



Australian Government

Department of Climate Change, Energy,
the Environment and Water

EPBC 2006/2912

Mr Michael McErlean
Planning & Approvals Manager
North Harbour Holdings Pty Ltd
44 Brook Crescent, Burpengary East Qld 4505

Approval of Action Management Plan for North East Business Park Project, Burpengary East, Queensland

Dear Mr. McErlean,

Thank you for your email dated 16 July 2025 to the Department of Climate Change, Energy, the Environment and Water (the department), seeking approval of the Action Management Plan for North East Business Park, in accordance with condition 9 of the above project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Officers of the department have advised me on the Action Management Plan and the requirements of the conditions of the approval for this project. On this basis, and as a delegate of the Minister for the Environment and Water (the Minister), I have decided to approve *Land Based Environmental Management Plan - Sub-Plan 09 - Regional Park Additional Fill Areas, North Harbour, version RW3* dated 09 September 2025. Now this plan has been approved, it must be implemented.

As you are aware, the department has an active monitoring program which includes monitoring inspections, desk top document reviews and audits. Please ensure that you maintain accurate records of all activities associated with, or relevant to, the conditions of approval so that they can be made available to the department on request.

Should you require any further information please contact Robert Hine by email to:
PostApproval@dcceew.gov.au

Yours sincerely

A handwritten signature in dark ink, appearing to read 'B. Linton-Smith'.

Brendan Linton-Smith
Director, Post Approvals (Qld)
Environment Assessments (Vic and Tas) and Post Approvals Branch
Environment Regulation Division
17 October 2025

DCCEEW.gov.au
John Gorton Building - King Edward Terrace, Parkes ACT 2600 Australia
GPO Box 3090 Canberra ACT 2601 ABN: 63 573 932 849
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LAND BASED ENVIRONMENTAL MANAGEMENT PLAN - SUB-PLAN 09

Regional Park Additional Fill Areas North Harbour

Lot 2 SP320619
Burpengary East

A Report Prepared for
North Harbour Holdings Pty Ltd

SEPTEMBER 2025

DOCUMENT CONTROL

Document

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Client	North Harbour Holdings Pty Ltd

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Issue	Version	Draft/Final	Date Sent	Distributed to	No. Copies	Media	Delivery Method
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Client Issue

Version	Date	Author		Approved by	
		Name	Initials	Name	Initials
RW1	08/06/25	Nicole Davies	ND	Adam McArthur	AM
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1 INTRODUCTION

1.1 Background

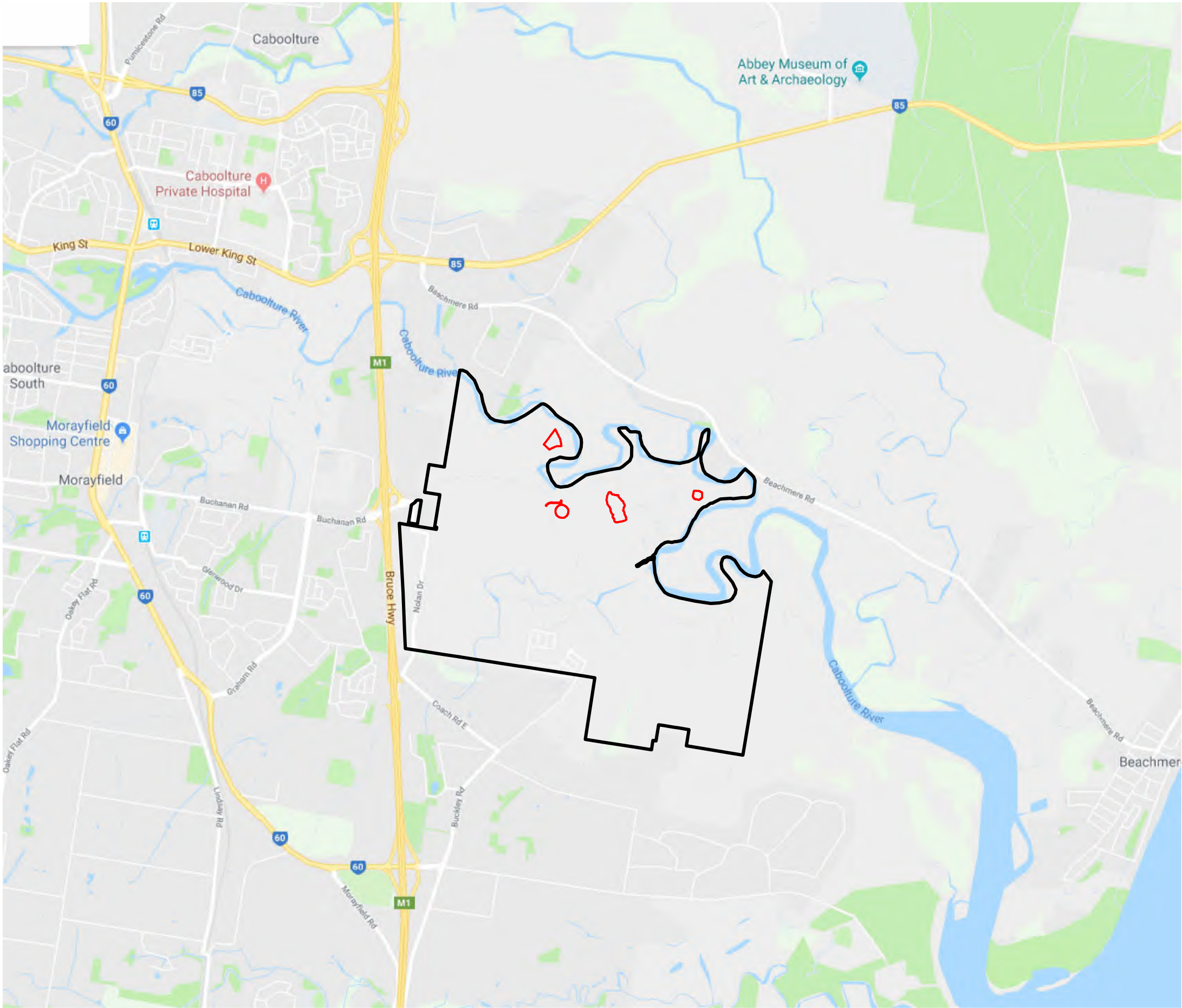
JWA Pty Ltd have been engaged by North Harbour Holdings Pty Ltd (formerly North East Business Park Pty Ltd) to complete a Land Based Environmental Management Plan (LBEMP) for the proposed bulk earthworks associated with the Regional Park Additional Fill Areas. The site is located land to the east of Hardwood Drive at the North Harbour development site, Burpengary East; formally described as Lot 2 on SP320619 (**FIGURE 1**). The four proposed fill areas range in size from 0.6 to 3.5 ha. An aerial photograph of the site is shown in **FIGURE 2**.

The subject site has a preliminary approval for development allowing mixed industry, business area precincts, open space and related purposes (Court Order no. 911 of 2015, Council Ref. MCU-2002-1079). It is understood that it is proposed to fill four (4) areas within the regional park on the site. The proposed bulk earthworks are being undertaken under this current preliminary approval.

In accordance with Condition 9 of the EPBC Approval (Ref: EPBC 2006/2912) the NEBP development is to be undertaken in accordance with the provisions of a Land Based Environmental Management Plan (LBEMP), approved by the Commonwealth Minister for the Environment, so as to ensure potential impacts to Matters of National Environmental Significance (MNES) are appropriately managed.

The following LBEMPs have previously been prepared for the NEBP and approved by the Commonwealth Minister for the Environment:

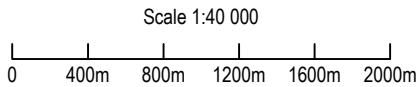
- *North East Business Park - Land Based Environmental Management Plan for Matters of National Environmental Significance (Version 2)* prepared by Cardno and dated 31 January 2014 (LBEMP for MNES v2 (Cardno, 2014)), which comprises the overarching LBEMP for the NEBP development and provides specifications for the preparation of LBEMP Sub-Plans for specific programs of approved works that are to be undertaken as part of the orderly and staged establishment of the NEBP development - approved on 17th February 2014. The overarching LBEMP was subsequently updated by JWA Pty Ltd in 2021. *North East Business Park - Land Based Environmental Management Plan for Matters of National Environmental Significance (Version 3)* prepared by JWA Pty Ltd and dated 30th November 2021 (LBEMP for MNES v3 (JWA 2021) - approved on 21st December 2021.
- *North East Business Park - LBEMP Sub-Plan 01 (Version 2)* prepared by Cardno and dated 31 January 2014 (LBEMP Sub-Plan 01), which comprises an LBEMP Sub-Plan prepared in accordance with the specifications of the LBEMP for MNES v2 (Cardno 2014) and addressing the works program associated with preliminary works within part of the Mixed Industry and Business Area (MIBA) - approved on 17th February 2014.
- *North East Business Park - LBEMP Sub-Plan* prepared by Future-Plus Environmental and dated 22 August 2014 (LBEMP Sub-Plan 02), which comprises an LBEMP Sub-Plan prepared in accordance with the specifications of the LBEMP v2 (Cardno 2014) and



LEGEND

 LBEMP Sub-plan 09 Site Boundary

 NEBP Site Boundary

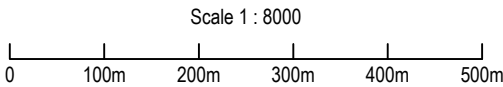


SOURCE: Google Maps	CLIENT North Harbour Holdings Pty Ltd	FIGURE 1	TITLE LOCALITY PLAN
SCALE: 1 : 40 000 @ A3			
JWA Pty Ltd Ecological Consultants	PROJECT LBEMP Sub-Plan 09	PREPARED: BW DATE: 10 June 2025 FILE: Q15003_LBEMP09_20250610.dwg	
	Regional Park Additional Fill Areas		
	North Harbour, Burpengary East QLD City of Moreton Bay LGA		



LEGEND

-  LBEMP Sub-plan 09 Site Boundary
-  NEBP Site Boundary



SOURCE: Metro Maps Aerial dated 07/11/24

SCALE: 1 : 8000 @ A3

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FIGURE 2

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TITLE

**AERIAL
PHOTOGRAPH**

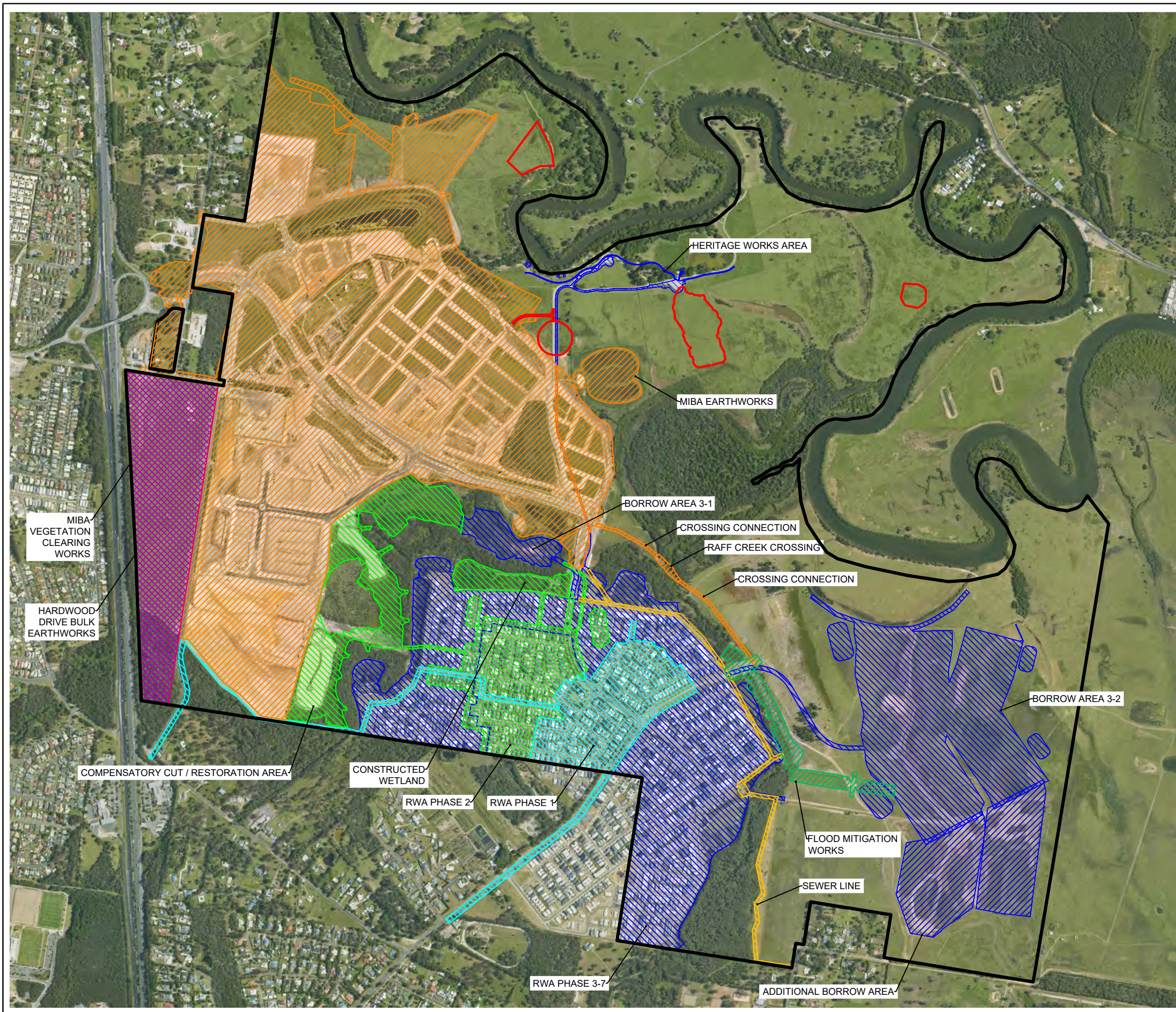
addressing the works program associated with preliminary works within Phase 1 of the Residential West Area (RWA) - approved on 25th August 2014.

- *North East Business Park - LBEMP Sub-Plan* prepared by JWA Pty Ltd and dated 8 July 2015 (LBEMP Sub-Plan 03), which comprises an LBEMP Sub-Plan prepared in accordance with the specifications of the LBEMP v2 (Cardno 2014) and addressing the works program associated with preliminary works within Phase 2 of the Residential West Area (RWA) - approved on 28th July 2015.
- *North East Business Park - LBEMP Sub-Plan 04* prepared by JWA Pty Ltd and dated 13th June 2016, prepared in accordance with the specifications of the LBEMP v2 (Cardno 2014) and addressing the works program associated with works within Phases 3-7 of the RWA - approved on 17th June 2016. Sub-Plan 04 was subsequently updated to include heritage areas and an extension to the borrow pit area, with the updated plan approved in September 2017.
- *North East Business Park - LBEMP Sub-Plan 05* prepared by JWA Pty Ltd and dated 28th March 2018, prepared in accordance with the specifications of the LBEMP v2 (Cardno 2014) and addressing the works program associated with works to install the sewer line to service the NEBP development.
- *North East Business Park - LBEMP Sub-Plan 06* prepared by JWA Pty Ltd and dated 17th December 2020, prepared in accordance with the specifications of the LBEMP v2 (Cardno 2014) and addressing the works program associated with the Mixed Industry and Business Area (MIBA) and the Raff Creek Crossing bulk earthworks - approved by the Commonwealth Minister for the Environment on 4th January 2021. Sub-Plan 06 was subsequently updated to address revised (based on updated flood modelling for the NEBP site) earthworks design for the north-western corner of the MIBA associated with proposed sports fields and drainage works - approved on 20th September 2024.
- *North East Business Park - LBEMP Sub-Plan 07* prepared by JWA Pty Ltd and dated 17th December 2020, prepared in accordance with the specifications of the LBEMP v2 (Cardno 2014) and addressing the works program associated with flood mitigation works - approved by the Commonwealth Minister for the Environment on 23rd August 2021.
- *North East Business Park - LBEMP Sub-Plan 08* prepared by JWA Pty Ltd and dated 19th December 2024, prepared in accordance with the specifications of the LBEMP v3 (JWA 2021) and addressing the works program associated with the Hardwood Drive bulk earthworks - approved by the Commonwealth Minister for the Environment on 21st February 2024.

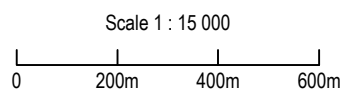
FIGURE 3 shows the extent of current and previous LBEMP areas on the subject site.

1.2 Site Description

The majority of the site is highly disturbed and has been the subject of previous land clearing, livestock grazing and plantation forestry activities.



- LEGEND**
- LBEMP Sub-plan 09 Site Boundary
 - NEBP Site Boundary
 - LBEMP Sub-plan 08 Extent - Hardwood Drive Bulk Earthworks
 - LBEMP Sub-plan 07 Extent - Flood Mitigation Works
 - LBEMP Sub-plan 06 (Revised) Extent
 - MIBA (remaining areas) - Bulk Earthworks
 - Raff Creek Crossing & Connection
 - LBEMP Sub-plan 05 Extent - Sewer Pump Station SPS-BGY017 (PS3) Reticulation Network
 - LBEMP Sub-plan 04 Extent
 - Residential West Area - Balance (Phases 3-7)
 - Borrow Areas
 - Heritage Works
 - LBEMP Sub-plan 03 Extent
 - Residential West Area - Phase 2
 - Compensatory Cut / Restoration Area
 - Constructed Wetland
 - LBEMP Sub-plan 02 Extent - Residential West Area Phase 1
 - LBEMP Sub-plan 01 Extent - MIBA (part of) Vegetation Clearing Works



SOURCE: Metro Maps Aerial dated 07/11/24 SCALE: 1 : 15 000 @ A3 JWA Pty Ltd Ecological Consultants	CLIENT North Harbour Holdings Pty Ltd PROJECT LBEMP Sub-Plan 09 Regional Park Additional Fill Areas North Harbour, Burpengary East QLD City of Moreton Bay LGA	FIGURE 3	TITLE EXTENT OF CURRENT & PREVIOUS LBEMP AREAS
		PREPARED: BW DATE: 10 June 2025 FILE: Q15003_LBEMP09_20250610.dwg	

The works area has been largely cleared of native vegetation (**FIGURE 4**). The area previously cleared currently consists of grassland, with vegetation predominately dominated by a range of introduced pasture grasses.

Weeds are being actively managed as part of the approved works.

1.3 Scope and Objectives

This LBEMP provides a structured management plan with the objective of minimising the impacts of the approved works program on MNES.

Specifically, the LBEMP addresses the bulk earthworks associated with the Regional Park Addition Fill Areas, and provides:

- An overview of the location and nature of the approved program of works that is the subject of this LBEMP;
- An assessment of the likelihood of occurrence of MNES within or adjacent to the works site;
- An assessment of the risk that the works program represents to relevant MNES; and
- Environmental management specifications for those aspects of the works program that are associated with a Medium to Extreme risk of harm to one or more MNES.

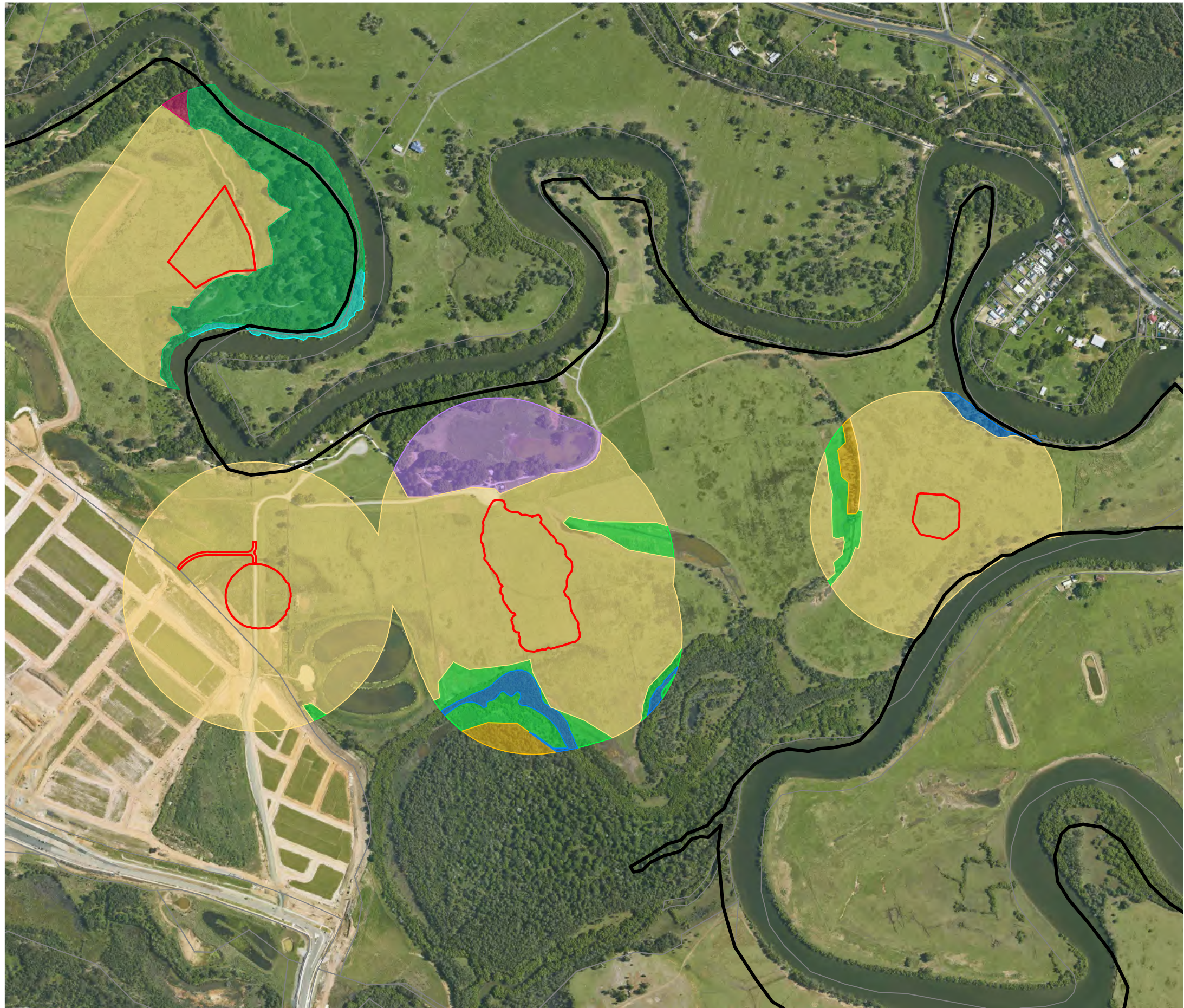
1.4 Roles and Responsibilities

It is the responsibility of North Harbour Holdings Pty Ltd (the Developer) to ensure that all tasks described in this LBEMP are completed within the specified timeframes.

