Characterise/verify the improvement in surface water quality infiltrating (via infiltration ponds) to groundwater associated with improved site practices and land cover. - Identify and respond to the potential for generation of acid sulphate soils on-site and off-site. - Characterise the emergence of potential impacts associated with the New Resource Recovery Facility located in the eastern portion of the Proposal Site.	Moderate 3	Elementary 3	Medium 6
Leachate mitigation and minimisation measures	O	Minimise the generation of leachate	- Minimisation of leachate generation by: - Application of daily and intermediate cover over deposited waste to minimise rainfall infiltration. - Diversion of stormwater so it does not come into contact with leachate or waste.	Moderate 3	Elementary 3	Medium 6

Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Risk Assessment		
				Significance of Impact	Manageability of Impact	Residual Impact
			– Diversion of runoff from surrounding land away from the landfill; and – Minimise the size of the active tipping face. • Control, collect and manage leachate through the use of the Leachate Collection and Conveyance System. • Daily monitoring of leachate levels. • Reduce the amount of leachate generated by the progressive construction of the final capping for the Former Landfill Areas in accordance with the Updated Progressive Capping Plan (Appendix U).			
Soil and Water – Flooding						
Flooding impacts	O	Impacts of flooding on employees and visitors	• Proposed buildings are to be located outside of the 1% AEP flood extent • All buildings (habitable and non-habitable) are to have finished floor levels at a minimum of 150 mm above the ground to prevent nuisance ingress of stormwater. • Flood evacuation will be managed through the Breen Site Emergency Management Plan.	Minor 2	Simple 1	Low 3
Heritage						
Non-Aboriginal Heritage Impacts	O	Impact of future Embellished Marang Parklands on adjacent coastal dunes and nature reserves to the south/south-west of the Proposal Site	• Preparation of a Landscape Management Plan	Low 1	Simple 1	Low 2
Aboriginal Heritage Impacts	C	Unexpected finds	• Induction process for contractors • Cease work and contact Heritage NSW	Minor 2	Simple 1	Low 3
Visual Impact						
Light spill from operation	O	Impact of light spill on nearby receptors	Ensure that the design of lighting seeks to reduce light spill	Minor 2	Simple 1	Low 3
Air Quality						
Air Quality Impacts - Dust	C / O	General dust impact	• Implement dust monitoring and reactive management system	Minor 2	Simple 1	Low 3

Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Risk Assessment		
				Significance of Impact	Manageability of Impact	Residual Impact
			• Training all staff and personnel on the need to minimise dust • Site induction to include details regarding measures to minimise dust impacts • On-site vehicles and mobile plant engines switched off when not in use • Visually monitor to ensure no dust plumes travel off-site • Review of complaints relating to dust • Monitor weather conditions and ambient air quality to identify periods where off-site dust impacts may be exacerbated			
	C / O	Dust from Traffic Movements	• Watering of unpaved haul roads • Chemical suppressants on unpaved haul roads • Regular cleaning of paved haul roads • Restricting traffic to designated routes • Enforcing on-site speed limits • Keeping vehicle loads covered except when loading/unloading	Minor 2	Simple 1	Low 3
	O	Dust from materials handling	• Minimising drop heights • Apply water sprays to loading/unloading activities and at active faces of stockpiles	Minor 2	Simple 1	Low 3
	C / O	Dust from wind erosion	• Minimise size of exposed areas • Rehabilitate exposed areas as soon as practicable • Cover stockpiles when not in use	Minor 2	Simple 1	Low 3
Air Quality Impacts – Greenhouse gas emissions	C / O	Greenhouse gas emissions	• Utilise energy efficient building design features such as natural ventilation and lighting, and insulation; and, • Consider on-site renewable energy, such as solar power.	Moderate 3	Elementary 3	Medium 6
Noise and Vibration						
Noise and Vibration	C	Construction noise impact	• Ensure compliance with project specific noise trigger levels	Minor 2	Simple 1	Low 3
	O	Operational noise impact	• Ensure compliance with project specific noise trigger levels	Minor 2	Simple 1	Low 3

Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Risk Assessment		
				Significance of Impact	Manageability of Impact	Residual Impact
Traffic and Transport						
Operation of the New Resource Recovery Facility	P/O	Operational Traffic Management Plan	A traffic management plan that details the traffic operation and control of all on-site activities.	Minor 2	Standard 2	Low/Medium 4
	P/O	Workplace Travel Plan	A workplace travel plan is recommended to promote sustainable travel trends, such as car pooling or public transport	Minor 2	Standard 2	Low/Medium 4
	P/O	Signage and pedestrian priority measures at access driveway / Lindum Road extension	Signage (e.g. give-way to pedestrians), traffic calming (e.g. speed humps or raised thresholds) and line marking (e.g. zebra crossing) are to be considered	Minor 2	Simple 1	Low 3
Operation of the future Embellished Marang Parklands	P/O	Signage and Wayfinding Strategy	Development of a comprehensive signage plan that integrates with the approved sport fields. This is to ensure sufficient level of detail is provided to visitors on parking locations, facilities, emergency access points, loading and disabled parking. This will seek to minimise the level of internal traffic movements associated with circulation and parking	Minor 2	Standard 2	Low/Medium 4
Construction	P/C	Construction Traffic Management Plan (CTMP)	A Construction Traffic Management Plan (CTMP) shall be prepared by suitably qualified professional to manage and mitigate potential traffic impacts during the construction program.	Minor 2	Standard 2	Low/Medium 4
	P/C	Internal Management Strategy	An internal management strategy shall be established within the construction site. This strategy shall form part of the site's induction that will be undertaken by all personnel on-site	Minor 2	Standard 2	Low/Medium 4
	C	On-site parking during construction	The on-site parking within the construction compound is required to provide a dedicated safe area where personnel can access their vehicles.	Minor 2	Simple 1	Low 3
Fire and Incident Management						
Bushfire	DD	Bushfire protection	- The bush fire protection measures for the proposal would be refined during detailed design and would comply with the acceptable solutions defined in PBP 2019 in relation to asset protection zones, public roads and accessibility and provision of services. - Compliance with PBP 2019 Performance Criteria	Minor 2	Standard 2	Low/Medium 4
	O	Operational bushfire safety	Prior to commencement of operation of the New Resource Recovery Facility an emergency plan would be developed for staff and other persons at the facility in the event of fire.	Minor 2	Standard 2	Low/Medium 4

Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Risk Assessment		
				Significance of Impact	Manageability of Impact	Residual Impact
Fire safety	DD	Fire safety system design	The fire safety system for the new Resource Recovery Facility would be refined during detailed design and developed in consultation with FRNSW.	Minor 2	Standard 2	Low/Medium 4
	O	Operational fire safety	Prior to commencement of operation of the New Resource Recovery Facility, the following would be developed: - An operations plan for stockpile management with a copy to be included within the ESIP - An emergency plan for staff and other persons at the facility in the event of fire - An ESIP for firefighters in accordance with FRNSW Guideline Emergency services information package and tactical fire plans	Minor 2	Standard 2	Low/Medium 4
Hazards						
Hazards and risks	P/C	Construction hazard and risk management across the proposal	Prepare a hazard and risk management plan (HRMP) as a sub-plan of the CEMP. As a minimum, the plan would: - Include an emergency response plan - Be prepared by a suitably qualified hazard management specialist - Provide for the implementation, monitoring and maintenance of the identified hazard controls.	Moderate 3	Elementary 3	Medium 6
	C	Accidental spillage and discharge across the proposal during construction	- Keep wet and dry spill kit, sand-filled/gravel-filled socks and geotextile matting on the Proposal Site at all times. - Train staff in the appropriate deployment, use, removal and disposal of spill kit.	Moderate 3	Elementary 3	Medium 6
	C	Workforce and public safety during construction across the proposal	Fence off and secure the Proposal Site to prevent public access.	Moderate 3	Elementary 3	Medium 6
	C	Hazardous material and dangerous goods transportation to the construction site during construction	- Use terracing excavation methods where applicable. - Backfill or cover all open excavations with boards/plates outside of working hours.	Moderate 3	Elementary 3	Medium 6
	C	Utility or services strike across the proposal during construction	Inspect the entry connection into the Proposal Site ahead of any required demobilisation to ensure there are no road-user or pedestrian hazards.	Moderate 3	Elementary 3	Medium 6

Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Risk Assessment		
				Significance of Impact	Manageability of Impact	Residual Impact
	C	Utility or services strike across the proposal during construction	Handle and use dangerous goods and hazardous materials in accordance with: - the NSW Occupational Health and Safety Act 2000; - the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005); - NSW Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998; and - Australian Government's Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2008).	Moderate 3	Elementary 3	Medium 6
	O	Hazardous material and dangerous goods transportation and storage during operation	Undertake detailed utility surveys as part of the detailed design along with utility-provider consultation.	Moderate 3	Elementary 3	Medium 6
	O	Hazardous material and dangerous goods storage during operation	Prepare and work to a utility and services plan. No work would take place outside of this plan without additional consultation and utility searches.	Moderate 3	Elementary 3	Medium 6
	DD/O	Driver safety across the proposal during operation	Handle, store and use dangerous goods and hazardous materials in accordance with: - the NSW Workplace Health and Safety Act 2011; - the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005); - NSW Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998; and - Australian Government's Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2008).	Moderate 3	Elementary 3	Medium 6
Biodiversity						
Biodiversity impacts	C	Sedimentation and contaminated and/or nutrient rich run-off	- Sediment barriers or sedimentation ponds shall be installed to control the quality of water released from the Proposal Site into the receiving environment. - Appropriate controls will be utilised and maintained to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways.	Minor 2	Elementary 3	Low/Medium 5

Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Risk Assessment		
				Significance of Impact	Manageability of Impact	Residual Impact
	C/O	Noise impacts on biodiversity	Noise barriers shall be installed, or daily/seasonal timing of construction and operational activities shall be undertaken, to reduce impacts of noise. Daily timing of construction activities is recommended in accordance with Table 1 of Interim Noise Guidelines (2009)	Minor 2	Elementary 3	Low/Medium 5
	C	Dust impacts on biodiversity	Adaptive dust monitoring programs shall be undertaken to control air quality. Dust suppression measures will be implemented during construction works to limit dust from the Proposal Site	Minor 2	Elementary 3	Low/Medium 5
	C	Inadvertent impacts on adjacent habitat or vegetation	Temporary fencing shall be installed to protect significant environmental features such as riparian zones. Fencing is to be installed prior to the commencement of any construction works.	Minor 2	Elementary 3	Low/Medium 5
	C	Transportation of weeds and pathogens	- Hygiene protocols shall be implemented to prevent the spread of weeds or pathogens between infected areas and uninfected areas. - Vehicles, machinery and building refuse associated with the development construction should remain only within construction footprint areas, avoiding weed or pathogen related impacts to vegetation outside of the Proposal Site - Phytophthora control measures must be undertaken from the commencement of the Proposal to minimise the risk of spread.	Minor 2	Elementary 3	Low/Medium 5
	O	Indirect impacts to off-site adjacent vegetation	- Staff training and site briefing shall be implemented to communicate environmental features to be protected and measures to be implemented. - All staff working on the development will undertake an environmental induction as part of their site familiarisation. This induction will include items such as: - avoiding indirect impacts to offsite adjacent vegetation - correct storage of chemicals to prevent runoff into adjacent vegetation	Minor 2	Simple 1	Low 3
	O	Impacts to retained vegetation	- Provision shall be made for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the Proposal Site. - Any landscape plantings in the Proposal Site is to use locality derived native species and those found within the region.	Minor 2	Elementary 3	Low/Medium 5
	C	Clearing impacts on Green and Golden Bell Frogs	Pre-clearing surveys of areas of potential refuge habitat and protocol for the management of Green and Golden Bell Frogs detected in construction areas.	Minor 2	Elementary 3	Low/Medium 5

Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Risk Assessment		
				Significance of Impact	Manageability of Impact	Residual Impact
			Pre-clearance surveys should be undertaken by a suitably qualified ecologist. If tadpoles are observed in areas of pooled water, an ecologist should be contacted to confirm the species of the tadpoles. If a Green and Golden Bell Frog is detected during the works, a qualified ecologist should be contacted. If the frog needs to be collected from the works area prior to the ecologist arriving on-site they can be captured using disposable gloves and placed in a suitable container/plastic bag with a small amount of distilled water or small handful of moistened grass/leaves and then moved to the designated relocation site by the project ecologist only after consultation with DPIE.			