The Developer is to ensure that all employees and contractors involved in the NEBP development works are aware of, and contractually required to comply with, the requirements of the overarching LBEMP for MNES v3 (JWA 2021) and this LBEMP Sub-Plan 09.

In the preparation of this LBEMP Sub-Plan 09, the services of an appropriately qualified and experienced ecologist have been engaged for the purposes of determining:

- The risk of negative impacts on MNES within the impact area; and
- Environmental management measures required to minimise, to the greatest extent practicable, any adverse impacts on MNES.



LEGEND

LBEMP Sub-plan 09 Site Boundary

NEBP Site Boundary

Vegetation Communities

RE12.1.3 - Mangrove shrubland to low closed forest on marine clay plains and estuaries

Eucalyptus tereticomis, *Melaleuca quinquenervia*, *Casuarina glauca*, *Eucalyptus siderophloia*, *Melaleuca styphelioides* open forest

Mixed revegetation

Heritage Park

Casuarina glauca offset area

Saltmarsh offset area

Mangrove offset area

Disturbed terrestrial grassland

Scale 1 : 8000
0 100m 200m 300m 400m 500m

SOURCE: Metro Maps Aerial dated 07/11/24

SCALE: 1 : 8000 @ A3

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FIGURE 4

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TITLE

**VEGETATION
COMMUNITIES**

1.5 Compliance with EPBC Act Approval Condition 9

Condition 9	Compliance
The person taking the action must prepare and submit a Land-Based Environmental Management Plan (LBEMP) for the Minister's approval. The LBEMP must include, but not be limited to, the following:	
a. Measures to minimise impacts on EPBC Act listed threatened species, including measure to care for injured fauna and a vegetation clearing strategy	Management measures to minimise impacts on EPBC Act listed threatened species are included in SECTION 4. Management measures include tasks, actions and timing. This section also provides a rationale, objectives/targets and performance indicators to ensure the management measures are effective. Element 2: Fauna (SECTION 4.2) and Element 3: Koalas (SECTION 4.3) detail measures to care for injured fauna and koalas, respectively, and provides a clearing strategy that includes: - Pre-clearance surveys; - Provisions of a licenced fauna spotter/catcher; - Ensuring vegetation clearance works comply with the procedures of Policy 6: Vegetation Clearing Practices of the Nature Conservation (Koala) Conservation Plan 2017; and - Vegetation clearance is conducted in a sequential manner in order to direct Koalas and other fauna away from threatening processes or hostile environments (e.g. roads) and towards any retained vegetation or habitat links. It should be noted that the additional fill areas have been largely cleared of native vegetation and currently consists of grassland, with vegetation predominately dominated by a range of introduced pasture grasses. No further vegetation clearing is proposed for the additional fill areas.
b. Measures to limit the spread of pests and invasive species	Measures to limit the spread of pests and invasive species are included in Element 5: Weeds and Pests (SECTION 4.5). Management measures include tasks, actions and timing. This section also provides a rationale, objectives/targets and performance indicators to ensure the management measures are effective. Management measures include: - Identify specific areas of pest infestation; - Manage pest infestations within the works site; - Minimise the introduction and dispersal of pest species; - Record keeping; and - Corrective actions

Condition 9	Compliance
c. Sediment and erosion controls	Sediment and erosion control measures are included in Element 6: Soil Erosion, Sediment Loss and Water Quality (SECTION 4.6). Management measures include tasks, actions and timing. This section also provides a rationale, objectives/targets and performance indicators to ensure the management measures are effective.
d. Measures to implement, monitor, or improve (should deficiencies be identified) the LBEMP	SECTION 5 details the non-conformance and corrective action procedures should deficiencies be identified.

2 DESCRIPTION OF APPROVED WORKS PROGRAM

2.1 Description of Works Site

The proposed works covered by this LBEMP Sub-Plan 09 involves the following:

- Bulk earthworks associated with the Regional Park additional fill areas - within Lot 2 SP320619.

The four proposed fill areas range in size from 0.6 to 3.5 ha. The extent of the Regional Park additional fill areas bulk earthworks area is shown in **FIGURE 5**.

The proposed works comprise construction of four fill platforms designated Fill Areas 1 to 4, using stripped topsoil and/or other materials unsuitable for reuse as controlled fill (non-select materials) previously won during the development of the North Harbour MIBA precinct. Bulk earthworks plans (**APPENDIX 1**) show the four proposed fill areas ranging from 0.6 to 3.5 hectares in size, with fill to be placed up to about 1.5 m height. The fill zones will form relatively level, open space areas, which may be utilised for future recreational purposes. The design of the proposed fill areas has considered and is in accordance with the Flood Management Plan (SLR 2025). The proposed filling will result in a minor reduction in post-development flood storage. However, the amount of post-development flood storage remains greater than the pre-development flood storage.

Disturbance of natural soil across the proposed fill areas will be limited to stripping of vegetation and topsoil for subgrade preparation only. If required, such stripping would be generally limited to a depth of no more than about 0.5m. No other excavations into the underlying soil profile are proposed.

Non-select materials which are to be used for filling are expected to comprise either non-ASS, or material which has been previously treated as part of the MIBA site development.

It should be noted that parts of the MIBA Bulk Earthworks area have been covered by previous LBEMP Sub-Plans.

The MIBA area has been included in a number of ecological assessments including:

- Terrestrial Ecology Assessment Report - Northeast Business Park (Cardno 2007);
- Ecological Assessment Report: NEBP - Residential West RoL (Cardno 2014b);
- Wetland Mapping Report: North East Business Park Residential West Area (JWA 2015);
- Significant Residual Impact Assessment - Marine Plants, North East Business Park Raff Creek Crossing (JWA 2019a);
- Significant Residual Impact Assessment - Marine Plants, North East Business Park MIBA Bulk Earthworks (JWA 2019b); and
- Revised Vegetation Management Plan - North Harbour MIBA Bulk Earthworks (JWA 2024a).



LEGEND

LBEMP Sub-plan 09 Site Boundary

NEBP Site Boundary

Proposed Works

Extent of Cut

Extent of Fill

Finished Contour



Scale 1 : 8000
0 100m 200m 300m 400m 500m

SOURCE: KN Group (Ref: 25109 FILL AREAS.dwg); Metro Maps Aerial dated 07/11/24
SCALE: 1 : 8000 @ A3

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FIGURE 5

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TITLE

**PROPOSED
WORKS**

The majority of the works site has been subject to vegetation clearing as part of the historical land uses. The area previously cleared currently consists of grassland, with vegetation dominated by a range of introduced pasture grasses. Retained vegetation adjoining the works area consists of the following vegetation communities:

- Casuarina +/- mangrove estuarine wetlands;
- Coastal saltmarsh/saltpan vegetation;
- Mangrove estuarine wetlands;
- Coastal and subcoastal dry sclerophyll forest/woodland;
- *Eucalyptus tereticornis* fringing woodland;
- Mixed revegetation; and
- Persicaria, Cyperus and Juncus wetland.

Weeds are being actively managed as part of the approved MIBA works.

Overall, the works site has experienced substantial disturbance as a result of previous land uses, which has severely degraded the ecological values of the area.

2.2 Description of Works Program

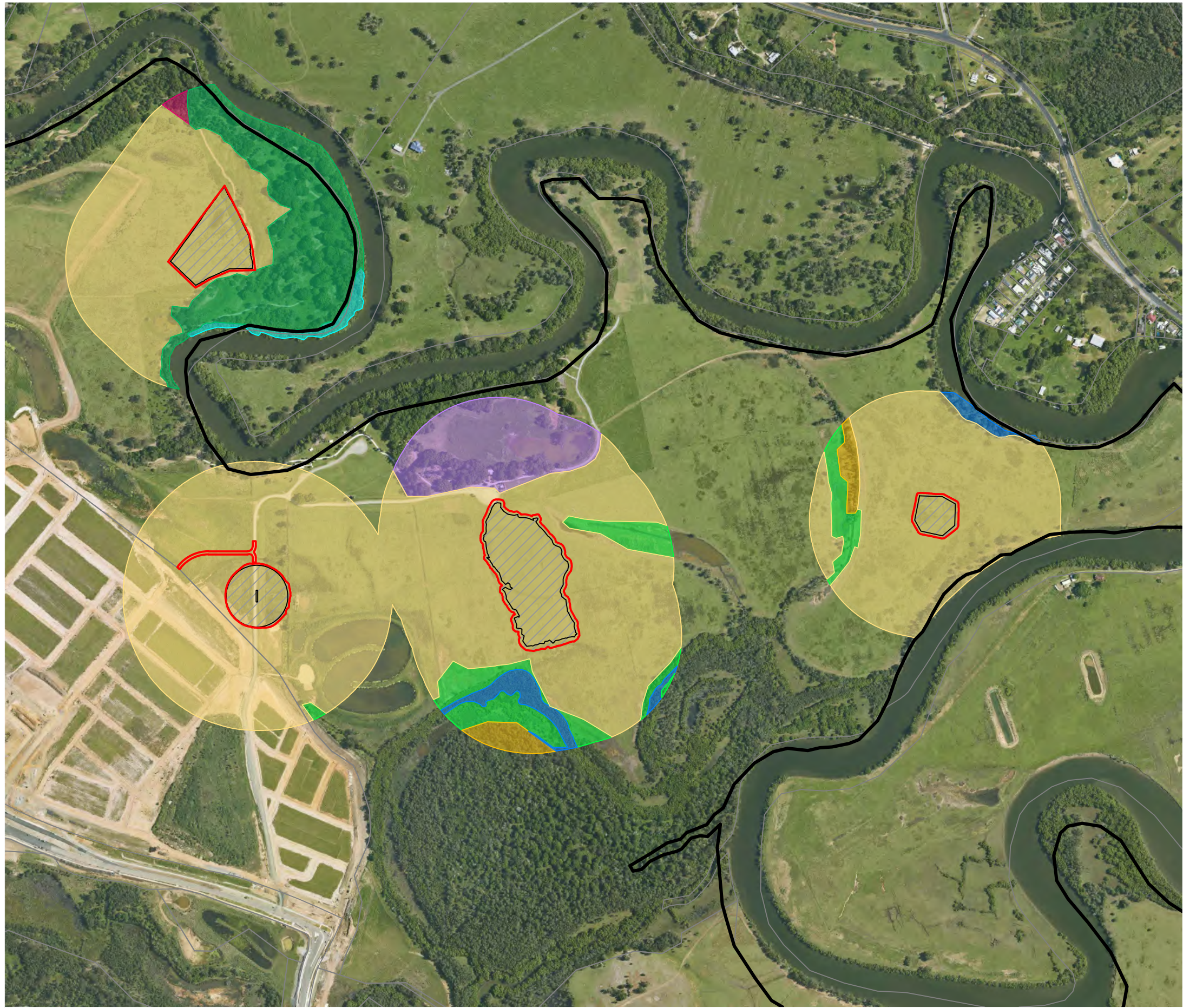
FIGURE 6 shows the vegetation communities and habitat types proposed to be removed from within the works site.

2.3 Summary of Works Program

A summary of the works site and works program covered by this LBEMP Sub-Plan 09 is provided in TABLE 1.

TABLE 1
DESCRIPTION OF APPROVED WORKS PROGRAM ASPECT DESCRIPTION

Aspect	Description	Figure/Plan Reference
Works Site Description	Regional Park - Lot 2 SP320619.	Refer to FIGURES 4 - 5.
Works Site Area	The four proposed fill areas range in size from 0.6 to 3.5 ha.	FIGURE 5.
Vegetation (Habitat) Types within Works Site	Currently vegetation communities present within the works site include: • Disturbed terrestrial grassland with scattered regrowth.	Refer to FIGURE 4.



LEGEND

- Extent of Works
- LBEMP Sub-plan 09 Site Boundary
- NEBP Site Boundary

Vegetation Communities

- RE12.1.3 - Mangrove shrubland to low closed forest on marine clay plains and estuaries
- Eucalyptus tereticomis*, *Melaleuca quinquenervia*, *Casuarina glauca*, *Eucalyptus siderophloia*, *Melaleuca styphelioides* open forest
- Mixed revegetation
- Heritage Park
- Casuarina glauca* offset area
- Saltmarsh offset area
- Mangrove offset area
- Disturbed terrestrial grassland

Scale 1 : 8000

0 100m 200m 300m 400m 500m

SOURCE: Metro Maps Aerial dated 07/11/24

SCALE: 1 : 8000 @ A3

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FIGURE 6

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TITLE

VEGETATION
CLEARANCE
PLAN

Aspect	Description	Figure/Plan Reference
Nature and Extent of Vegetation Clearance Works	The following vegetation types will be cleared as part of the works program: Disturbed terrestrial grassland with scattered regrowth. The clearance of non-remnant vegetation will be subject to the same controls as outlined in the EPBC approval.	Refer to FIGURE 6 - Impacts.
Nature and Extent of Bulk Earthworks	Proposed works involves the following: Bulk earthworks of cut and fill associated with the Regional Park area.	Refer to FIGURE 5.
Nature and Extent of Road Works	N/A	N/A
Nature and Extent of Infrastructure and Building Works	The proposal is for bulk earthworks only.	N/A
Nature and Extent of Landscaping Works	NA	NA
Nature and Extent of Restoration Works	A Bulk Earthworks Plan (KNGroup 2025) has been prepared for the additional fill areas.	APPENDIX 1
Relevant State and Local Government Approvals	The Bulk Earthworks has been approved by Moreton Bay Regional Council. As part of the approval process, the State's advice has been received and incorporated into the Council's conditions of approval.	N/A
Timing and Duration of Works Program	Commencement: Mid 2025 Complete: Late 2025	N/A

3 MNES RISK ASSESSMENT

3.1 Introduction

For each works program forming part of the NEBP development, the approved overarching LBEMP for MNES v3 (JWA 2021) requires a risk assessment of potential adverse impacts of the works program on MNES (TABLE 2). Table 2 of Section 4 of the LBEMP for MNES v3 (JWA 2021) specifies the MNES that are to be considered by the LBEMP.

In order to ensure that current environmental requirements are being suitably addressed, an updated search of the Commonwealth EPBC Act Protected Matters Search Tool (PMST) has been completed to provide an up-to-date list of protected matters that may occur within a 5 km radius of the site. The suitability of the habitats on the site for listed threatened flora and fauna species and migratory species identified in database search was also assessed to determine which of those species could potentially occur on the site.

This MNES Risk Assessment for the works program the subject of this LBEMP Sub-Plan 09 has been completed based on consideration of:

- The likelihood of occurrence of specific MNES within or adjacent to the approved works site; and
- The risk assessment framework contained within Section 5 of the LBEMP for MNES v3 (JWA 2021).

3.2 Likelihood of Occurrence Assessment

The likelihood of occurrence of MNES was based on the results of site assessments, as well as a review of the Ecological Assessment Report - NEBP Residential West RoL dated 12th June 2014 (Cardno 2014b).

TABLE 2
ASSESSMENT OF LIKELIHOOD OF OCCURRENCE

MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
FLORA			
<i>Acacia attenuata</i>	Whipstick Wattle	This species occurs on flat coastal lowland plains, at altitudes of lower than 30 m above sea level. Across this range <i>A. attenuata</i> typically occurs in seasonally waterlogged areas of wet heathland or heathland margins, open forest and woodland communities, and specifically on sandy poorly drained soils or peat swamps which are infertile. <i>Acacia attenuata</i> has been recorded growing in shrublands with <i>Leptospermum whitei</i> and <i>Baeckea frutescens</i> ; in wallum with <i>Banksia aemula</i> and <i>Eucalyptus robusta</i> ; in woodlands with <i>Corymbia trachyphloia</i> , <i>E. umbra</i> and <i>Banksia oblongifolia</i> ; and in open forests of <i>E. umbra</i> , <i>E. racemosa</i> and <i>Melaleuca quinquenervia</i> . <i>Acacia attenuata</i> has been found in disturbed environments, such as roadsides subject to vegetation control, indicating the potential for a wide distribution within its range (DoE 2016).	Low. This species has not previously been recorded on the NEBP site. <i>Melaleuca</i> tree swamps provide potentially suitable habitat but do not occur within the impact area.
<i>Acronychia littoralis</i>	Scented acronychia	Scented acronychia are generally found along the margins of littoral rainforest, including the transition zones between littoral rainforests and swamp sclerophyll or cypress pine communities.	Low. Suitable habitat for this species was not observed in the locality.
<i>Arthraxon hispidus</i>	Hairy Joint Grass	Hairy-joint Grass is found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps, as well as woodland. In south-east Queensland, Hairy-joint Grass has also been recorded growing around freshwater springs on coastal foreshore dunes, in shaded small gullies, on creek banks, and on sandy alluvium in creek beds in open forests, and also with bog mosses in mound springs (DoE 2016).	Low / Moderate. This species has not previously been recorded on the NEBP site. <i>Melaleuca</i> tree swamps provide potentially suitable habitat but do not occur within the impact area.
<i>Bosistoa transversa</i>	Three-leaved bosistoa	Occurs in lowland subtropical rainforest up to 300m above sea level. In the Gold Coast hinterland it grows on reddish loam over basalt rock on a very steep slope in complex notophyll vine forest with emergent Brush	Low. Suitable habitat for this species was not observed in the locality.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
		Box (<i>Lophostemon confertus</i>). Associated canopy species include White Booyong, Soft Corkwood (<i>Caldcluvia paniculosa</i>), Rosewood (<i>Dysoxylum fraserianum</i>), Yellow Carabeen (<i>Sloanea woollsii</i>) and Giant Water Gum (<i>Syzygium francisii</i>). At Buderim, Queensland, it has been found in remnant vine forest pockets within highly disturbed and weed infested habitats on a site with varying slope, from relatively flat to a steep scree slope. The species appears to occur only in areas that have experienced minimal disturbance (Dept. Environment 2012).	
<i>Cryptocarya foetida</i>	Stinking cryptocarya	Occurs in coastal sands, or close to the coast, occurring in littoral rainforest on old sand dunes and subtropical rainforests over slate and occasionally on basalt to an altitude of 150 m. Associated species include <i>Syzygium hemilamprum</i> (Broad-leaved Lilly Pilly), <i>Acronychia imperforata</i> (Beach Acronychia), <i>Cryptocarya triplinervis</i> (Three-veined Laurel), <i>Cupaniopsis anacardioides</i> (Tuckeroo), <i>Flindersia bennettiana</i> (Bennet's Ash), <i>Lophostemon confertus</i> (Brush Box) and <i>Syzygium luehmannii</i> (Small-leaved Lilly Pilly). Distribution, Iluka on the north coast of New South Wales, to Fraser Island in Queensland (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Cryptostylis hunteriana</i>	Leafless tongue orchid	The Leafless Tongue-orchid has been reported to occur in a wide variety of habitats including heathlands, heathy woodlands, sedgeland, <i>Xanthorrhoea</i> spp. plains, dry sclerophyll forests (shrub/grass sub-formation and shrubby sub-formation), forested wetlands, freshwater wetlands, grasslands, grassy woodlands, rainforests and wet sclerophyll forests (grassy sub-formation). Soils are generally considered to be moist and sandy, however, this species is also known to grow in dry or peaty soils (DoE 2016).	Low. This species has not previously been recorded on the NEBP site. <i>Melaleuca</i> tree swamps provide potentially suitable habitat but do not occur within the impact area.
<i>Cupaniopsis shirleyana</i>	Wedge-leaf tuckeroo	The Wedge-leaf tuckeroo occurs in various dry rainforest habitats, including riverbanks and hillside vine thickets (DoE, 2020).	Low. Suitable habitat for this species was not observed in the locality.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
<i>Macadamia integrifolia</i>	Macadamia nut	Occurs in remnant rainforest, including complex mixed notophyll forest, and prefers partially open areas such as rainforest edges. This species can occur in areas with slopes ranging from level to steep and in a wide range of landforms including hill crests, hill slopes, scree slopes and foot slopes, gullies, benches and terrace plains. Occurs at altitudes ranging from 5-340m above sea level (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Macadamia ternifolia</i>	Bopple nut	Occurs in lowland warm complex notophyll vine forest and <i>Araucarian</i> notophyll vine forest on basic and intermediate volcanic soils and alluvia in higher rainfall areas of south-east Queensland. This species generally occurs in south-facing gullies with fertile, basalt-derived krasnozems soils or the interface between sandstone and basalt krasnozems. Surface soils tend to be dark, of varying textures (sandy loams to light clays), slightly acid (pH 5.5-7.0) and well drained (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Macadamia tetraphylla</i>	Rough-shelled bush nut	Occurs in subtropical rainforest and complex notophyll vineforest, at the margins of these forests and in mixed sclerophyll forest. It occurs in restricted habitat, growing on moderate to steep hillslopes on alluvial soils at well-drained sites. This species growing at altitudes ranging from 10 to 460m ASL (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Notelaea lloydii</i>	Lloyd's Olive [#]	Lloyd's Olive is found in the ecotone between eucalypt open forests and vine thickets at 80-480 m above sea level. The species occurs on undulating to hilly terrain either in moist gullies or on gentle to steep dry slopes but is rarely found on rocky outcrops.	Low. This species was not located during recent site surveys and suitable habitat for this species was not observed in the locality.
<i>Persicaria elatior</i>	Tall knotweed	Knotweeds grow in damp environments including coastal swamps, watercourses, lakes, damp forests and disturbed areas (NSW DECCW, 2005).	Low. While low lying damp areas occur on site, these are heavily disturbed by previous approved clearing and invasion of exotic grasses.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
<i>Phaius australis</i>	Lesser Swamp Orchid	The Lesser Swamp-Orchid is commonly associated with coastal wet heath/sedgeland wetlands, swampy grassland or swampy forest and often where Broad-leaved paperbark or Swamp mahogany are found. Typically, the Lesser swamp-orchid is restricted to the swamp-forest margins, where it occurs in swamp sclerophyll forest (Broad-leaved paperbark/Swamp mahogany/Swamp box (<i>Lophostemon suaveolens</i>)), swampy rainforest (often with sclerophyll emergents), or fringing open forest. It is often associated with rainforest elements such as Bangalow palm (<i>Archontophoenix cunninghamiana</i>) or Cabbage tree palm (<i>Livistona australis</i>) (DoE 2016).	Low. This species has not previously been recorded on the NEBP site. <i>Melaleuca</i> tree swamps provide potentially suitable habitat but are not present within the impact area.
<i>Phaius bernaysii</i>	Yellow swamp-orchid	Occurs along the margins between open forest/woodland and closed sedgeland, along the perimeter of a swamp, often in a fairly shady environment in <i>Melaleuca quinquenervia-Eucalyptus robusta</i> open forest in sandy or peaty soil. This species is currently known to occur only in one area on Stradbroke Island, near Myora in Queensland (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Planchonella eerwah</i>	Shiny-leaved Condoo [#]	The species grows in subtropical rainforest, dry rainforest and Hoop Pine (<i>Araucaria cunninghamii</i>) vine scrub.	Low. This species was not located during recent site surveys and suitable habitat for this species was not observed in the locality.
<i>Rhodamnia rubescens</i>	Scrub Turpentine [#]	This species commonly occurs in all rain forest subforms except cool temperate rainforest. The species occupies a range of volcanically derived and sedimentary soils and is a common pioneer species in eucalypt forests. Populations and individuals of this species are often found in wet sclerophyll associations in rainforest transition zones.	Low. This species was not located during recent site surveys and suitable habitat for this species was not observed in the locality.
<i>Rhodomyrtus psidioides</i>	Native Guava [#]	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines (OEH 2021).	Low. This species was not located during recent site surveys and suitable habitat for this species was not observed in the locality.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
<i>Samadera bidwillii</i>	Quassia	Occurs in lowland rainforest or on rainforest margins, but it can also be found in other forest types, such as open forest and woodland. This species is commonly found in areas adjacent to both temporary and permanent watercourses in locations up to 510m altitude. The species occurs on lithosols, skeletal soils, loam soils, sands, silts and sands with clay subsoils. Commonly associated tree species include Spotted Gum (<i>Corymbia citriodora</i>), Grey Gum (<i>Eucalyptus propinqua</i>), White Mahogany (<i>E. acmenoides</i>), Forest Red Gum (<i>E. tereticornis</i>), Pink Bloodwood (<i>C. intermedia</i>), an ironbark (<i>E. siderophloia</i>), Gum Topped Box (<i>E. moluccana</i>), Gympie Messmate (<i>E. cloeziana</i>), and Broad-Leaved Ironbark (<i>E. fibrosa</i>) (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Sophora fraseri</i>	Brush sophora	This species grows in moist habitats, often in hilly terrain at altitudes from 60-660m on shallow soils along rainforest margins in eucalypt forests or in large canopy gaps in closed forest communities (Dept. Environment 2012). Occurs in wet sclerophyll forest and a range of rainforest types on shallow stony to shaly soils, of loam to clay texture derived from sandstone or basalt rocks. Associated species include: <i>Corymbia citriodora</i> , <i>Eucalyptus carnea</i> , <i>E. microcorys</i> , <i>E. acmenoides</i> , <i>E. propinqua</i> and <i>Lophostemon confertus</i> . The shrub appears to prefer growing along rainforest margins, in eucalypt forests in the vicinity of rainforests or in large canopy gaps in closed forest communities (DEHP 2013).	Low. Suitable habitat for this species was not observed in the locality.
<i>Thesium australe</i>	Austral toadflax	Austral toadflax is semi-parasitic on roots of a range of grass species, notably Kangaroo Grass (<i>Themeda triandra</i>). It occurs in shrubland, grassland or woodland, often on damp sites, in subtropical, temperate and subalpine climates over a wide range of altitudes. It occurs on soils derived from sedimentary, igneous and metamorphic geology on a range of soils including black clay loams to yellow podzolics and peaty loams. Vegetation types include open grassy heath dominated by Swamp Myrtle	Low. Suitable habitat for this species was not observed in the locality.

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Scientific Name	Common Name		
		(<i>Leptospermum myrtifolium</i>), Small-fruit Hakea (<i>Hakea microcarpa</i>), Alpine Bottlebrush (<i>Callistemon sieberi</i>), Woolly Grevillea (<i>Grevillea lanigera</i>), Coral Heath (<i>Epacris microphylla</i>) and <i>Poa</i> spp.; Kangaroo Grass grassland surrounded by Eucalyptus woodland; and grassland dominated by Barbed-wire Grass (<i>Cymbopogon refractus</i>) (Dept. Environment 2012).	
<i>Triunia robusta</i>	Glossy spice bush	A species usually found in subtropical rainforest.	Low. Suitable habitat for this species was not observed in the locality.
<i>Zieria exsul</i>	Banished Stink Bush [#]	<i>Zieria exsul</i> is restricted to lowland wallum woodland and open forest on sandy substrates that are often seasonally waterlogged.	Low. This species was not located during recent site surveys and suitable habitat for this species was not observed in the locality.
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<i>Anseranas semipalmata</i>	Magpie Goose	The Magpie goose occurs mainly in coastal and sub-coastal areas of northern Australia. The species is now a rare vagrant in NSW. It generally inhabits open lakes, swamps and permanent wetlands which are dominated by rush and sedge vegetation, with grasslands nearby.	Low. Suitable habitat for this species was not observed in the locality.
<i>Anthochaera phrygia</i>	Regent Honey-eater	Regent Honeyeaters mostly occur in dry Box-Ironbark eucalypt woodland and dry sclerophyll forest associations in areas of low to moderate relief, wherein they prefer moister, more fertile sites available, for example along creek flats, or in broad river valleys and foothills. At times of food shortage (e.g. when flowering fails in preferred habitats), Regent Honeyeaters also use other woodland types and wet lowland coastal forest dominated by Swamp Mahogany (<i>Eucalyptus robusta</i>) or Spotted Gum (<i>Corymbia maculata</i>) (DoE 2016). Regent Honeyeaters usually nest in the canopy of forests or woodlands, and in the crowns of tall trees, mostly eucalypts. Studies in the	Low. Suitable habitat for this species was not observed in the locality.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
		Bundarra-Barraba region indicate that birds actively select the tallest trees available to nest in. Nests in riparian sites are mostly built in rough-barked trees. Nests in woodland sites vary according to the availability of rough-barked trees: in woodlands dominated by rough-barked species (e.g. ironbarks), nests are placed in rough-barked trees; in woodlands where rough-barked trees are scarce (e.g. those dominated by White Box), nests are placed mostly in smooth-barked species (DoE 2016.)	
<i>Apus pacificus</i>	Fork-tailed Swift	This species occurs over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines (Higgins 1999). They forage aerially, up to hundreds of metres above ground, but also less than 1 m above open areas or over water. They probably roost aerially but are occasionally observed to land. They are widespread but scattered in coastal areas from 20° S, south to Brisbane and in much of the south south-eastern region (Dept. Environment 2012).	Moderate. This species may forage over the site.
<i>Ardea alba</i>	Great egret	This species inhabits a wide range of wetland habitats including swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs. This species usually frequents shallow waters (Dept. Environment 2012).	Moderate. A small amount of foraging habitat for this species may occur within the open paddocks when wet.
<i>Ardea ibis/ Bubulcus ibis</i>	Cattle egret	This species inhabits tropical and temperate grasslands, wooded lands and terrestrial wetlands. It uses predominately shallow, open and fresh wetlands including meadows and swamps with low emergent vegetation	Moderate. Foraging habitat for this species may occur within the open paddocks.

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Scientific Name	Common Name		
		and abundant aquatic flora. This species often forages away from water on low lying grasslands, improved pastures and croplands. It is commonly found in cattle fields and other farm areas that contain livestock. This species roosts in trees, or amongst ground vegetation in or near lakes and swamps (Dept. Environment 2012).	
<i>Argyreus hyberbius inconstans</i>	Australian fritillary*	The Australian fritillary butterfly is restricted to open, swampy, coastal areas (i.e. <i>Melaleuca</i> wetlands) where the larval food plant, <i>Viola betonicifolia</i> , grows as a small, insignificant ground herb in association with <i>Lomandra longifolia</i> (long leaved matrush) and grasses, especially the grass <i>Imperata cylindrica</i> (blady grass) (DEHP 2016).	Low. The larval food plant has not been observed on site to date, and suitable habitat does not occur within or immediately adjacent to the impact area.
<i>Botaurus poiciloptilus</i>	Australian bittern	This species occurs in terrestrial freshwater wetlands and, rarely, estuarine habitats. It favours wetlands with tall, dense vegetation, where it forages in still, shallow water up to 0.3m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. The species favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and/or reeds (e.g. <i>Phragmites</i> , <i>Cyperus</i> , <i>Eleocharis</i> , <i>Juncus</i> , <i>Typha</i> , <i>Baumea</i> , <i>Bolboschoenus</i>) or cutting grass (<i>Gahnia</i>) growing over muddy or peaty substrate (Dept. Environment 2012).	Low. Potential habitat for this species may be found within vegetation associated with the creek south of works area, however dense aquatic vegetation (sedges, rushes) was not present in the vicinity of the impact area.
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats	Low. This species has not previously been recorded in the NEBP area. Paddock areas within the works site provide some potential habitat for this species when flooded. However, the level of disturbance/slashing that occurs across these areas has substantially reduced the quality of this potential habitat.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
		mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season.	
<i>Calidris canutus</i>	Red Knot [#]	In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps (Higgins & Davies 1996).	Low. Suitable habitat for this species was not observed in the impact area.
<i>Calidris ferruginea</i>	Curlew Sandpiper [#]	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (Higgins & Davies 1996).	Low. Suitable habitat for this species was not observed in the impact area.
<i>Calidris tenuirostris</i>	Great Knot [#]	In Australasia, the species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. They are occasionally found on exposed reefs or rock platforms, shorelines with mangrove vegetation, ponds in saltworks, at swamps near the coast, saltlakes and non-tidal lagoons. The Great Knot rarely occurs on inland lakes and swamps (Higgins & Davies 1996).	Low. Suitable habitat for this species was not observed in the impact area.
<i>Calyptorhynchus lathami lathami</i>	South-eastern Glossy Black-Cockatoo [#]	This species is associated with woodland or open sclerophyll forests with populations of Allocasuarina, which comprise its exclusive diet. They require large old trees with hollows for nesting.	Low. Suitable habitat for this species was not observed in the locality.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
<i>Chalinolobus dwyeri</i>	Large-eared pied bat	This species requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging. Almost all records have been found within several kilometres of cliff lines or rocky terrain. Roosting has also been observed in disused mine shafts, caves, overhangs and disused Fairy martin (<i>Hirundo ariel</i>) nests. It also possibly roosts in the hollows of trees. The structure of primary nursery roosts appears to be very specific, i.e. arch caves with dome roofs (that need to be deep enough to allow juvenile bats to learn to fly safely inside) and with indentations in the roof (presumably to allow the capture of heat). These physical characteristics are not very common in the landscape and therefore a limiting factor (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Charadrius leschenaultii</i>	Greater Sand Plover [#]	In the non-breeding grounds in Australasia, the species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons (Bamford 1988; Blakers et al. 1984; Lane 1987; Sibson 1948; Stewart et al. 2007), and inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs (Abbott 1982; Morris 1989; Sedgwick 1978). They are occasionally recorded on near-coastal saltworks and saltlakes, including marginal saltmarsh, and on brackish swamps (C.D.T. Minton 2002 pers. comm; Sibson 1953; Storr 1964b, 1977; Storr et al. 1986). They seldom occur at shallow freshwater wetlands (Storr 1977). Once, during a severe drought, the species was recorded in a poorly grassed paddock with large bare areas, more than 1 km from the nearest water (Eckert 1968).	Low. Suitable habitat for this species was not observed in the impact area.
<i>Charadrius mongolus</i>	Lesser Sand Plover [#]	In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and	Low. Suitable habitat for this species was not observed in the impact area.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
		occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. It also sometime occurs in short saltmarsh or among mangroves. The species also inhabits saltworks and near-coastal saltpans, brackish swamps and sandy or silt islands in river beds (Marchant & Higgins 1993). In north-western Australia, the species appears to use the Port Hedland saltworks in preference to nearby beaches (C. Minton 2002, pers. comm.). The species is seldom recorded away from the coast, at margins of lakes, soaks and swamps associated with artesian bores (Marchant & Higgins 1993). On its breeding grounds it occurs in alpine valleys (Dement'ev & Gladkov 1951).	
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper [#]	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (<i>Eucalyptus camaldulensis</i>) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	Low. Suitable habitat for this species was not observed in the locality.
<i>Coeranoscincus reticulatus</i>	Three-toed Snake-tooth Skink [#]	This species inhabits rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. This species feeds on earthworms and beetle grubs and is found in leaf litter, often immediately adjacent to fallen tree trunks.	Low. Suitable habitat for this species was not observed in the locality.
<i>Cuculus optatus</i>	Oriental cuckoo	This species occurs in mixed, deciduous and coniferous forests, woodlands, and open paddocks with trees (Flegg, 2002).	Low. No suitable foraging habitat for this species occurs within the impact area.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
<i>Cyclopsitta diophthalma coxeni</i>	Coxen's fig-parrot	Coxen's fig-parrot occurs in rainforest habitats including subtropical rainforest, dry rainforest, littoral and developing littoral rainforest, and vine forest. Remaining populations are now concentrated into fragmented remnants of dry rainforest and cool subtropical rainforest that are drier and hillier than the habitats that were occupied in the past. Within these rainforest habitats, the fig-parrot is likely to favour alluvial areas that support figs and other trees with fleshy fruits, in particular, habitats that have a high diversity of fig species, and that have a fruiting season that is staggered across moisture and altitudinal gradients (DoE 2016). Most recent records of the fig-parrot have been from small stands of remnant native vegetation, at forest edges, and in thin tracts of gallery forest (at edges of rivers or streams). Coxen's Fig-Parrot has also been recorded in other habitat types including sub-littoral mixed scrub; corridors of riparian vegetation in woodland, open woodland or other types of cleared or partially-cleared habitat; and isolated stands of fig or other trees on urban, agricultural or cleared land (DoE 2016).	Low. Suitable habitat for this species was not observed in the locality.
<i>Dasyornis brachypterus</i>	Eastern bristlebird	This species inhabits moist, mountain ranges within about 100km of the coast. In Queensland most sightings have been within localised pockets of relatively open eucalypt forest in close proximity to denser vegetation along creek lines and rainforest. Soils are relatively fertile, derived from basalts of the Main Range Volcanics and Mt Warning Shield. The ground stratum of the eucalypt forests favoured by the eastern bristlebird is a mosaic of dense clumped grasses interspersed with patches of shrubs, ferns, tangled vines and fallen logs. The more common grasses include Wild sorghum (<i>Sarga leiocladum</i>), Kangaroo grass (<i>Themeda triandra</i>) and Tussock grass (<i>Poa labillardieri</i>). The presence of mature Wild sorghum tussocks is thought to be a good indicator of high-quality bristlebird habitat (DEHP 2013).	Low. Suitable habitat for this species was not observed in the locality.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
<i>Dasyurus hallucatus</i>	Northern quoll	This species is found within most treed habitats and is most abundant in broken, rocky country and in open eucalypt forest within 150 km of the coast. Northern quoll habitat generally encompasses some form of rocky area for denning purposes. In Queensland Northern quolls are more likely to be present in high relief areas that have shallower soils, greater cover of boulders, less fire impact and were closer to permanent water (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Dasyurus maculatus maculatus</i>	Spotted-tailed quoll	This species occurs in coastal areas and adjacent ranges of South-east Queensland from Bundaberg to the border and inland to Monto and Stanthorpe (Dept. Environment 2012). It generally occurs in densely vegetated areas ranging from rainforest and vine-forest through to dry and wet eucalypt forest, woodland and coastal heathland (DEHP 2013). Transient males are sometimes seen in more open areas, including land cleared for pasture (DEHP 2013). The Spotted-tailed quoll is predominantly nocturnal and rests during the day in dens. Habitat requirements include suitable den sites such as hollow logs, tree hollows, rock outcrops or caves (Dept. Environment 2012). Individuals also require an abundance of food, such as birds and small mammals, and large areas of relatively intact vegetation through which to forage (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Delma torquata</i>	Collared delma	Due to specific habitat requirements, this species distribution is highly fragmented and restricted to only a few locations. The Collared delma is known from the western suburbs of Brisbane, QLD and the following sites: Bunya Mountains, Blackdown Tableland National Park (NP), Bullyard Conservation Park, D'Aguilar Range NP, Expedition NP, Naumgna and Lockyer Forest Reserves, Western Creek near Millmerran and the Toowoomba Range (Dept. Environment 2012). This species inhabits eucalypt dominated woodland and open forest where it is associated with suitable micro-habitats (exposed rocky outcrops). The	Low. Suitable habitat for this species was not observed in the locality.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
		ground cover is predominantly native grasses, such as Kangaroo Grass (<i>Themeda triandra</i>), Barbed-wire Grass (<i>Cymbopogon refractus</i>), Wiregrass (<i>Aristida</i> sp.) and Lomandra (<i>Lomandra</i> sp.) (Dept. Environment 2012). The presence of rocks, logs, bark and other coarse woody debris, and mats of leaf litter (typically 30-100mm thick) appears to be an essential characteristic of the collared delma microhabitat and is always present where the species occurs (Dept. Environment 2012). Whilst Collared delmas are often found associated with small rocks, the presence of small rocks is not an essential habitat characteristic (Dept. Environment 2012).	
<i>Epinephelus daemeli</i>	Black rockcod	This is a marine species, inhabiting reefs and estuaries.	Low. Suitable habitat for this species was not observed on site.
<i>Erythrotriorchis radiatus</i>	Red goshawk	The Red goshawk occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia. Riverine forests are also used frequently. Such habitats typically support high bird numbers and biodiversity, especially medium to large species which the goshawk requires for prey. The Red goshawk nests in large trees, frequently the tallest and most massive in a tall stand, and nest trees are invariably within one km of permanent water (DoE 2016). The Red goshawk occurs over wooded and forested lands of tropical and warm-temperate Australia, coastal and sub-coastal. This species prefers forest and woodland with a mosaic of vegetation types, large prey populations (birds), and permanent water. The vegetation types include eucalypt woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest, and rainforest margins (DoE 2016).	Moderate. Forested areas adjoining the works site provide potential foraging habitat for this species. However, this species may also utilise scattered eucalypts within grazed areas to search for prey.
<i>Falco hypoleucos</i>	Grey Falcon [#]	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	Low. This species is extremely rare and suitable habitat for this species was not observed in the locality.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
<i>Furina dunmalli</i>	Dunmall's snake	Suitable habitat for this species includes forests and woodlands dominated by <i>Acacia harpophylla</i> on black alluvial cracking clays and Eucalypt-Bulloak associations on sandstone derived soils (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Gallinago hardwickii</i>	Latham's Snipe, Japanese Snipe	Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level (Chapman 1969; Naarding 1981). They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies)	Low. Suitable habitat for this species was not observed within the works area.
<i>Geophaps scripta</i>	Squatter pigeon	Preferred habitat for this species includes open-forest to sparse open-woodland, with a grassy ground layers and patches of bare ground (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Grantiella picta</i>	Painted honeyeater	This species inhabits Acacia and Box-gum woodlands and Box-ironbark forests. A specialist feeder on mistletoes, particularly those of the genus <i>Amyema</i> (DOEH, 2016).	Low. Suitable habitat for this species was not observed in the locality.
<i>Haliaeetus leucogaster</i>	White-bellied sea-eagle	This species has a large distribution range throughout SE QLD and is found in association with coasts, large rivers and estuaries and prefers to nest in large trees adjacent watercourses (Dept. Environment 2012).	Low. This species may fly over the MIBA area, however, is unlikely to nest in the immediate locality.
<i>Hemiaspis damelii</i>	Grey Snake [#]	In Queensland, grey snake habitat is Brigalow <i>Acacia harpophylla</i> and Belah <i>Casuarina cristata</i> woodlands on heavy, dark brown to black cracking clay soils, particularly in association with water bodies, areas with small gullies and ditches, and floodplain environments where the species shelters beneath logs, rocks and soil cracks. Habitat in Queensland also includes Queensland bluegrass <i>Dichanthium sericeum</i> and/or Mitchell grass <i>Astrela spp.</i> grassland on alluvial plains with cracking clay soils. Key attributes of grey snake habitat are the floodplains and ephemeral wetlands which provide breeding habitat for the frog species that are	Low. Suitable habitat for this species was not observed in the locality.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
		its main prey, the presence of the frog species themselves, and the heavy clay soils which provide and cracks and crevices that the species uses in its hunting strategy and for shelter.	
<i>Hirundapus caudacutus</i>	White-throated needletail	This species occurs flying over most types of habitats, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. It is recorded in all coastal regions of Queensland and NSW and almost always forage aerially (Dept. Environment 2012).	Moderate. This species may forage over the impact area.
<i>Lathamus discolor</i>	Swift Parrot	The Swift parrot inhabits dry sclerophyll eucalypt forests and woodlands. It occasionally occurs in wet sclerophyll forests. The Swift Parrot migrates from its Tasmanian breeding grounds to overwinter in the box-ironbark forests and woodlands of Victoria, New South Wales and southern Queensland. The principal wintering grounds are the inland slopes of the Great Dividing Range and along the eastern coastal plains. In northern New South Wales and south-eastern Queensland, Narrow-leaved Red Ironbark (<i>E. crebra</i>), Forest Red Gum forests and Yellow Box forest are commonly utilised (DoE 2016).	Low. The fragmented nature of local habitat reduces the likelihood that this species will utilise the area, and suitable habitat does not occur within the impact area.
<i>Limnodromus semipalmatus</i>	Asian Dowitcher [#]	The species feeds on inter-tidal mudflats. This habitat is often vulnerable to pollution (e.g., oil spill and urban waste) especially in highly populated parts of Asia (Higgins & Davies 1996). During the non-breeding season, the bird roosts in sheltered coastal environments such as estuarine and intertidal mudflats, lagoons, creeks and saltworks.	Low. Suitable habitat for this species was not observed in the impact area.
<i>Limosa lapponica baueri</i>	Nunivak Bar-tailed Godwit [#]	It is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Less frequently it occurs in salt lakes and brackish wetlands, sandy ocean beaches and rock platforms. It often occurs around beds of seagrass, and sometimes in nearby saltmarsh or the outer margins of mangrove areas.	Low. Suitable habitat for this species was not observed in the impact area.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
		It forages at low to mid tide in shallow water or along the water's edge on sandy substrates on intertidal flats, banks and beaches or on soft mud substrates.	
<i>Limosa limosa</i>	Black-tailed Godwit [#]	In Australia the Black-tailed Godwit has a primarily coastal habitat environment. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. The use of habitat often depends on the stage of the tide. It is also found in shallow and sparsely vegetated, near-coastal, wetlands; such as saltmarsh, saltflats, river pools, swamps, lagoons and floodplains. There are a few inland records, around shallow, freshwater and saline lakes, swamps, dams and bore-overflows. They also use lagoons in sewage farms and saltworks (Higgins & Davies 1996).	Low. Suitable habitat for this species was not observed in the impact area.
<i>Litoria olongburensis</i>	Wallum Sedge Frog [#]	The Wallum Sedge Frog is found in ephemeral, semi-permanent and permanent wetlands with emergent reeds, ferns and/or sedges, in undisturbed coastal wallum. Wallum is described as sandmass heathland and shrubland, and various forest, woodland, sedgeland and grassland communities (DoE 2016).	Low. Terrestrial grassland within the works site is highly disturbed and is unlikely to provide potential habitat for this species.
<i>Macroderma gigas</i>	Ghost Bat [#]	They currently occupy habitats ranging from the arid Pilbara to tropical savanna woodlands and rainforests. During the daytime they roost in caves, rock crevices and old mines.	Low. Suitable habitat for this species was not observed in the locality.
<i>Merops ornatus</i>	Rainbow bee-eater	This species occurs in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. Usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. Also occurs in inland and coastal sand dune systems, and in mangroves (Dept. Environment 2012).	High - Known. This species has been observed during previous site assessments.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
<i>Mixophyes fleayi</i>	Fleay's barred frog	This species is found in wet forests, including rainforests, Antarctic beech forests, and eucalypt forests.	Low. Suitable habitat for this species was not observed in the locality.
<i>Mixophyes iteratus</i>	Giant barred frog	This species occurs along shallow rocky streams in rainforest, wet sclerophyll forest and farmland from 100 to 1000m altitude or deep, slow moving streams with steep banks in the lowlands (DEHP 2013).	Low. Suitable habitat for this species was not observed in the locality.
<i>Monarcha melanopsis</i>	Black-faced monarch	This species occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest. During winter or migration, this species also occurs in marginal habitats such as 20-30 years old regrowth rainforest, nearby open eucalypt forest (mainly wet sclerophyll forests), especially in gullies with a dense, shrubby understorey as well as dry sclerophyll forests and woodlands, often with a patchy understorey (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Monarcha trivirgatus/</i> <i>Symposiachrus</i> <i>trivirgatus</i>	Spectacled monarch	This species occupies the understorey of mountain/lowland rainforests, thickly wooded gullies, and waterside vegetation; mostly well below the canopy, and occasionally mangroves (Pizzey and Knight 1997).	Low. Suitable habitat for this species was not observed in the locality.
<i>Myiagra cyanoleuca</i>	Satin flycatcher	This species occurs in heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occurs in coastal forests, woodlands, mangroves and drier woodland and open forests (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Nannoperca oxleyana</i>	Oxleyan pygmy perch	This species is found in slow flowing or still waters, usually those that are tannin stained and slightly acidic within lowland coastal wallum habitats (DEHP 2017).	Low. No suitable watercourse occurs within the vicinity of the impact area.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
<i>Neoceratodus forsteri</i>	Australian lungfish	This species occurs in a number of aquatic habitats, from streams through to altered and artificial habitats such as dams and reservoirs (DoE, 2017)	Low. No suitable watercourse occurs within the vicinity of the impact area.
<i>Numenius madagascariensis</i>	Eastern Curlew [#]	It generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. May also roost on wooden oyster leases or other similar structures	Low. Suitable habitat for this species was not observed in the impact area.
<i>Pandion haliaetus</i>	Osprey	This raptor is thinly distributed in coastal Australia. It nests in singularly overtopping, generally dead trees. The Eastern osprey hunts in coastal rivers, estuaries and streams and may gather nesting material from nearby forests.	Moderate. This species may fly over the impact area, however, is unlikely to nest in the immediate locality.
<i>Petauroides volans</i>	Southern greater glider	This species is most abundant in tall, montane moist forests, and prefers habitat with a diversity of eucalypt species. It appears very sensitive to clearing (logging etc) and is reliant on tree hollows in old, mature trees for shelter and breeding. In southern Queensland, they have been found to require at least 2 - 4 dens trees per 2 hectares of suitable habitat (DoE, 2016).	Low. Suitable habitat for this species was not observed in the locality.
<i>Petaurus australis</i>	Yellow-bellied Glider [#]	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north;	Low. Suitable habitat for this species was not observed in the locality.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
		moist coastal gullies and creek flats to tall montane forests in the south. Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein.	
<i>Phascolarctos cinereus</i>	Koala [#]	Koalas naturally inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by Eucalyptus species. Koala habitat can be broadly defined as any forest or woodland containing species that are known koala food trees, or shrubland with emergent food trees. The distribution of this habitat is largely influenced by land elevation, annual temperature and rainfall patterns, soil types and the resultant soil moisture availability and fertility. Preferred food and shelter trees are naturally abundant on fertile clay soils (DoE 2016).	Moderate. Evidence of koala activity has previously been recorded in the area. Only widely scattered eucalypts occur within the MIBA area, however areas of remnant vegetation that may provide Koala habitat are present directly adjacent to the site.
<i>Phyllodes imperialis smithersi</i>	Pink underwing moth	This species is found at heights below 600m in subtropical rainforest environments. It is associated with the larval food plant <i>Carronia multiseppalea</i> (DoE, 2017).	Low. Suitable habitat for this species was not observed in the locality.
<i>Pluvialis squatarola</i>	Grey Plover	In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes. The species is also very occasionally recorded further inland, where they occur around wetlands or salt-lakes (Marchant & Higgins 1993 and references therein).	Low. Suitable habitat for this species was not observed in the locality.
<i>Potorous tridactylus tridactylus</i>	Long-nosed potoroo	The long-nosed potoroo has scattered populations extending from south-eastern Queensland through to NSW. This species occurs across a range of vegetation types from subtropical and warm temperate rainforest through tall open forest with dense understory to dense coastal heaths (DEHP 2013). Its main habitat requirements are access to some form of dense vegetation for shelter and nesting materials, as well as the	Low. Suitable habitat for this species was not observed in the locality.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
		presence of an abundant supply of underground roots and fungi for food (DEHP 2013, Dept. Environment 2012).	
<i>Pseudomugil mellis</i>	Honey Blue Eye [#]	The Honey Blue-eye inhabits slightly acidic (pH 4.4-6.8), clear and tannin-stained lakes, streams and wetlands (Arthington & Marshall 1993) with sandy or muddy bottoms in coastal heath (wallum) ecosystems. The species usually occurs where there is little or no flow, and the fish can find shelter in dense, aquatic vegetation, such as emergent and submerged sedges, along the margins.	Low. Suitable habitat for this species was not observed in the locality.
<i>Pteropus poliocephalus</i>	Grey-headed Flying Fox	The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. It also feeds on commercial fruit crops and on introduced tree species in urban areas. The primary food source is blossom from <i>Eucalyptus</i> and related genera but in some areas, it also utilises a wide range of rainforest fruits. None of the vegetation communities used by the Grey-headed Flying-fox produce continuous foraging resources throughout the year. As a result, the species has adopted complex migration traits in response to ephemeral and patchy food resources (DoE 2016). The Grey-headed Flying-fox roosts in aggregations of various sizes on exposed branches. Roost sites are typically located near water, such as lakes, rivers or the coast. Roost vegetation includes rainforest patches, stands of Melaleuca, mangroves and riparian vegetation, but colonies also use highly modified vegetation in urban and suburban area (DoE 2016).	Moderate. This species has not previously been recorded, and no roosting sites are known to occur in the vicinity of the MIBA. However, scattered eucalypts provide potential feeding resources for this highly mobile species.
<i>Rhipidura rufifrons</i>	Rufous fantail	In east and south-east Australia, the Rufous fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood (<i>Eucalyptus microcorys</i>), Mountain grey gum (<i>E. cypellocarpa</i>), Narrow-leaved peppermint (<i>E. radiata</i>), Mountain ash (<i>E.</i>	Low. No suitable habitat for this species occurs within the impact area.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
		<i>regnans</i>), Alpine ash (<i>E. delegatensis</i>), Blackbutt (<i>E. pilularis</i>) or Red mahogany (<i>E. resinifera</i>); usually with a dense shrubby understorey often including ferns. They also occur in subtropical and temperate rainforests; for example near Bega in south-east NSW, where they are recorded in temperate Lilly pilly (<i>Acmena smithi</i>) rainforest, with Grey myrtle (<i>Backhousia myrtifolia</i>), Sassafras (<i>Doryphora sassafras</i>) and Sweet pittosporum (<i>Pittosporum undulatum</i>) subdominants. They occasionally occur in secondary regrowth, following logging or disturbance in forests or rainforests. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, including Spotted gum (<i>Eucalyptus maculata</i>), Yellow box (<i>E. melliodora</i>), ironbarks or stringybarks, often with a shrubby or heath understorey. They are also recorded from parks and gardens when on passage. In north and north-east Australia, they often occur in tropical rainforest and monsoon rainforests, including semi-evergreen mesophyll vine forests, semi-deciduous vine thickets or thickets of Paperbarks (<i>Melaleuca</i> spp.) (Dept. Environment 2012).	
<i>Rostratula australis</i>	Australian painted snipe	The Australian painted snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum <i>Muehlenbeckia</i> or canegrass or sometimes tea-tree (<i>Melaleuca</i>). The Australian painted snipe sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber (DoE 2016).	Low. This species has not previously been recorded in the NEBP area. Wet grassland areas within the works site provide some potential habitat for this species. However, the level of slashing that occurs across the area has substantially reduced the quality of this potential habitat.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
<i>Saiphos reticulatus</i>	Three-toed snake-tooth skink	This species inhabits rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. This species feeds on earthworms and beetle grubs and is found in leaf litter, often immediately adjacent to fallen tree trunks (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Stagonopleura guttata</i>	Diamond Firetail [#]	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season).	Moderate. This species may forage over the impact area.
<i>Thiornis rubricollis rubricollis</i>	Hooded plover (eastern)	This species is mostly seen on ocean beaches, however, may also occur on near-coastal lakes and lagoons and estuaries.	Low. Suitable habitat for this species was not observed in the locality.
<i>Tringa nebularia</i>	Common Greenshank, Greenshank	The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. The edges of the wetlands used are generally of mud or clay, occasionally of sand, and may be bare or with emergent or fringing vegetation, including short sedges and saltmarsh, mangroves, thickets of rushes, and dead or live trees.	Low. Suitable habitat for this species was not observed in the locality.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
<i>Turnix melanogaster</i>	Black-breasted button quail	This species is restricted to rainforests and forests, mostly in areas with 770-1200 mm rainfall per annum. They prefer drier low closed forests, particularly semi-evergreen vine thicket, low microphyll vine forest, araucarian microphyll vine forest and araucarian notophyll vine forest. This species may also be found in low, dense acacia thickets and, in littoral area, in vegetation behind sand dunes. An extensive dense leaf-litter layer is required for foraging and possibly also roosting. Fallen logs and a dense, heterogeneously distributed shrub layers are also considered to be important habitat characteristics for shelter and breeding (Dept. Environment 2012).	Low. Suitable habitat for this species was not observed in the locality.
<i>Xenus cinereus</i>	Terek Sandpiper [#]	In Australia, has been recorded on coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Generally roosts communally amongst mangroves or dead trees, often with related wader species. Breaks up into smaller flocks or even solitary birds when feeding in open intertidal mudflats.	Low. No suitable habitat for this species occurs within the impact area.
<i>Xeromys myoides</i>	Water Mouse [#]	In south-east Queensland, water mouse habitat includes mangrove communities and adjacent sedgeland, grasslands and freshwater wetlands. Mangrove communities in this region are typically comprised of <i>Avicenna marina</i> var. <i>australasica</i> , <i>Rhizophora stylosa</i> , <i>Bruguiera gymnorhiza</i> , <i>Aegiceras corniculatum</i> and <i>Ceriops tagal</i> var. <i>australis</i> (DoE 2016).	Low. Areas of coastal and sub-coastal swamps near the site and downstream provide potential habitat for this species, although the quality of this habitat is substantially reduced by livestock disturbance. No potential habitat occurs within the impact area.