22.2 Social and Economic

The Proposal will provide a social benefit to the community through the creation of jobs, modernisation and increased capacity for recycling, enhanced sustainability initiatives, and provision of expanded open space delivering benefits to health and wellbeing. The proposed mitigation measures contained in the Social and Economic Impact Assessment (**Appendix B**) and summarised in **Section 21.0** of the EIS are considered to adequately mitigated the potential for any adverse social or amenity impacts to the community.

Moreover, the Proposal will not result in any likely significant or detrimental economic impacts. Instead the Proposal is likely to result in significant positive economic benefits including the provision of additional employment opportunities at the Proposal Site. It will also generate benefits to the local and regional population through improved recycling and waste management practices, but also via the resulting creation of a regional park and associated outdoor facilities that will have a broad appeal to the community.

22.3 Biophysical

This assessment has found that while there may be minor to moderate impacts as a result of the proposal, the impacts are not considered to be of sufficient significance, either in nature or extent to be regarded as unacceptable. Mitigation and management measures outlined in **Section 21.0** and appended technical reports will further ameliorate and minimise any potential impacts.

The proposal does require offsets for impacts on 7.53ha of potential threatened species habitat of the Golden and Green Bell Frog. However, these have been considered and assessed as part of the BDAR completed, consistent with the BC Act. Outside of these impacts, the proposal will not affect Commonwealth land, or have a significant impact on any matters of national environmental significance and therefore a referral to the Australian Minister for Environment is not required.

22.4 Ecologically Sustainable Development

The EP&A Regulation lists 4 principles of ecologically sustainable development to be considered in assessing a project. They are:

- The precautionary principle;
- Intergenerational equity;
- Conservation of biological diversity and ecological integrity; and
- Improved valuation and pricing of environmental resources.

An analysis of these principles follows.

Precautionary Principle

The precautionary principle is utilised when uncertainty exists about potential environmental impacts. It provides that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. The precautionary principle requires careful evaluation of potential environmental impacts in order to avoid, wherever practicable, serious or irreversible damage to the environment.

This EIS has not identified any serious threat of irreversible damage to the environment and therefore the precautionary principle is not relevant to the proposal.

Intergenerational Equity

Inter-generational equity is concerned with ensuring that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. The proposal has been designed to benefit both the existing and future generations by:

providing a modern resource recovery facility to maximise the long term recovery of Sydney's C&D and C&I waste;

Providing new parklands that will provide opportunities to enhance the health and wellbeing of current and future generations;

Minimising impacts to surrounding ecological communities through the careful management of surface, groundwater, contamination and biodiversity impacts.

The proposal has integrated short and long-term social, financial and environmental considerations so that any foreseeable impacts are not left to be addressed by future generations. Issues with potential long term implications such as waste disposal would be avoided and/or minimised through construction planning and the application of safeguards and management measures described in this EIS and the appended technical reports.

Conservation of biological diversity and ecological integrity

The principle of biological diversity upholds that the conservation of biological diversity and ecological integrity should be a fundamental consideration.

The proposal would not have any significant effect on the biological diversity and ecological integrity of the study area.

Improved valuation, pricing and incentive mechanisms

The principles of improved valuation and pricing of environmental resources requires consideration of all environmental resources which may be affected by a proposal, including air, water, land and living things. Mitigation measures for avoiding, reusing, recycling and managing waste during construction and operation would be implemented to ensure resources are used responsibly in the first instance.

Additional measures will be implemented to ensure no environmental resources in the locality are adversely impacted during the construction or operational phases.

22.5 Site Suitability and Public Interest

The Proposal Site is suitable for the Proposal as Breen currently has consent to operate and continues to operate a “depot registered and approved by the EPA for the receipt of natural excavated material and demolition materials” on the Proposal Site under development consent 269/90. The consolidation of these land uses as part of the New Resource Recovery Facility is a natural evolution of these activities and is consistent with existing objectives of the zone and the long term strategic planning aims for the Proposal Site. Relocating the resource recovery activities to the eastern part of Lot 5 will also reduce the amenity impacts of the activities, moving them further away from existing residents and improving the Captain Cook Drive frontage.