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MNES		Habitat Requirements	Likelihood of Occurrence
Scientific Name	Common Name		
Various	Sea birds	Sea birds are those which spend a majority of time over coastal and oceanic environments, returning to land to nest.	Low. Suitable habitat for these species was not observed in the vicinity of the impact site.
Various	Wading birds	Wading birds are those which spend the majority of their time foraging in shallow marine or sometimes freshwater environments, such as beaches, mudflats, estuaries, or coastal wetlands.	Low. Suitable habitat for these species was not observed in the vicinity of the impact site.
Notes: # MNES species not listed in EPBC Approval but either known or considered likely to occur in or adjacent to the NEBP site or listed in current database search and therefore considered in this LBEMP Sub-Plan. * Species listed in the EPBC Approval but not currently listed as an MNES pursuant to the EPBC Act and therefore not subject to further consideration in this LBEMP Sub-Plan. Species that will clearly not occur on the site (i.e. whales, sharks, marine fish and turtles) have been omitted.			

3.3 MNES Risk Assessment

To manage the risk of adverse impacts on MNES and comply with the duty of care as defined by the *Environmental Protection Act 1994*, the following is required:

- Identification of the potential environmental hazards associated with the works program;
- Assessment environmental risks; and
- Development of controls to eliminate or minimise residual environmental risk.

In accordance with AS/NZS ISO 31000:2009 Risk management - Principles and Guidelines and Section 5 of the LBEMP for MNES v3 (JWA 2021), a project hazard identification and risk assessment has been undertaken in order to identify and evaluate the risks posed to MNES by the various construction activities associated with the works program.

This risk assessment evaluates unmitigated project specific environmental hazards, including assigning likelihood and consequence levels, to determine a risk rating for each identified risk. The criteria for determining likelihood and consequence levels, and risk ratings for each identified risk are based on AS/NZS ISO 31000:2009 and are consistent with the criteria described in Tables 3 to 5 of Section 5 of the LBEMP for MNES v3 (JWA 2021).

Likelihood and consequence criteria and the risk rating matrix adopted in this risk assessment are provided in **TABLES 3 to 5** of this LBEMP Sub-Plan 09. The results of the risk assessment are documented in **TABLE 6** of this LBEMP Sub-Plan 09. Note that in cases where the likelihood and consequence of risks relating to a particular hazard varied across the works site, the most conservative figure was adopted.

TABLE 3
LIKELIHOOD LEVELS

Level	Descriptor	Qualitative Description
A	Almost Certain	The event is expected to occur. The event will occur on an annual (or more frequent) basis.
B	Likely	It is probable the event will occur. The event has occurred several times before at similar developments.
C	Possible	The event may or may not occur. The event may occur once during the development.
D	Unlikely	The event may occur at some time but is unlikely. The event has been known to happen from time to time at similar developments.
E	Rare	The event may occur in exceptional circumstances. The event has not been heard of occurring at similar developments.

TABLE 4
CONSEQUENCE LEVELS

Level	Descriptor	Qualitative Description
1	Insignificant	Environment: No damaged detected. People: Event does not result in injury (i.e. no medical treatment required). Property: No damage to property. Amenity: No detectable impact on amenity.
2	Minor	Environment: Minor impact of short duration or short-term damage. People: Reversible injury or illness. Property: Minor damage to property (<\$5,000 to repair). Amenity: Minor, localised and short-term amenity impacts, no complaints.
3	Moderate	Environment: Short term damage, localised impact. People: Irreversible disability or impairment (30%) to one or more persons. Property: Moderate damage to property (<\$50,000 to repair). Amenity: One (1) or two (2) complaints, impacts extending to several properties and/or lasting for several days.
4	Major	Environment: Significant impact locally and potential for offsite impacts. People: Severe injuries or impairment (60%) to one or more persons, single fatality. Property: Major damage to property (<\$500,000 to repair). Amenity: Many complaints, impacts extensive and/or lasting for many days, up to five (5) properties rendered uninhabitable for more than one day.
5	Catastrophic	Environment: Significant impacts to regional ecosystems and threatened species, potential for widespread off-site impacts. People: Multiple fatalities, or irreversible injuries/impairment (>60%). Property: Significant loss to property (>\$1,000,000 to repair). Amenity: Multiple dwellings rendered uninhabitable for >1 day.

TABLE 5
RISK MATRIX CRITERIA

		Consequence				
		1 (Insignificant)	2 (Minor)	3 (Moderate)	4 (Major)	5 (Catastrophic)
Likelihood	A (Almost Certain)	Medium	High	High	Extreme	Extreme
	B (Likely)	Medium	Medium	High	High	Extreme
	C (Possible)	Low	Medium	High	High	High
	D (Unlikely)	Low	Low	Medium	Medium	High
	E (Rare)	Low	Low	Medium	Medium	High

The risk ratings presented in **TABLE 5** are to be interpreted as follows:

- **Low:** Risk can be adequately managed by routine procedures and work practices.
- **Medium:** Corrective action other than administrative controls is needed.
- **High:** Significant risk control measures need to be implemented before works commence.
- **Extreme:** Operations are not to be undertaken without extensive risk control and mitigation measures in place prior to the commencement of works.

The emphasis of this LBEMP Sub-Plan 09 is on the management of activities assessed as having a risk rating of 'Extreme', 'High' or 'Medium' for MNES that are known or considered likely to occur within (Moderate or High likelihood of occurrence) or adjacent to the works site the subject of the approved works program.

As such, for each hazard associated with the approved works program that has been assessed as having a 'Extreme', 'High' or 'Medium' level of risk to one or more MNES, applicable environmental management elements are specified in **TABLE 6** and associated detailed specifications are provided in **SECTION 4** of this LBEMP Sub-Plan 09.

TABLE 6
ENVIRONMENTAL RISK ASSESSMENT REGISTER

Hazard	Risk	MNES Potentially Impacted	Likelihood	Consequence	Risk Rating	Management Element Reference Section
Vegetation clearing and grubbing	Loss of MNES flora within areas to be cleared / grubbed.	All MNES flora.	D	2	Low	n/a
	Damage to potential habitat for MNES flora and fauna intended to be retained.	All MNES flora and fauna.	D	2	Low	n/a
	Injury, death or displacement of MNES fauna, including the Koala	All terrestrial MNES fauna.	D	2	Low	n/a
	Removal of topsoil resulting in loss of seed bank / tubers of MNES flora.	All MNES flora.	D	2	Low	n/a
	Increased soil instability causing erosion and sedimentation of downstream waterways providing potential habitat for MNES.	All MNES flora and fauna.	C	3	High	3
Movement of construction plant and machinery, increased road	Injury or death of MNES fauna, including Koalas, utilising the works site or surrounding road network.	All terrestrial MNES fauna.	D	2	Low	n/a

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Hazard	Risk	MNES Potentially Impacted	Likelihood	Consequence	Risk Rating	Management Element Reference Section
traffic from construction vehicles.	Introduction and / or spread of weeds or pest animal / ant species causing degradation of potential habitat for MNES potential or increased competition / predation on MNES.	All MNES flora and fauna.	C	2	Medium	2
Construction personnel bringing dogs onto the works site.	Injury and harassment of MNES fauna, including Koalas.	All terrestrial MNES fauna.	D	2	Low	n/a
Bulk earthworks, including filling and excavation, generally.	Erosion and discharge of sediment-laden runoff to downstream waterways impacting on water quality and habitat for MNES.	All aquatic MNES flora and fauna.	C	3	High	3
Bulk earthworks, including filling and excavation, below 5m AHD.	Disturbance of potential acid sulphate soils resulting in release of acidic discharge and other contaminants to soils and downstream waterways providing potential habitat for MNES.	All aquatic MNES flora and fauna.	C	4	High	4

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Hazard	Risk	MNES Potentially Impacted	Likelihood	Consequence	Risk Rating	Management Element Reference Section
Construction of roads, stormwater, sewerage and water supply infrastructure, and landscaping works.	Runoff of sediment from disturbed work surfaces and stockpiles causing sedimentation of downstream waterways, impacting on water quality and habitat for MNES.	All aquatic MNES flora and fauna.	C	3	High	3
	Introduction or spread of weeds or pest animals / ants through importation of construction materials, plant and equipment.	All MNES flora and fauna.	C	3	High	2
Fire ignition caused by operation of construction plant or equipment, welding, personnel smoking or other construction activities.	Spread of uncontrolled fire resulting in loss or damage to retained vegetation providing potential habitat for MNES.	All terrestrial MNES flora and fauna.	D	2	Low	N/A

4 ENVIRONMENTAL MANAGEMENT ELEMENTS

Based on consideration of the risk assessment presented in **TABLE 6**, the following environmental management elements have been identified as applicable to the approved works program the subject of this LBEMP Sub-Plan 09:

- Element 1: LBEMP Sub-Plan Risk Assessment (refer **SECTION 3**);
- Element 2: Weeds and Pests;
- Element 3: Soil Erosion, Sediment Loss and Water Quality; and
- Element 4: Acid Sulphate Soils.

Each of these environmental management elements consists of the following key components:

- **Rationale:** the reason(s) why this management element is, or is not, relevant to the specific works program the subject of this LBEMP Sub-Plan 09.
- **Objectives:** the objectives and targets to be achieved by implementing this management element.
- **Performance Indicators:** measurable indicators and standards set to assess the efficacy of management measures taken.
- **Tasks:** specific management and monitoring tasks that need to be undertaken, including:
 - **Actions:** details of the actions, including monitoring, to be undertaken; and
 - **Timing:** details concerning the timing and frequency for undertaking specific actions.

4.1 Element 1: LBEMP Sub-plan MNES Risk Assessment

SECTION 3 of this LBEMP Sub-Plan 09 details the MNES Risk Assessment undertaken for the approved works program in accordance with Element 1: LBEMP Sub-Plan MNES Risk Assessment.

4.2 Element 2: Weeds and Pests

Rationale			
Construction activities, including vegetation clearance works, associated with the approved works program have the potential to: - introduce weeds or pest animal species to the works site through the importation of construction materials or the use of vehicles, plant and equipment contaminated with pest material (e.g. weed seed, eggs, pest ants); - further disperse invasive species within and external to the works site through the movement of construction vehicles, plant and equipment between areas infested and not currently infested with invasive species; and - further disperse invasive species through the reuse of cleared vegetation containing weed material across the works site. Surveys of the NEBP site undertaken for the NEBP EIS (refer Cardno 2008) and monitoring completed as part of works completed to date recorded the presence of a number of restricted invasive plants species under the QLD <i>Biosecurity Act 2014</i>, as listed below:			
Common Name	Scientific Name	Location on Site	Biosecurity Act Status
Asparagus fern	<i>Asparagus aethiopicus</i>	Scattered across site	Category 3
Broad-leaved Pepper Tree	<i>Schinus terebinthifolia</i>	Scattered across site and in disturbed riparian areas	Category 3
Camphor Laurel	<i>Cinnamomum camphor</i>	Within the retained habitat to the south of the works area	Category 3
Groundsel Bush	<i>Baccharis halimifolia</i>	Scattered across site	Category 3
Lantana	<i>Lantana camara</i>	Scattered across site	Category 3
Singapore Daisy	<i>Sphagneticola trilobata</i>	Within the retained habitat to the south of the works area	Category 3
Yellow bells	<i>Tecoma stans</i>	Scattered across site, particularly along Caboolture River in the north	Category 3
The works site is not currently located within a Fire Ant Biosecurity Zone.			
Objective / Target			
- Existing pest infestations are controlled prior to commencing the approved program of works. - No new pest species are introduced to or spread within the works site as a result of the approved program of works. - No pest species are dispersed from the works site to the surrounding environment as a result of the approved program of works.			
Performance Indicators			
- No invasion / dispersal of weeds or pest animal species. - Weeds are treated in accordance with industry best practice and any relevant statutory requirements.			

Management Measures		
Tasks	Actions	Timing
Identify specific areas of pest infestation.	Prior to commencing the approved program of works (i.e. vegetation clearing) conduct a survey of the works site and adjacent areas (where accessible) in accordance with the Pest and Invasive Species Plan (JWA 2025) (APPENDIX 2) to identify and map the presence and location of pest infestations.	Prior to commencement of the construction phase.
Manage pest infestations within the works site.	In areas where earthworks are to occur: - clear and stockpile weed infested areas separately from weed free areas; and - dispose of, rather than reuse, weed infested material in accordance with local government requirements. Monitor the area for new weed infestations or reinfestation in accordance with the Pest and Invasive Species Plan (JWA 2025) (APPENDIX 2), and treat in accordance with: - Department of Agriculture, Forestry and Fisheries (DAFF) requirements and industry best practice as detailed in http://www.daff.qld.gov.au/plants/weeds-pest-animals-ants Preference should be given to the use of manual control measures near waterways adjacent to works site and any herbicides used in the control of weeds on site are to be suitable for use near waterways.	Prior to and during the construction phase.
Minimise the introduction and dispersal of pest species.	Ensure that all vehicles, plant and equipment brought onto the works site is weed and red imported fire ant free through the use of appropriate pest hygiene declarations and / or inspections in accordance with the Pest and Invasive Species Plan (JWA 2025) (APPENDIX 2). Ensure that all equipment (e.g. machinery, vehicles and clothing) used in weed-infested areas on the works site are cleaned of weed material, including soil potentially containing weed seed, before moving into weed-free areas of the works site or off-site. (Note that the LP Act requires that written notice must be provided before supplying (including disposal to a licensed waste facility) any 'thing' (including gravel, machinery, mulch, packing material, sand, soil, vehicles etc.) that is, or could be, contaminated with certain declared Class 2 plants). Avoid any unnecessary movement of vehicles, plant and equipment, or personnel in areas of known weed infestation and in areas of retained vegetation. Ensure that all mulch and fill material imported to the site is certified as being weed and red imported fire ant free.	Ongoing during the construction phase.
Record keeping	The following records and reports are to be retained in relation to this environmental management element and shall	Ongoing

Management Measures		
Tasks	Actions	Timing
	be made available to relevant administering authorities upon request: • copies of pest hygiene declarations or other evidence that materials and equipment used on site are pest free (e.g. inspection records); • copies of any 'written notice' required to be provided under the LP Act; and • records of pest monitoring and treatment conducted throughout the construction phase.	
Corrective actions	In the event of a non-compliance with the stated performance indicators, corrective action procedures should be implemented in accordance with SECTION 5 of this LBEMP Sub-Plan 09. Appropriate corrective actions in relation to this environmental management element may include, but may not be limited to: • treatment of any new infestations or reinfestation in accordance with the Pest and Invasive Species Plan (JWA 2025) (APPENDIX 2); • review work practices to avoid unnecessary movement of people, plant or equipment into areas of known weed infestation or retained vegetation; • consider establishing a weed washdown bay on site (refer to Pest and Invasive Species Plan (JWA 2025) - APPENDIX 2) to clean down equipment prior to entry / exit from the site; and • environmental awareness training of personnel.	Ongoing

4.3 Element 3: Soil Erosion, Sediment Loss and Water Quality

Rationale
The approved works program, including vegetation clearance works and bulk earthworks, has the potential to impact on water quality and potential habitat for MNES within downstream waterways and wetlands, including the Moreton Bar RAMSAR wetland. Appropriate erosion and sedimentation controls must be implemented to minimise the release of sediment and other contaminants generated by construction activities into downstream waterways. A detailed Erosion and Sediment Control Strategy has been developed (Hall Civil 2025) (APPENDIX 3). The Erosion and Sediment Control Strategy has included an erosion risk assessment in accordance with Best Practice Erosion and Sediment Control (IECA, 2008) and has determined that the proposed works represent a 'very low' erosion risk. Regardless, due to the location of the proposed works areas on the floodplain, and their proximity to the Caboolture River and associated RAMSAR wetland, specific management measures have been identified below in the event of an extreme weather event.
Objective / Target
- To minimise changes to water quality within receiving waters as a result of the approved works program. - To minimise sedimentation resulting in the loss or degradation of potential habitat for MNES within receiving waters as a result of the approved works program.
Performance Indicators
- No physical evidence of on-site erosion leading to the off-site transport and deposition of sediment. - Progressive establishment of stable soils as soon as practicable following completion of vegetation clearance and grubbing works within the works site.

Management Measures		
Tasks	Actions	Timing
Appropriately manage development activities to maintain acceptable water quality levels within receiving waterways and wetlands.	The ESCP will be reviewed and certified by a CPESC prior to commencement of works. This review and certification will ensure the plan has been prepared to satisfy the intent and minimum standards nominated within the IECA (2008) Best Practice Erosion and Sediment Control Guideline.	Prior to the construction phase.
	The ESCP shall be supplemented by Progressive Erosion and Sediment Control Plans (PESCP). PESCPs are to be developed to identify the specific location and, where required, additional erosion and sediment controls applicable to individual work stages. PESCPs shall be documented via mark ups to approved plans. Where a change in the level of sediment control standard is proposed in a PESCP, the PESCP shall be reviewed and approved by an appropriately qualified person prior to the change being implemented.	Prior to and ongoing during the construction phase.
	Adhere to all water quality assurance measures in accordance with the Erosion and Sediment Control Strategy (Hall Civil 2025) (APPENDIX 3) including: Minimise the extent and duration of disturbance, maintaining	Prior to and ongoing during the construction phase.

Management Measures		
Tasks	Actions	Timing
	existing ground cover to the greatest extent possible. • Commissioning / decommissioning of plant and refuelling to be undertaken a minimum of 30m away from any watercourse/drainage line. • All ERSED controls to be inspected regularly (weekly, pre/post rainfall event i.e. forecast or actual rainfall of >10mm) with maintenance/repairs to be undertaken when necessary. • Revegetation of disturbed/bare areas to be progressively implemented. • Where clean water drains and sediment traps/sumps are necessary, all clean water drains and sediment traps and associated drainage must be installed and commissioned prior to the commencement of any grubbing works within the catchment area. • All controls must be installed within approved project footprint. • Ensure all site access is stabilised with rumble grid and clean rock.	
	In the event that the works are to be completed between December - March, in addition to the above, once each area of earthworks is completed, stabilisation will be applied in the form of soil binder or hydro-mulching with a minimum 75% cover within 10 days of the completion of works within any area of a work site.	Prior to and ongoing during the construction phase.
	In the event of a forecast for an extreme weather event, in addition to the above, the following measures should be completed: • Cease all works that involve opening new ground or placement of fill; • Inspect the condition of all erosion and sediment control devices on site to ensure that these measures are operationally effective prior to the event; • If necessary, establish temporary flow diversion up-slope of open, newly formed batters; • Stabilise all drainage pathways and exposed surfaces still subject to construction with temporary erosion and sediment control techniques (i.e. erosion control blankets, hydraulic blankets, or mulching); • Secure any erosion control blankets with additional anchorage such as sandbags, rocks, or timber stakes.	Prior to and ongoing during the construction phase.

Management Measures		
Tasks	Actions	Timing
Record keeping	The following records and reports are to be retained in relation to this environmental management element and shall be made available to relevant administering authorities upon request: all records necessary to satisfy council and relevant environmental management plans.	Ongoing
Corrective Actions	In the event of a non-compliance with the stated performance indicators, corrective action procedures should be implemented in accordance with SECTION 5 of this LBEMP Sub-Plan 09 and the Erosion and Sediment Control Strategy (Hall Civil 2025) (APPENDIX 4). Appropriate corrective actions in relation to this environmental management element are provided in the approved Erosion and Sediment Control Strategy and include, but are limited to: - removal of sediment, reinstatement of sediment fences or other maintenance of erosion and sediment control measures; and - reevaluation of the size, location and type of erosion and sediment control measures to improve effectiveness in response to monitoring results.	Ongoing

4.4 Element 4: Acid Sulphate Soils

Rationale
The works program involves filling and excavation of material greater than 5m AHD in areas that are unlikely to contain actual and potential acid sulphate soils (ASS). Portions of the MIBA development area (offsite) are located below 5m AHD and are likely to contain actual and potential acid sulphate soils (ASS). Disturbance of ASS has the potential to result in release acidic discharge and other contaminants to soil and waters impacting on potential habitat for MNES flora and fauna. Appropriate soil management practices must be employed in order to avoid detrimental impacts to land and water within and adjacent to the works site associated with disturbance to ASS. A detailed ASS management plan has been developed (Tectonic 2025) (APPENDIX 5).
Objective / Target
To minimise and where possible, avoid the exposure of ASS, and prevent acid leachate from leaving the site and potentially impacting on adjacent waters.
Performance Indicators
Compliance with the requirements of relevant local and state government approvals that deal with the management of Acid Sulphate Soils.

Management Measures		
Tasks	Actions	Timing
Appropriately manage development activities involving disturbance to acid sulphate soils.	An Acid Sulphate Soils Investigation and Management Plan (Tectonic 2025) (APPENDIX 4) has been prepared for the site.	Complete
	Implement the Acid Sulphate Soils Investigation and Management Plan (Tectonic 2025) (APPENDIX 4) to ensure that no environmental harm as defined under the <i>Environment Protection Act 1994</i> is caused.	Ongoing during the construction phase.
Record keeping	The following records and reports are to be retained in relation to this environmental management element and shall be made available to relevant administering authorities upon request: all records required under the approved Acid Sulphate Soils Management Plan.	Ongoing
Corrective actions	In the event of a non-compliance with the stated performance indicators, corrective action procedures should be implemented in accordance with SECTION 5 of this LBEMP Sub-Plan 09.	Ongoing

5 NON-CONFORMANCE AND CORRECTIVE ACTION PROCEDURES

In the event of a non-compliance with the stated performance indicators of this LBEMP Sub-Plan 09 or any other incidents that cause actual or potential harm to any MNES, relevant investigations should be undertaken as detailed in the Implementation, Monitoring and Improvement Plan (**TABLE 7**) to identify the cause of the non-compliance; and a corrective action report (CAR) should be prepared including the following details:

- description of the non-compliance;
- date of non-compliance;
- identified cause of non-compliance;
- description of proposed corrective actions;
- persons / entities consulted in developing corrective actions;
- timeframe for implementation of corrective actions;
- nominated person responsible for implementation; and
- validation monitoring requirements.

An example CAR form is provided in **APPENDIX 5**.

Appropriate corrective actions should be determined by the Developer in consultation with relevant experts and the administering authority (where required) and shall be implemented by the Developer within the agreed timeframe noted on the CAR.

Validation monitoring should be undertaken to confirm that the nominated corrective actions have been effective.

The Developer shall maintain a register of CARs, which shall be made available to any relevant local, state or commonwealth government department, any statutory authority or any other person, consensually or as lawfully required.

The Developer shall notify the Commonwealth Department of the Environment of any non-conformances with this LBEMP Sub-Plan 09 or any environmental incidents involving MNES as soon as practicably possible.

TABLE 7
IMPLEMENTATION, MONITORING AND IMPROVEMENT PLAN

Element	Monitoring Activity			Incident Response	Corrective Action
	What	When	Who		
Weeds and Pests (SECTION 4.2)	Minimisation of weed introduction and spread	Pre, during and post construction	Principal Contractor/Landscaper/Bush rehabilitator	Contractor/Ecologist/Landscaper/Bush Rehabilitator	Weed infestations are to be prevented and managed as outlined in the Pest and Invasive Species Plan (JWA 2025) (APPENDIX 2). If infestations occur, measures contained in the Plan should be reviewed and adapted based on the weed species and extent of infestation.
	Control of pest animals	During and post construction	Principal Contractor/Ecologist	Contractor/Ecologist	Pest populations are to be managed as outlined in the Pest and Invasive Species Plan (JWA 2025) (APPENDIX 2). If pests are recorded, measures contained in the Plan should be reviewed and adapted based on the pest species and extent of presence.
Soil Erosion, Sediment Loss and Water Quality (SECTION 4.3)	Control of erosion and sedimentation	Pre, during and post construction	Principal Contractor/Engineer	Contractor/Engineer	Erosion and sedimentation control devices are to be maintained as per the Erosion and Sediment Control Strategy (Hall Civil 2025) (APPENDIX 3). If the measures contained within this plan do not result in acceptable outcomes, the plan should be reviewed and modified accordingly. Ongoing monitoring must be implemented to ensure that management measures are successful.

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North Harbour - Regional Park Additional Fill Areas

Element	Monitoring Activity			Incident Response	Corrective Action
	What	When	Who		
	Maintenance of appropriate water quality and surface flow regimes	Pre, during and post construction	Principal Contractor/Engineer	Contractor/Engineer	Water quality and flow regimes are to be maintained as per the Erosion and Sediment Control Strategy (Hall Civil 2025) (APPENDIX 3). If the measures contained within this plan do not result in acceptable outcomes, the plan should be reviewed and modified. Ongoing monitoring must be implemented to ensure that management measures are successful.
Acid Sulphate Soils (SECTION 4.4)	Acid sulphate soils are appropriately managed	Pre, during and post construction	Principal Contractor/Engineer	Contractor/Engineer	Acid sulphate soils are to be maintained as per the Acid Sulphate Soils Investigation and Management Plan (Tectonic 2025) (APPENDIX 4). If the measures contained within this plan do not result in acceptable outcomes, the plan should be reviewed and modified. Ongoing monitoring must be implemented to ensure that management measures are successful.

6 RECORD KEEPING

The Developer is to maintain appropriate records concerning all tasks and actions undertaken in accordance with this LBEMP Sub-Plan 09 including:

- copies of all relevant permits or approvals relevant to the works the subject of this LBEMP Sub-Plan 09;
- the name, qualifications and contact details of the suitably qualified ecologist engaged to the assist in the preparation of this LBEMP Sub-Plan 09;
- any records required to be kept in for specific environmental management elements as identified in **SECTION 4** of this LBEMP Sub-Plan 09; and
- all incident reports and corrective action requests generated during the works program.

All records shall be kept for a minimum of 5 years following completion of the works program and shall be made available to any relevant local, state or commonwealth government department, statutory authority or any other person, consensually or as lawfully required.

REFERENCES

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Hall Civil (2025) *Erosion And Sediment Control Plan - North Harbour Open Space Earthworks - Early Works*. Report prepared for North Harbour Holdings Pty Ltd.

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JWA (2015). *Wetland Mapping Report: North East Business Park Residential West Area*. Report prepared for North East Business Park Pty Ltd.

JWA (2019a). *Significant Residual Impact Assessment - Marine Plants, North East Business Park Raff Creek Crossing*. Report prepared for North Harbour Holdings Pty Ltd.

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JWA (2021) *North East Business Park - Land Based Environmental Management Plan For Matters Of National Environmental Significance v3*. Report prepared for North Harbour Holdings Pty Ltd.

JWA (2024a). *Revised Vegetation Management Plan, North East Business Park MIBA Bulk Earthworks*. Report prepared for North Harbour Holdings Pty Ltd.

JWA (2025). *Pest and Invasive Species Plan - Regional Park Additional Fill Areas, North Harbour*. Report prepared for North Harbour Holdings Pty Ltd.

SLR (2025) *North Harbour - Flood Management Plan (including sports fields, additional fill areas and Area 1)*. Report prepared for North Harbour Holdings Pty Ltd.

Tectonic Geotechnical Pty Ltd (2025). *Acid Sulfate Soil Investigation and Management Plan North Harbour Mixed Industry and Business Area (MIBA)*. Report Prepared for North Harbour Holdings Pty Ltd.

APPENDIX 1 - BULK EARTHWORKS PLANS (KNGROUP 2025)



OPEN SPACE BULK EARTHWORKS PLAN



EXTENT OF CUT

EXTENT OF FILL

DESIGN IS IN ACCORDANCE WITH SLR FLOOD MANAGEMENT PLAN
(INCLUDING SPORTS FIELDS AND ADDITIONAL FILL AREAS)
REF: 620.30047.00200-R01 VERSION 7 DATED MARCH 2025

DRAWING INDEX	
DRAWING NO.	DRAWING TITLE
25-109-01	EARTHWORKS PLAN AND DRAWING INDEX
25-109-02	OVERALL EARTHWORKS PLAN
25-109-03	BULK EARTHWORKS CROSS SECTIONS

SCALE  1 : 5000 (A1 UNREDUCED)

DO NOT SCALE THIS DRAWING
IF IN DOUBT - ASK!