The proposed Embellished Marang Parklands is suitable for the Proposal Site as it will deliver on the long standing VPA commitments to provide regionally significant parklands and open space for the community of the Sutherland Shire. The combination of throughput and processing capabilities, modern resource recovery facilities, and the continuation of approved landfilling and land restoration activities on the Proposal Site using material produced on-site is a unique feature of this Proposal. The circular nature of material being produced on the Proposal Site and then restored to the Proposal Site, contributes to minimising off-site impacts and ensures, in essence, a closed system of operation and on-site landfilling and restoration activities.

The Proposal therefore responds to both an increased demand for resource recovery in the Sutherland Shire and broader Sydney region, as well as addressing demand for public open space.

On this basis, for the above reasons, the Proposal Site is considered suitable for the proposed use.

The Proposal is in the public interest as it represents an appropriate use consistent with the Proposal Site’s existing use. The New Resource Recovery Facility will offer an essential waste disposal and recovery service within the Sutherland Shire region that responds to rising trends in the recycling of materials. Moreover, the Proposal will result in the provision of new publicly accessible parklands. In these regards, the Proposal will provide significant and essential infrastructure and services to the area and is therefore considered to be in the public interest.

23.0 Conclusion

The Environmental Impact Statement (EIS) has been prepared to consider the environmental, social and economic impacts of the Proposal.

Specifically, the Proposal involves the following key integrated components:

- Construction and operation of a Resource Management Facility, comprising:
 - A New Resource Recovery Facility on the eastern part of the Proposal Site (Lot 5), including consolidation of existing waste management activities within this part of the Proposal Site;
 - A Waste Disposal Facility, being the continuation of current land restoration, landfilling and contouring operations at the Proposal Site by permanent application of some of the residual waste materials from the New Resource Recovery Facility to land on Lot 5;
- Demolition and/or relocation to Lot 5 (as required) of the Existing Breen Resources Facility on Lots 1122, 1123 and 6 (this includes those parts of Lots 1122, 1123 and 6 that will comprise the Playing Fields);
- Water usage and management across the entirety of the Proposal Site and adjacent playing fields;
- Ongoing long-term monitoring of the Former Landfill Site leveraging the environmental benefits and synergies of utilising the same personnel, plant, material and infrastructure;
- Re-profiling of parts of the Proposal Site within Lots 1122, 1123 and 6, with some existing waste materials from those lots. Breen confirms that no new waste is being received on Lots 1122, 1123 and 6 for the purposes of landfilling on these lots so as to facilitate the delivery of the Embellished Marang Parklands and Playing Fields;
- Capping and contouring areas of the Proposal Site within Lots 1122, 1123, and Lot 6, with suitable material recovered from the New Resource Recovery Facility and some existing materials, with some specific material imported to the Proposal Site for capping and covering, such as low permeability clay to enable the delivery of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6; and
- Delivery of activated community space in the form of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6.

The EIS has addressed the issues outlined in the SEARs (**Appendix D**) and accords with Schedule 2 of the EP&A Regulation as required for the submission of this SSD Application.

Having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development, the carrying out of the Proposal is justified for the following reasons:

- The Proposal will modernise Breen's resource recovery operations through the development of a vertically integrated and purpose-built New Resource Recovery Facility that will enable significant diversion of waste away from landfill and contribute to achieving the NSW Government's resource recovery targets;
- The Proposal will deliver high quality activated open space and parklands envisaged in the VPA that will contribute a significant and prominent new regional parkland for the benefit of the entire Sutherland Shire community;
- The Proposal promotes the orderly and economic use of the Proposal Site as it caters to and supports the ongoing and planned development of the Embellished Marang Parklands while ensuring a modern and efficient resource recovery facility continues to operate on the Proposal Site; and
- The Proposal, in conjunction with the proposed mitigation measures, does not result in any unacceptable biophysical or amenity impacts during construction or operation to the Proposal Site, surrounding development and surrounding natural landscapes.

Given the merits described above it is requested that the application be approved.