REVISIONS

[illegible]

Client:



North Harbour

BUSINESS PARK

BY PORT BINNLI

OPEN SPACE

BULK EARTHWORKS PLAN



L1, 62 Astor Terrace, Spring Hill, QLD 4000
www.kngroup.com.au | 07 3017 1900

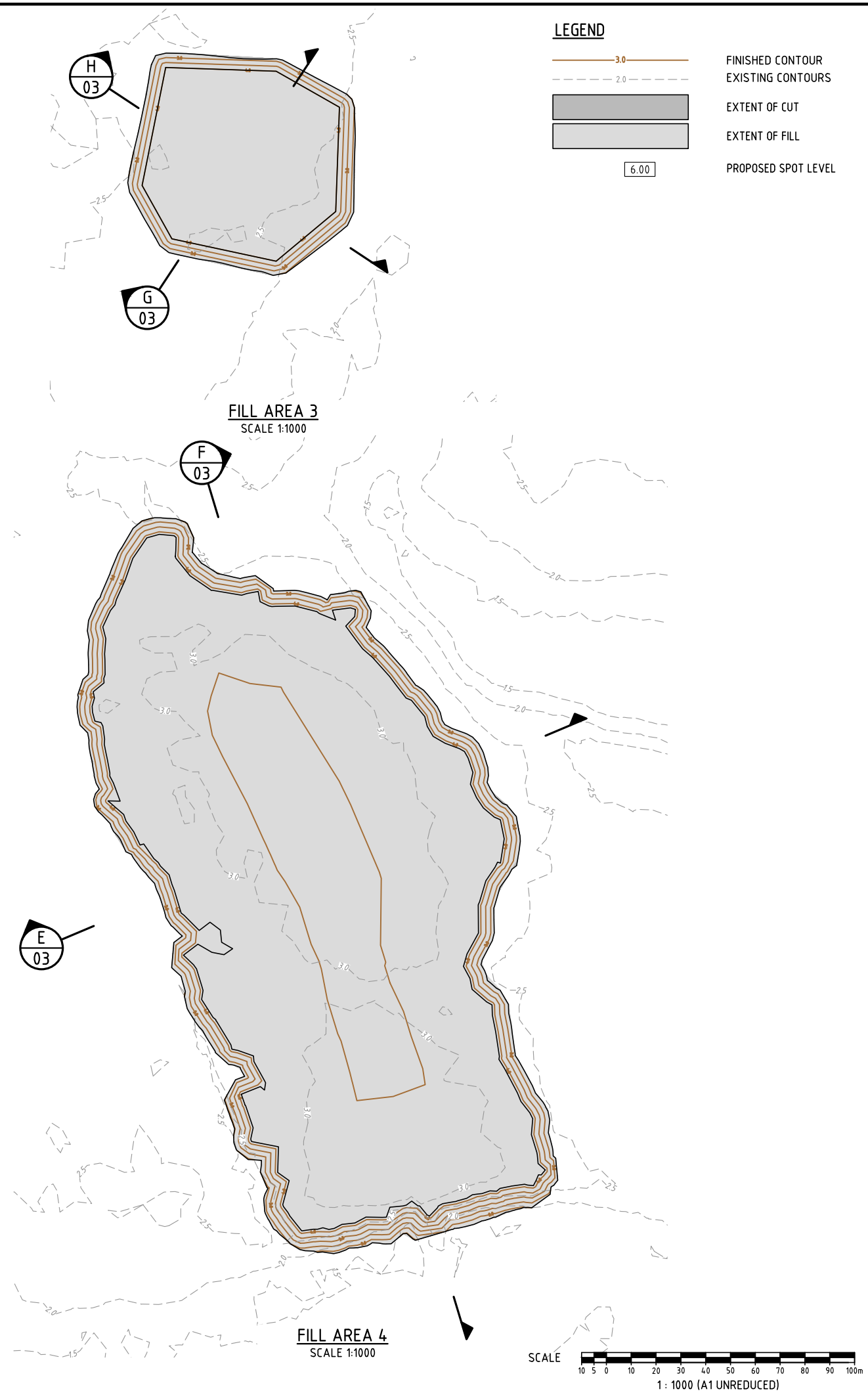
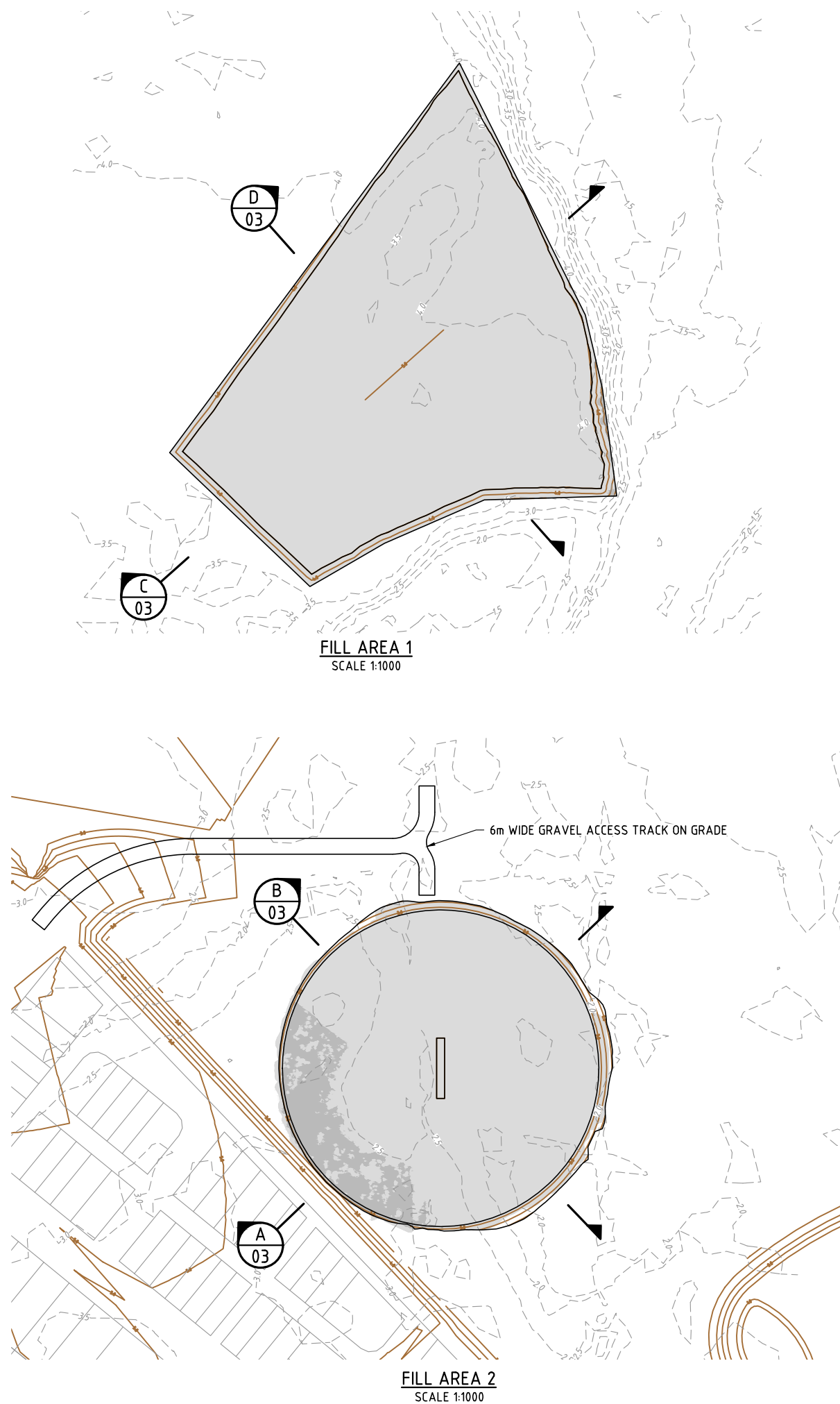
Approved Director - RPEQ 17544

Drawing Title

EARTHWORKS PLAN
AND DRAWING INDEX

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Scale AS SHOWN			Sheet 01 of 03
A1	Drawing No 25-109-01		Revision A

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APPENDIX 2 - PEST AND INVASIVE SPECIES PLAN (JWA 2025)



PEST AND INVASIVE SPECIES PLAN

Regional Park Additional Fill Areas North Harbour

Lot 2 SP320619
Burpengary East

A Report Prepared for
North Harbour Holdings Pty Ltd

JUNE 2025

DOCUMENT CONTROL

Document

Title	Pest and Invasive Species Plan, North Harbour - Regional Park Additional Fill Areas
Job Number	Q15003
File Reference	2015 Clients\15003_North East Business Park, Morayfield\Reports\LBEMP09 - Additional Fill Areas
Version and Date	RW2 13/06/25
Client	North Harbour Holdings Pty Ltd

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Client Issue

Version	Date	Author		Approved by	
		Name	Initials	Name	Initials
RW1	08/06/25	Nicole Davies	ND	Adam McArthur	AM
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1 INTRODUCTION

1.1 Background

JWA Pty Ltd has been engaged by North Harbour Holdings Pty Ltd (formerly North East Business Park Pty Ltd) to prepare a Revised Pest and Invasive Species Plan (PISP). The PISP forms part of the Land-based Environmental Management Plan (LBEMP) sub-plan 09 developed for the proposed bulk earthworks associated with the Regional Park Additional Fill Areas.

This PISP provides details regarding the processes involved with works and management of pests and invasive species during the bulk earthworks phase. It should be noted that management of weeds and pests following this stage will be covered by other management plans e.g. Site Rehabilitation Plan, Biting Insect Management Plan.

1.2 The Subject Site

The site is located land to the east of Hardwood Drive at the North Harbour development site, Burpengary East; formally described as Lot 2 on SP320619 (**FIGURE 1**). The four proposed fill areas range in size from 0.6 to 3.5 ha. An aerial photograph of the site is shown in **FIGURE 2**.

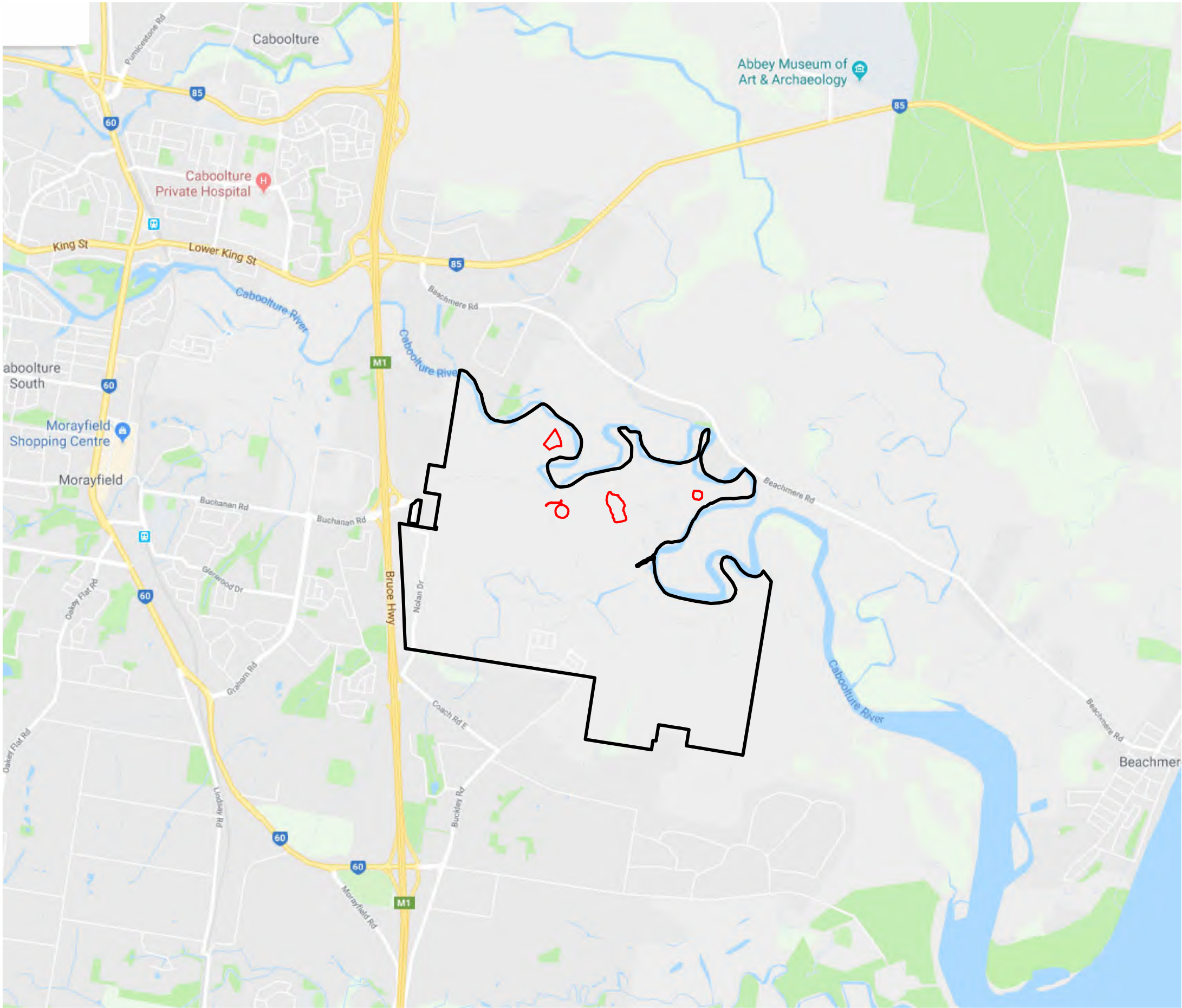
The majority of the site is highly disturbed and has been the subject of previous land clearing, livestock grazing and plantation forestry activities. The Caboolture River forms the northern boundary where some mature vegetation is existing along the banks of the river. This vegetation has been planted by NEBP as part of the rehabilitation of the Caboolture River. Small, isolated pockets of vegetation are scattered throughout the remainder of the site.

1.3 The Proposed Works

The proposed works involves the bulk earthworks associated with the Regional Park additional fill areas - within Lot 2 SP320619.

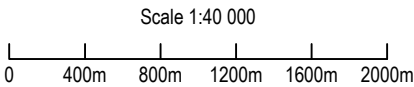
The four proposed fill areas range in size from 0.6 to 3.5 ha. The extent of the Regional Park additional fill areas bulk earthworks area is shown in **FIGURE 3**. **ATTACHMENT 1** contains the engineering plans for the additional works area.

The proposed works comprise construction of four fill platforms designated Fill Areas 1 to 4, using stripped topsoil and/or other materials unsuitable for reuse as controlled fill (non-select materials) previously won during the development of the North Harbour MIBA precinct. Earthworks plans prepared by KN Group (Dwg. No. 25-109 01-09, Mar 2025) show the four proposed fill areas ranging from 0.6 to 3.5 hectares in size, with fill to be placed up to about 1.5 m height. The fill zones will form relatively level, open space areas, which may be utilised for future recreational purposes.



LEGEND

- LBEMP Sub-plan 09 Site Boundary
- NEBP Site Boundary



SOURCE: Google Maps

SCALE: 1 : 40 000 @ A3

JWA Pty Ltd
Ecological Consultants

CLIENT
North Harbour Holdings Pty Ltd

PROJECT
Pest and Invasive Species Plan
Regional Park Additional Fill Areas
North Harbour, Burpengary East QLD
City of Moreton Bay LGA

FIGURE 1

PREPARED: BW
DATE: 10 June 2025
FILE: Q15003_LBEMP09_20250610.dwg

TITLE

LOCALITY PLAN



LEGEND
 LBEMP Sub-plan 09 Site Boundary
 NEBP Site Boundary

Scale 1 : 8000
0 100m 200m 300m 400m 500m

SOURCE: Metro Maps Aerial dated 07/11/24

SCALE: 1 : 8000 @ A3

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City of Moreton Bay LGA

FIGURE 2

PREPARED: BW
DATE: 10 June 2025
FILE: Q15003_LBEMP09_20250610.dwg

TITLE
AERIAL
PHOTOGRAPH



LEGEND

 LBEMP Sub-plan 09 Site Boundary

 NEBP Site Boundary

Proposed Works

 Extent of Cut

 Extent of Fill

 Finished Contour



Scale 1 : 8000
0 100m 200m 300m 400m 500m

SOURCE: KN Group (Ref: 25109 FILL AREAS.dwg); Metro Maps Aerial dated 07/11/24
SCALE: 1 : 8000 @ A3

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Regional Park Additional Fill Areas
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City of Moreton Bay LGA

FIGURE 3

PREPARED: BW
DATE: 10 June 2025
FILE: Q15003_LBEMP09_20250610.dwg

TITLE

**PROPOSED
WORKS**

Disturbance of natural soil across the proposed fill areas will be limited to stripping of vegetation and topsoil for subgrade preparation only. If required, such stripping would be generally limited to a depth of no more than about 0.5m. No other excavations into the underlying soil profile are proposed.

Non-select materials which are to be used for filling are expected to comprise either non-ASS, or material which has been previously treated as part of the MIBA site development.

1.4 Objectives

The PISP is intended to assist North Harbour Holdings Pty Ltd in managing the impacts of pest and invasive species (flora and fauna) before, during, and after construction.

The aim of the PISP is to develop a comprehensive and integrated approach to guide the short- and long-term management of pests and invasive species within open space areas of the MIBA site.

Specific objectives of the PISP are to:

- Identify pests and invasive species (flora and fauna) that have been, or are likely to be, recorded on the subject site;
- Prioritise management based on species;
- Develop methods to examine, control, and/or eradication 'high priority' weeds and invasive species; and
- Recommend long-term control methods, including monitoring and reporting.

1.5 Format of the PISP

The PISP is structured as follows:

1. Introduction;
2. Existing Ecological Values;
3. Weed Management;
4. Pest Control; and
5. Monitoring and Reporting.

2 EXISTING ECOLOGICAL VALUES

2.1 Background

An Ecological Assessment of the subject site has previously been completed (JWA 2021). This assessment included identification of vegetation communities and threatened flora on site, along with a brief fauna survey. No Commonwealth or State listed threatened flora or fauna species were recorded on the subject site. However, several threatened fauna species were considered possible occurrences.

2.2 Vegetation Communities

2.2.1 Introduction

One (1) broad vegetation community were identified within the additional fill areas. This section provides a description of the vegetation community and a discussion of the condition and conservation status. The conservation status of vegetation communities is discussed with reference to the Regional Ecosystem Description Database (Queensland Herbarium 2019) and the *Queensland Vegetation Management (VM) Act 1999* where appropriate.

Retained vegetation adjoining the works area consists of the following vegetation communities:

- Casuarina +/- mangrove estuarine wetlands;
- Coastal saltmarsh/saltpan vegetation;
- Mangrove estuarine wetlands;
- Coastal and subcoastal dry sclerophyll forest/woodland;
- *Eucalyptus tereticornis* fringing woodland;
- Mixed revegetation; and
- Persicaria, Cyperus and Juncus wetland.

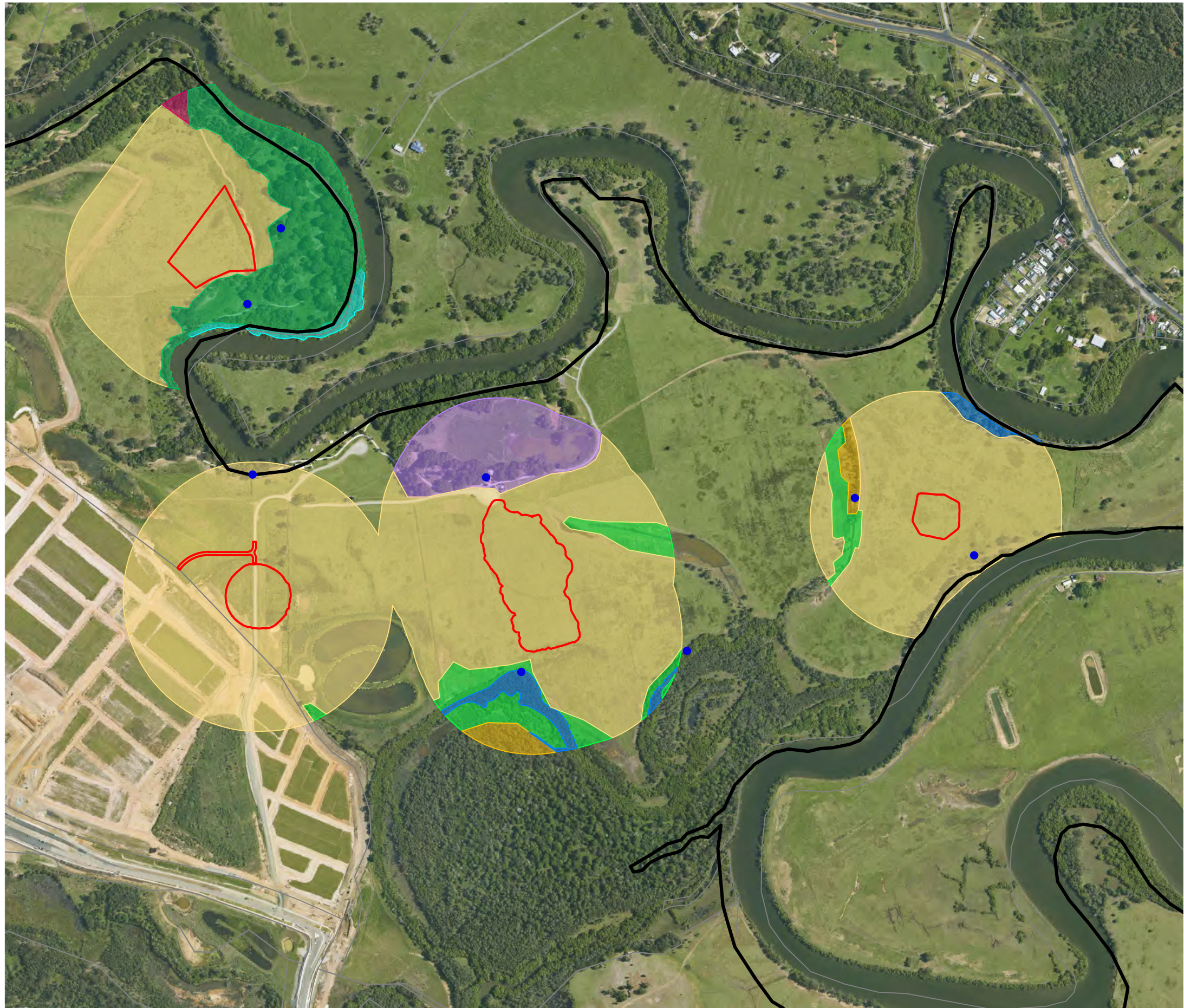
2.2.2 Disturbed Terrestrial Grassland

Location and Area

This community is located over the additional fill areas (**FIGURE 4**).

Description

This community is comprised of open pasture with the occasional regrowth *Acacia* spp., Paperbark or clump of Lantana. There is also the occasional melon hole populated with sedges such as *Cyperus polystachyos*, *Fimbristylis* spp., *Juncus* spp., and Frogsmouth (*Philydrum lanuginosum*). Pasture grasses include *Paspalum* sp.* and *Cynodon dactylon**. Introduced species include rat's tail grass (*Sporobolus* sp.*), *Convolvulus* sp.*, *Lepidium* sp.*, *Conyza* sp.*, and *Passiflora subpeltata*.



LEGEND

- LBEMP Sub-plan 09 Site Boundary
- NEBP Site Boundary
- Indicative Weed Monitoring Locations

Vegetation Communities

- RE12.1.3 - Mangrove shrubland to low closed forest on marine clay plains and estuaries
- Eucalyptus tereticornis*, *Melaleuca quinquenervia*, *Casuarina glauca*, *Eucalyptus siderophloia*, *Melaleuca styphelioides* open forest
- Mixed revegetation
- Heritage Park
- Casuarina glauca* offset area
- Saltmarsh offset area
- Mangrove offset area
- Disturbed terrestrial grassland

Scale 1 : 8000

0 100m 200m 300m 400m 500m

SOURCE: Metro Maps Aerial dated 07/11/24

SCALE: 1 : 8000 @ A3

JWA Pty Ltd
Ecological Consultants

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North Harbour Holdings Pty Ltd

PROJECT
Pest and Invasive Species Plan
Regional Park Additional Fill Areas
North Harbour, Burpengary East QLD
City of Moreton Bay LGA

FIGURE 4

PREPARED: BW
DATE: 10 June 2025
FILE: Q15003_LBEMP09_20250610.dwg

TITLE

INDICATIVE
WEED MONITORING
LOCATIONS

Condition

As grazing pasture this community is in good condition with only light grazing impacts. As a vegetation community it is in poor condition given the lack of a shrub or tree layer.

Conservation Status

This area is not mapped as remnant vegetation and has no conservation status under the VM Act 1999.

2.3 Significant Flora and Fauna Species

No flora or fauna species listed as threatened under either the Commonwealth *Environment Protection Biodiversity and Conservation (EPBC) Act (1999)* or Queensland *Nature Conservation (NC) Act (1992)* were recorded on the subject site in previous assessments (JWA 2021). Koala and Grey-headed flying-fox have since been opportunistically recorded within the retained and rehabilitated vegetation along the Caboolture River.

2.4 Fauna Habitat

Habitat suitability assessments of the threatened and migratory fauna species that are known to occur or are considered possible occurrences in the locality determined that the following threatened species had reasonable potential to be present within the subject site:

- Australian painted snipe (*Rostratula australis*);
- Grey-headed flying-fox (*Pteropus poliocephalus*) - **RECORDED**;
- Koala (*Phascolarctos cinereus*) - **RECORDED**;
- Red goshawk (*Erythrorhynchus radiatus*);
- Grey falcon (*Falco hypoleucos*);
- Swift parrot (*Lathamus discolor*);
- Coxen's fig-parrot (*Cyclopsitta diophthalma*);
- Diamond Firetail (*Stagonopleura guttata*); and
- Water mouse (*Xeromys myoides*).

Whilst these species are considered a known or possible occurrence on the broader subject site, the additional fill areas do not contain suitable habitat for these species, except for the Red goshawk and Grey falcon which may hunt over these areas.

3 WEED MANAGEMENT

3.1 Introduction

The focus for weed management is the removal of existing weeds and prevention of further infestations. Weed control will also occur as part of landscaping and rehabilitation works associated with the development and will be described in a separate management plan.

3.2 Weeds on Site

Several weeds have been recorded on the subject site. The following are some of the major weed species identified:

- Lantana* (*Lantana camara*) - Weed of National Significance (WoNS), Class 3 declared weed;
- Annual ragweed* (*Ambrosia artemisiifolia*)- Class 3 declared weed;
- Broadleaved pepper tree* (*Schinus terebinthifolia*)- Class 3 declared weed;
- Groundsel bush* (*Baccharis halimifolia*)- Class 3 declared weed; and
- Rat's tail grass* (*Sporobolus* sp.) - Class 3 declared weed.

3.3 Weed Species Management Protocols

The weed species management protocols are as follows:

1. No soil disturbance is to occur within areas of retained vegetation. Soil disturbance within retained vegetation and any areas to be landscaped shall be kept to a minimum to avoid weed recruitment.
2. All nursery stock for landscaping purposes shall be weed, pest and disease free and certified as such by the supplier where feasible. The certificates are to be obtained prior to the commencement of any regeneration/revegetation works on site.
3. All mulch produced on site (by mulching cleared vegetation and trees) shall specifically exclude fertile material from weed species (where a risk of proposition exists) and be stored outside of the retained vegetation. Vegetation mulching will be suitably controlled to avoid contamination. Any fertile weed material will be transported from the site to an approved disposal facility.
4. Weed or potential weed species shall not be planted during landscaping operations.
5. Weeds on the subject site will be managed using suitable control measures (i.e. chemical and/or physical control) as outlined in **ATTACHMENT 2**.
6. Clearing operations are to ensure that propagative material from cleared weeds does not spread across the site. Vehicles, earthworks machinery, clothing and other equipment must not introduce weed material to the site or spread such material throughout the site. Vehicles and machinery are to be cleaned in accordance with the Vehicle and Machinery Cleandown Procedures (QLD Department of Agriculture and Fisheries 2019).

7. Weed monitoring will occur monthly as per **SECTION 5.2.**

Specific weed control methodology is contained within **ATTACHMENT 2.**

4 PEST CONTROL

4.1 Introduction

The focus for pest management is the prevention of further pest infestations through implementation of precautions during construction and through development/landscaping design. The following sections provides guidance on the specific measures to be implemented for pests and invasive species likely to occur.

4.2 General

A general induction of all construction personnel will aim to ensure awareness of pest animal, and the related issues, responsibilities and mitigation procedures. An induction should cover include the following (as a minimum):

- Pest species covered by the PISP and relevant / helpful key identification tools;
- Biosecurity procedures to ensure high risk species such as fire ants/yellow crazy ants are not brought onto the site via construction equipment etc.
- Strict adherence to a no domestic dogs policy on the subject site during construction; and
- Requirement to report any direct or indirect evidence of pest animals (sightings, footprints, scats, dead or injured native fauna).

4.3 Dog (*Canus familiaris*) Management

On the subject site, any risks to native fauna mortality or injury are most likely to result from domestic dogs that are introduced by construction personnel, or that may roam from nearby properties. Domestic dogs are particularly of concern for their potential to cause injury or death to koalas in the area. The following measures are recommended:

- Construction personnel are prohibited from bringing dogs onto the site.
- Any sightings of dogs during bulk earthworks are to be immediately reported to the site foreman.
- Moreton Bay Regional Council (MBRC) will be contacted to assist with the containment and/or removal of feral dogs or roaming domestic dogs.

4.4 Cane Toad (*Bufo marina*) Management

Cane toads occur across most of QLD and almost all of Southeast Queensland (SEQ) (Kearney et al. 2008). It is important to maintain or lower cane toad abundance in order to minimise impacts as prey (i.e. due to their high level of toxicity) and as predators / competitors on small native animals such as frogs. The following measures are expected to ensure cane toad numbers on subject site are reduced and/or remain low:

- Construction materials to be brought on site, including soils and landscaping materials, must be inspected for cane toads.

- Development activities must not create areas where water may pool and stagnate, thereby creating habitat for cane toads.
- Any construction or reprofiling of drainage lines should encourage flow and regular flushing, and incorporate dense fringing vegetation to discourage cane toads
- Dense plantings should be incorporated into landscaping around newly created waterways and wetlands (e.g. stormwater detention basins, lakes etc.) to discourage access by cane toads.

4.5 Fire Ants (*Solenopsis invicta*) and Yellow Crazy Ant (*Anoplolepis gracilipes*) Management

Fire ants are considered to be a super pest because of their aggressive and highly adaptive nature (DAF 2019). Nests can also be found next to or under objects on the ground, such as timber, logs, rocks, pavers or bricks, and disturbed ground around pots and buildings (Business Queensland 2019). Fire ant species can cause immense damage to the environment and industries that rely on it. They can also be dangerous to human health due to painful stings and possible allergic reactions.

Yellow crazy ants have been detected in residential, industrial, commercial, agricultural and forest environments in coastal areas of QLD and in some suburbs in SEQ. The species will typically nest in areas with access to water or some moisture e.g. along creek banks, in utility service pits or piles of timber, under logs, debris or leaf litter, and around perimeters of buildings and within retaining walls where moisture is retained (DAF 2020).

The following measures are recommended to minimise the risk of introduction, and to manage any unavoidable infestation:

- Personnel are to receive training prior to commencement of works in general fire/yellow crazy ant identification and biosecurity requirements.
- All materials imported to the site that may contain fire ants, including soil, turf, mulch etc, must be obtained in compliance with the fire ant biosecurity measures contained within the Biosecurity Regulation 2016.
- Development activity should avoid (where practical) the build-up of construction / landscaping materials (e.g. timber, logs, stones) to minimise opportunities for nesting.
- Development activities must not create areas where water may pool and stagnate, thereby increasing the suitability of nesting habitat for yellow crazy ants.
- Biosecurity QLD should be notified within 24 hours of any potential fire ant or yellow crazy ant presence.

4.6 Mosquitofish Management

Mosquitofish occupy shallow, slow-moving waterbodies and are predators and/or competitors of small native fish and tadpoles. The following measures are recommended to discourage their presence on the subject site.

- Development activities must not create areas where water may pool and stagnate, thereby creating habitat for mosquito fish.
- Any construction or reprofiling of drainage lines should encourage flow and regular flushing and incorporate dense fringing vegetation to discourage mosquitofish.

4.7 Mosquito and Biting Midge Management

The North Harbour and broader locality support habitat resources for a mosquito and biting midge species that have the potential to impact on existing and future residents and users of the locality. The freshwater and saline wetlands and waterbodies within the locality presently provide a range of different habitat types for mosquito species known to be pests and vectors of communicable human viruses within the Moreton Bay Region. These habitats include the following:

- Slightly brackish and freshwater pools in Paperbark wetlands and mangroves provide habitat for *Verrallina funerea* and *Ochlerotatus vigilax*, which are known vectors of Ross River Virus and Barmah Forest fever. Both species are most frequently experienced at pest levels in areas situated within 5 km of breeding grounds.
- Freshwater pools provide habitat for *Culex annulirostris*, *Ochlerotatus notoscriptus*, *Coquillettidia linealis* and *Culex quinquefasciatus*, which are known vectors of viruses such as Ross River Virus, Barmah Forest Virus, Australian Encephalitis, Japanese Encephalitis, Murray Valley Encephalitis and Kunjin.
- Intertidal and brackish pools provide habitat for *Culex sitiens* and *Aedes alterans*, both known to be vectors of Ross River Virus.

Biting midges breed in environments, ranging from rainforests to coastal foreshores and estuarine systems. Biting midges are not known to transmit disease amongst humans and as such do not possess the same public health management risk as mosquitoes. Nevertheless, biting midge may during periods of high abundance cause discomfort to people in close proximity to midge breeding/larval habitats. It is likely that the NEBP site provides habitat for the several pestiferous species of biting midges, namely *Culicoides subimmaculatus*, *C. molestus* and *C. longior*. In addition to these species, *C. ornatus*, which appears to be undergoing a range expansion south of the Hervey Bay region, is also likely to be encountered. The main areas of potential breeding habitat for these species are the tidally influenced flats and banks of the Caboolture River and Raff Creek.

Control methods for mosquitos/midges during the earthworks phase includes the following:

- Pools of standing water, which may provide breeding habitat for some species of biting insect, will not be allowed to form.

- In the event that an increase in biting insects is noted through complaints from adjacent properties, the contractor and proponent will work with relevant MBRC officers to determine the source of the problem and undertake rectification as per current MBRC procedures.

5 MONITORING AND REPORTING

5.1 Introduction

To achieve the objectives of the PISP it will be necessary to monitor populations of weeds and pest species. This section outlines monitoring requirements during construction.

5.2 Weed Monitoring

5.2.1 Introduction

Monitoring is crucial in ensuring the continuing success of the weed control methods. Monitoring of the following areas for appearance of new weeds will be undertaken during earthworks:

- Vehicle washdown areas and adjacent overflows;
- Active construction areas;
- Stockpile/laydown areas;
- Areas of retained vegetation; and
- Other vulnerable areas as identified by the Environmental Manager or ecologist.

5.2.2 Active Construction Zones

The Contractor, specifically their appointed Environmental Manager, is responsible for undertaking monthly inspections of vehicle washdown areas and overflows, stockpile/laydown areas, and the general active construction zone to ensure appropriate weed hygiene measures as outlined in this plan are properly implemented. Spot checks of vehicles, machinery, equipment and materials are also to be undertaken.

5.2.3 Retained Vegetation

5.2.3.1 Introduction

Areas of retained vegetation immediately adjacent to the construction area must be regularly monitored for weeds by the ecologist, to ensure the efficacy of the control methods in this PISP and to detect and manage infestations in a timely manner.

5.2.3.2 Baseline Monitoring

Baseline data will be gathered by the ecologist prior to commencement of works to assist in documenting any changes in weed diversity and numbers due to earthworks activities.

Monitoring locations will be selected based on potential for disturbance and to cover a variety of habitat types. Plot-based surveys (20m x 20m) will be undertaken at each monitoring location and will include an estimate of the percentage (%) cover in the plot of individual weed species and a count of the number of each species. A baseline monitoring proforma is contained in **ATTACHMENT 3**. Indicative monitoring locations are shown in

FIGURE 4. Visual inspection of all other retained vegetation areas will also be completed whilst moving between monitoring sites, and any weed infestations noted for control.

5.2.3.3 Monitoring During Construction

Monitoring will continue as described for the baseline monitoring. Monitoring will be completed six (6) monthly during bulk earthworks and will continue for a period of six (6) months following completion of bulk earthworks. Depending on the findings during the baseline monitoring (**SECTION 5.2.3.2**) the frequency monitoring during construction may be increased.

5.3 Pest Monitoring

Management of pests on the site will focus on prevention of infestations. Monitoring will therefore focus on ensuring that protocols are adhered to and implemented effectively. The Environmental Manager is responsible for weekly monitoring of the following:

- All soils, mulches, turf, plants and other materials brought on to the site are in compliance with the necessary measures under the Biosecurity Regulation 2016 in terms of Fire ant and Yellow crazy ant control;
- No pools of standing water are allowed to form on the site, that may provide breeding opportunities for Cane toads or biting insects.

Compliance with 'No Dog' policies is to be monitored during bulk earthworks.

5.4 Reporting

The Environmental Manager is to prepare a report on a monthly basis outlining the following, as they pertain to their monitoring duties as per **SECTIONS 5.2.2** and **5.3**:

- Monitoring actions undertaken;
- Problems identified; and
- Actions taken to address identified problems.

Additionally, the ecologist will provide a monthly report outlining the results of weed monitoring in retained vegetation, any identified problems and recommended actions as per **SECTION 5.2.3**.

Reports are to be provided to MBRC, Queensland State Government Departments or the Commonwealth Department of Agriculture, Water and the Environment on request.

REFERENCES

Business Queensland (2019) Identifying fire ants. Business Queensland, Queensland Government. Available at: <https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/pests/fire-ants/fire-ants-qld/identifying>.

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DAF (2019) Vehicle and machinery cleandown procedures. Department of Agriculture and Fisheries (DAF), Queensland Government. Available at: https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/58178/cleandown-procedures.pdf

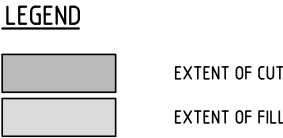
DAF (2020) Yellow crazy ants *Anoplolepis gracilipes*. Department of Agriculture and Fisheries (DAF), Queensland Government. Available at: https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/76637/yellow-crazy-ant.pdf.

Kearney, M, Phillips, BL, Tracy, CR, Christian, KA, Betts, G & Porter, WP (2008) 'Modelling species distributions without using species distributions: the cane toad in Australia under current and future climates.' *Ecography*, vol. 31, pp. 423-434.

ATTACHMENT 1 - ENGINEERING DRAWINGS (KN GROUP 2025)



OPEN SPACE BULK EARTHWORKS PLAN



DESIGN IS IN ACCORDANCE WITH SLR FLOOD MANAGEMENT PLAN
(INCLUDING SPORTS FIELDS AND ADDITIONAL FILL AREAS)
REF: 620.30047.00200-R01 VERSION 7 DATED MARCH 2025

SCALE 
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Client



North Harbour
BUSINESS PARK
BY PORT BINNLI
OPEN SPACE
BULK EARTHWORKS PLAN



Approved Director - RPEQ 17544			
Drawing Title			
EARTHWORKS PLAN AND DRAWING INDEX			
Drawn AA	Designed JB	Checked MAS	Date APR' 25
Scale AS SHOWN			Sheet 01 of 03
A1	Drawing No 25-109-01		Revision A

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ATTACHMENT 2 - WEED CONTROL METHODOLOGY

Primary Weeding

Weed eradication will be undertaken on a progressive basis through localised treatment of grass species via mechanical removal (hoe/rake, hand pulling and/or slashing) or with Roundup Biactive®. Woody weed species will be hand pulled or controlled using weed control techniques listed below. Weed removal techniques have been provided for all weed species observed on the subject site as well as noxious and environmental weeds that may occur on the subject site over time.

All chemical users will follow directions as per chemical material data sheets for use and installation. Utmost care must be taken when utilizing chemicals to ensure that no drift occurs outside of the treatment area. Spraying should not occur on windy days or within 24 hours of predicted rainfall.

Primary weeding should commence at the start of the active growing period (approximately November), or on an as needed basis.

Preparation before spraying, in the form of manual clearing of weeds from around native plants, must be carried out. Small native plants less than 20 cm in height are to be marked with a stake to indicate retention.

Weed material that does not contain any fertile parts will be mulched and spread on the ground and any weeds that may have fertile parts present will be disposed of at an approved waste disposal facility such as Council landfills or transfer stations.

Secondary Weeding

Secondary weeding involves the eradication of weeds that have been overlooked or re-shoot after primary treatment. Secondary weeding will occur three (3) to four (4) months after primary weeding and no later than six (6) months.

Weed Species and Treatment Methods

Common Name	Scientific Name	Control Method
Balloon cotton bush Crofton weed Blue billygoat weed Annual ragweed Paspalum Kikuyu Paramatta grass Whiskey grass	<i>Gomphocarpus physocarpus</i> <i>Ageratina adenophora</i> <i>Ageratum houstonianum</i> <i>Ambrosia artemisiifolia</i> <i>Paspalum</i> spp. <i>Pennisetum clandestinum</i> <i>Sporobolus africanus</i> <i>Andropogon virginicus</i>	Hand Weeding for all specimens under 10 cm. Blanket and Spot spraying with 1 part Roundup Biactive: 100 parts water for larger specimens or areas
Groundsel bush Bitou bush	<i>Baccharis halimifolia</i> <i>Chrysanthemoides monilifera</i>	Hand Weeding for all specimens where the soil is moist. Dispose of removed plants.

Common Name	Scientific Name	Control Method
		Cut stump and apply with 1 part Roundup Biactive: 100 parts water
Singapore daisy Coastal morning glory	<i>Wedelia trilobata</i> <i>Ipomoea cairica</i>	Hand Weeding for all specimens using a knife to loosen soil and leather gloves making sure all plant parts and rhizomes are removed. Dispose of removed plants. Blanket and Spot spraying with 1 part Roundup Biactive: 100 parts water
Winter senna	<i>Senna pendula</i>	Hand Weeding for small specimens, using a knife to loosen soil and leather gloves making sure all plant parts are removed. Larger specimens may need to be removed with a mattock. Dispose of removed plants. Cut Stump for large specimens using 1 part Roundup Biactive: 1.5 parts water.
Slash pine Camphor laurel Lantana Wild tobacco Cadaghi Umbrella tree Castor oil plant Broad-leaved pepper tree	<i>Pinus elliottii</i> <i>Cinnamomum camphora</i> <i>Lantana camara</i> <i>Solanum mauritianum</i> <i>Corymbia torrelliana</i> <i>Schefflera actinophylla</i> <i>Ricinus communis</i> <i>Schinus terebinthifolius</i>	Hand Weeding for all small specimens under 20 cm. Cut Stump for all specimens over 20 cm tall using 1 part Roundup Biactive ©: 1.5 parts water. Stem injection for up to 60cm diameter using 2ml Roundup Biactive undiluted
<i>Example of Registered Glyphosate Herbicides:</i> ▪ Defender Home and Garden TM ▪ Roundup Biactive TM / Roundup TM ▪ Zero TM <i>Example of Registered Metasulfuron Herbicide:</i> ▪ Brush - OffTM		

The following are control techniques that are to be utilised on site:

- **Cut Stump Method** - This method involves cutting plant stems as close to ground level as possible and immediately painting the cut stump with herbicide. This treatment can also be applied as a basal bark application to the first 15-20 cm (entire circumference) of an uncut stem if the adult bark has not yet developed. Chemical use with this application is dependent on the proximity of the weed to naturally ponding water or waterways and whether the chemical is registered for aquatic use.
- **Basal Bark Method** - This method involves applying an herbicide to the lower 35-45 cm bark around the entire stem using a hand-pump backpack sprayer fitted with a shut-off at the wand tip and an adjustable cone nozzle or a small, ATV (All-Terrain

Vehicle)-mounted sprayer with a shut-off at the wand tip and an adjustable cone nozzle.

- **Ring Barking** - This method involves removing the lower bark from the stem using a sharp implement to expose the phloem and xylem tissue to the outer environment thereby destroying it.
- **Spray Method** - There are two (2) types of spraying methods that will be employed where appropriate:
 - Selective blanket spraying: The area must initially be checked for the presence of any native species. Any weeds within 2 m of the drip zone of existing native species will be removed by hand. Alternatively, native species will be covered with impermeable material (e.g. a tarpaulin) for protection during spraying;
 - Spot spraying: The spray nozzle will be kept close to ground to avoid any overspray. Individual weeds will be spot-sprayed at the site. This method of spraying will be employed as native species are interspersed throughout the exotic grasses; and
 - Herbicides specific to each target species, where appropriate, will be identified prior to the implementation of any works. Herbicides will be applied in accordance with the manufacturer's specifications and when environmental conditions are most preferred (e.g. wind and rainfall).
- **Stem Injection** - Herbicides may be applied directly to the plant via stem injection. This involves applying an herbicide to the plant directly through drilling a hole into the stem and inserting the chemical. Axe cuts for stem injection can also be used. Cuts can be made at regular intervals around the stem and should leave a "pocket" into which the chemical must be immediately injected. Axe cuts should penetrate the cambium layer, but not the hardwood.
- **Wick Wiping** - This method employs vehicle-mounted (broad acre application) or hand-held equipment (small area/single plant application) to wipe or brush concentrated herbicide onto weeds. The herbicide is applied from permeable rope that is permanently connected to a reservoir containing Glyphosate. For purposes of weed control where accessibility to the infestation is low, a handheld 'wick wipe' will be used. This will also be incorporated for the control of emergent species. This method is particularly safe to use in areas where weed species are interspersed with native plants as there is no spray drift of herbicide.
- **Cutting and Chipping** - Manual weeding may involve cutting and chipping, pulling, digging or slashing and is preferred, depending on the growth stage and situation as detailed:
 - Where native plants are growing within a weed infestation and the use of selective herbicide is not possible;

- Where inadequate foliage is present to allow for successful uptake of herbicide e.g. Mile-a-minute runners typically exhibit this trait; and
- When hand weeding, the stem must be grasped firmly at the base of the plant and pulled. A trowel, mattock or sharp knife may be needed to loosen the soil. Care must be taken not to leave behind stems or other plant pieces that may re-shoot. Hand weeding should also be undertaken at times when weeds are not seeding to reduce dispersal and spread. Hand pulling is not recommended for some weed species as they readily sucker if their roots are disturbed e.g. *Lantana camara*. This method will be employed when removing exotic grass species within retained vegetation.

ATTACHMENT 3 - BASELINE DATA PROFORMA

Work Area Number:	Date:
Climatic Condition:	
Vegetation type: ☐ Rainforest ☐ Sclerophyll Forest ☐ Wetland ☐ Woodland ☐ Heath ☐ Riparian Veg	
Native Regeneration Scoring at Time of Assessment: ☐ Negligible ☐ Poor ☐ Moderate ☐ Good ☐ Exceptional	

NATIVE PLANT SPECIES LIST			
<i>Details of native plant species present and their abundance within the work area</i>			
Stratum	Native Plants		Abundance
	Common Name	Scientific Name	
Lower			

Pest and Invasive Species Plan
North Harbour - Regional Park Additional Fill Areas

Mid			
Upper			

THREATENED PLANT SPECIES/ENDANGERED ECOLOGICAL COMMUNITIES LIST		
<i>List of threatened plant species/Endangered Ecological Communities found at the work area</i>		
Species and Conservation Status	Number of Plants	Management Implications
Endangered Ecological Community	Management Implications	

HABITAT FEATURES			
Fauna observed: <i>e.g. Turkey mound present on site.</i>			
Fauna habitat features present on site: ☐ Hollows in trees ☐ Mature or over-mature trees ☐ Dead standing trees ☐ Rocks and boulders ☐ Fallen logs ☐ Caves, mineshafts or overhangs ☐ Springs ☐ Lagoons ☐ Pools ☐ Watercourses / gullies ☐ Riparian areas ☐ Wet or damp areas (including soaks / springs) ☐ Leaf litter ☐ Native grasses, rushes and sedges ☐ Fleshy fruited trees and shrubs ☐ Nectar bearing trees and shrubs ☐ Dense understorey shrubs ☐ Prickly understorey shrubs ☐ Seasonal cracks in the soil ☐ Other (please specify):			
Comments:			
ENVIRONMENTAL WEED SPECIES LIST			
<i>Details of weed species present and their abundance within the work area</i>			
Stratum	Major Environmental Weeds		Percentage Cover %
	Common Name	Scientific Name	
Lower			

Pest and Invasive Species Plan
North Harbour - Regional Park Additional Fill Areas

Mid			
Upper			

OTHER THREATS OR IMPACTS			
Feral Animal Presence:	Area of Most Disturbance	Impact	Management Implications
EXAMPLE: Cane Toad	Open disturbed area	On native fauna	Monitor presence
Possible Negative Impacts	Impact	Management Implications	
EXAMPLE: Stock intrusion	On regenerating native plants	Stock intrusion is unlikely, however if evidence of significant negative impact of regenerating native vegetation is detected, then fencing of stock may be required.	
EXAMPLE: Herbicide drift	On threatened XXXX plant and on native plants	Use of herbicides to control weeds around the threatened plants will have to be done with utmost care and only by experienced bush regenerators. In any case weed control using herbicides must comply with current Best Management Practice	
ENVIRONMENTAL RESTORATION ISSUES			
Weaknesses			
EXAMPLES: Exposed, no canopy, high light. Copious weed regeneration following disturbance. Sloping site difficult to work in. XXX threatened species present in abundance.			

Strengths	
<i>EXAMPLES: Good seed source for native recruitment. Some native regeneration occurring.</i>	
Restoration Objectives for Work Area	
<i>EXAMPLE: To undertake all enhancement plantings and the first stage weed control program by the release of the subdivision certificate, and to achieve an 80% native species canopy cover in all areas by November 2009.</i>	

APPENDIX 3 - EROSION AND SEDIMENT CONTROL PLAN (HALL CIVIL 2025)



Erosion & Sediment Control Plan

North Harbour Open Space Earthworks – Early Works

Hall Civil
149 Sippy Downs Drive, Buderim, QLD 4556
ABN 70 684 290 980

Revision No	Date	Prepared by	Reviewed By	Approval
1	3/04/2025	Morgan Hamilton	Greg Busse/Matt McDermott	Matt McDermott CPESC # 8153

CPESC	Matt McDermott	0432 797 430
Project Manager	Greg Busse	0457 777 313



1. SCOPE

This Erosion and Sediment Control Plan (ESCP) has been developed for the North Harbour Open Space Earthworks (Early works) in Morayfield, QLD for Hall Civil.

1.1 Guidelines

This ESCP has been prepared in accordance with the following document(s):

- Best Practice Erosion and Sediment Control (IECA, 2008)

1.2 Certification

This ESCP will be reviewed and certified by a CPESC prior to commencement of works. This review and certification will ensure the plan has been prepared to satisfy the intent and minimum standards nominated within the IECA (2008) Best Practice Erosion and Sediment Control Guideline.

2. PROJECT DESCRIPTION

2.1 Location & Land use

The subject site is part of the North Harbour greenfield development east of the Bruce Highway in Morayfield, Queensland (**Figure 1**).

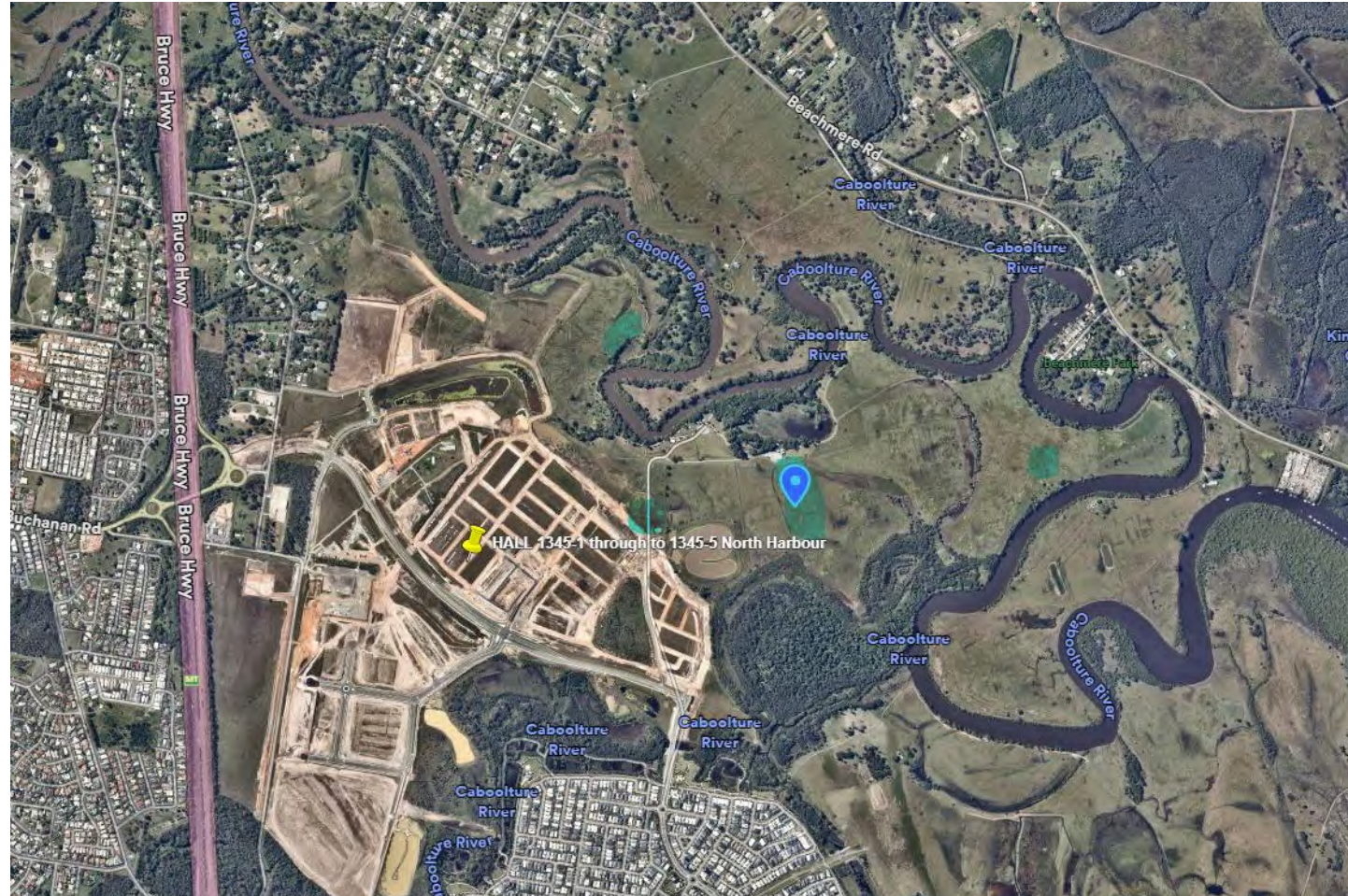


Figure 1: Locality Plan

2.1.1 Scope of Works

The scope of works is as follows:

- Bulk Earthworks
- Temporary stabilisation

The general arrangement of Erosion and Sediment Controls are illustrated in **figure 2**.

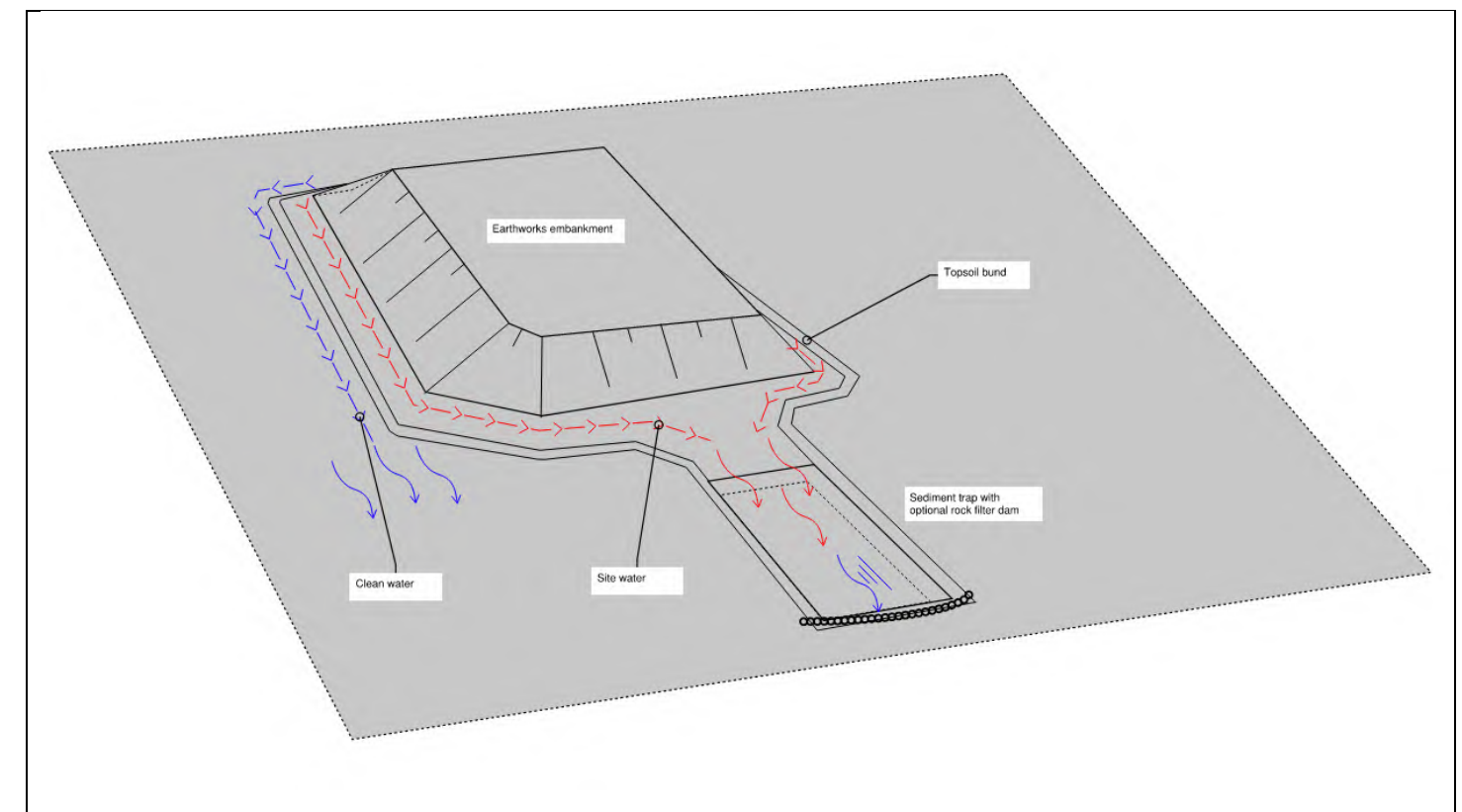


Figure 2: Typical Erosion and sediment control arrangement

3. SITE DESCRIPTION

3.1 Climate & Rainfall risk

Historic rainfall data for Morayfield Weather Station (Station No 04979), the closest long-term gauging station to the site, is illustrated in **Figure 3**. Relatively wetter conditions typically occur from December to March and drier conditions tend to persist from April to November.

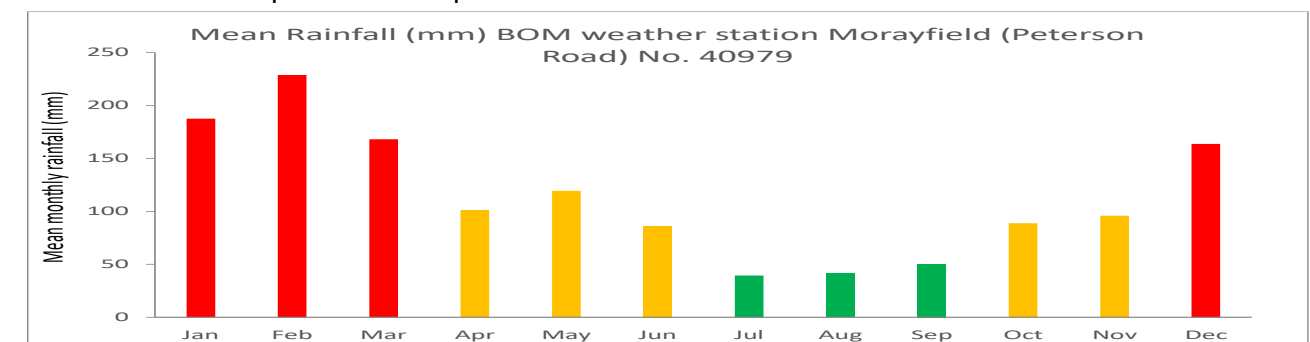


Figure 3: Mean Rainfall data, Morayfield Weather Station #40979 (2006-2025) Latitude 27.12° S Longitude: 152.94° E. Source: BOM



EROSION & SEDIMENT CONTROL PLAN

North Harbour Open Space Earthworks - Early Works

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Table 1: Erosion Risk Rating Categories (rainfall depth) as per Table 4.4.2, IECA, 2008

Erosion Risk Rating	Average Monthly rainfall depth (mm)
Very Low	0 to 30
Low	30+ to 45
Moderate	45+ to 100
High	100+ to 225
Extreme	>225

3.2 Topography and drainage

Based on a site inspection and contours presented on the project Drawings:

Topography is gently undulating and will generally drain towards the Caboolture to the east/southeast.

3.3 Soils

Based on a site inspection, the predominant soil composition is comprised of light clay.

4. RISK ASSESSMENT

4.1 IECA Soil loss assessment

Based on the requirements of IECA (2008), an erosion risk assessment has been conducted using the Revised Universal Soil Loss Equation (RUSLE). The calculated soil loss is then used to determine the level of sediment control required.

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

Equation 1 (IECA 2008)

Where:

A is the predicted soil loss (t/Ha/yr)

K is the soil erodibility factor

R is the rainfall erosivity factor

LS is the slope length/gradient factor

P is the erosion control practice factor

C is the ground cover and management factor

4.1.1 K - Factor - Soils

Typical soils to be encountered on site have been described as *light clay*. As such an assumption has been made for the K factor resulting in an adopted K factor of 0.025 based on Table E4 from IECA 2008. Resulting in an adopted **K factor of 0.025**.

4.1.2 R - Factor - Rainfall

An annual erosivity factor of **3481** has been adopted based on a 2-year, 6-hour rainfall intensity of 12.7mm/hr and the following equation from section E3.2 of IECA (2008).

$$R = 164.74 (1.1177)^S 50.6444$$

4.1.3 LS – Slope Length

As described in Section 3.2, the topography of the site comprises of gentle slopes. Based on existing/design surface levels, a worst-cast LS factors have been adopted based on the following:

- **Fill Areas 1, 2, 3 and 4** - Grades up to 2%, slope length 80m – adopted LS factor – 0.41

4.1.4 Cover (C) and Practice (P) Factors

A C-factor of 1 has been adopted in accordance with industry practice to reflect the worst-case level of cover offered during the proposed development activities.

The P factor represents the combined effect of management practices and structural methods to control erosion. An industry default P factor value of 1.3 has been applied to the risk assessment, which is recommended for the construction phase condition (per table E11 of IECA, 2008).

4.1.5 Estimated Soil Loss

Results of the erosion risk assessment are presented in **Table 4**. Sediment control type derived from IECA (2008) Table 4.5.1

Table 2: Estimated soil loss from each site catchment

Site	Disturbed Area (ha)	R	K	LS	P	C	(t/ha/yr)	(t/yr)	Adopted control	Comment
Fill Area 1	1.78	4350	0.025	0.41	1.3	1	58.0	103	Type 2	Construct sized sediment trap
Fill Area 2	1.26	4350	0.025	0.41	1.3	1	58.0	73	Type 2	Direct site water to wetland 4
Fill Area 3	0.66	4350	0.025	0.41	1.3	1	58.0	38	Type 2	Construct sized sediment trap
Fill Area 4	3.54	4350	0.025	0.41	1.3	1	58.0	205	Type 2	Construct sized sediment trap

Due to a maximum estimated soil loss of a maximum of 58 t/ha/yr based on worst case soil loss, the Erosion risk is nominated as **Very Low** in accordance with Table 4.4.3 of IECA (**Table 3**).

Table 3: Erosion risk rating based on estimated soil loss rate (as per Table 4.4.3 IECA 2008)

Erosion Risk Rating*	Soil loss (t/ha/yr)
Very Low ✓	0 to 150
Low	150+ to 225
Moderate	225+ to 500
High	500+ to 1500
Extreme	>1500

Erosion and sediment control will be installed for the project in accordance with the risk profile and specific constraints of the site (**Table 4**).



EROSION & SEDIMENT CONTROL PLAN

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Table 4: Erosion Control Standards

Erosion Risk as per Table 4.4.7 of IECA	Limit of forward Clearing	Stabilisation – Temporary	Stabilisation – Permanent
All	All reasonable and practicable steps taken to apply best practice erosion control measures to completed earth works, or otherwise stabilise such works, prior to anticipated rainfall-including existing unstable, undisturbed, soil surfaces under the management or control of the building/construction works.		
Low	Clearing and stripping is limited to 8 weeks prior to the scheduled commencement of bulk earthworks	Unfinished earthworks are suitably stabilised if disturbance is expected to be suspended for a period exceeding 30 days	Disturbed soil surfaces are stabilised with a minimum 70% cover within 30 days of the completion of works within any area of a work site.
Moderate	Clearing and stripping is limited to 6 weeks prior to the scheduled commencement of bulk earthworks	Unfinished earthworks are suitably stabilised if disturbance is expected to be suspended for a period exceeding 20 days.	Disturbed soil surfaces are stabilised with a minimum 70% cover within 20 days of the completion of works within any area of a work site.
High	Clearing and stripping is limited to 4 weeks prior to the scheduled commencement of bulk earthworks	Soil Stockpile & unfinished earthworks are suitably stabilised if rainfall is reasonably possible, and disturbance is expected to be suspended for a period exceeding 10 days.	Disturbed soil surfaces are stabilised with a minimum 75% cover within 10 days of the completion of works within any area of a work site

5. GENERAL NOTES

- This Erosion and Sediment Control Plan (ESCP) has been prepared to provide a site specific ESCP to demonstrate the management of erosion and sediment control in accordance with the Best Practice Erosion and Sediment Control Guidelines (IECA, 2008).
- This ESCP shall be supplemented by Progressive Erosion and Sediment Control Plans (PESCP). PESCPs are to be developed to identify the specific location and, where required, additional erosion and sediment controls applicable to individual work stages. PESCPs shall be documented via mark ups to approved plans. Where a change in the level of sediment control standard is proposed in a PESCP, the PESCP shall be reviewed and approved by an appropriately qualified person prior to the change being implemented.
- Minimise the extent and duration of disturbance, maintaining existing ground cover to the greatest extent possible.
- Commissioning / decommissioning of plant and refuelling to be undertaken a minimum of 30m away from any watercourse/drainage line.
- All ERSED controls to be inspected regularly (weekly, pre/post rainfall event i.e. forecast or actual rainfall of >10mm) with maintenance/repairs to be undertaken when necessary
- Revegetation of disturbed/bare areas to be progressively implemented
- Where clean water drains and sediment traps/sumps are necessary, all clean water drains and sediment traps and associated drainage must be installed and commissioned prior to the commencement of any grubbing works within the catchment area
- All controls must be installed within approved project footprint.
- Ensure all site access is stabilised with rumble grid and clean rock.

6. DEWATERING AND WATER QUALITY

- Basins/sumps to be dewatered prior to rain event that is likely to produce runoff; however, during dry conditions water may be retained in the settling pond as a source of construction water (i.e. dust suppression).
- If possible, it is recommended that dewatering/spread of collected runoff from basins be applied to well vegetated lands at least 40m away from any waterway to allow it to infiltrate within the site boundary, if this is done, ensure water is applied slowly and in a manner that avoids concentrated surface runoff and/or erosion.
- If actively discharging (pumping or siphoning) the water out of the basin, water must be treated to achieve, pH 6.5-8.5, oil and grease no visible trace and a standard 90%ile total suspended solids concentration not exceeding 50mg/L or 50%ile NTU reading (as per IECA Best Practice Erosion and Sediment Control Guidelines Appendix B) and no more than a 10% increase in background conditions.
- Where captured basin water is to be used onsite for dust suppression or construction purposed, water does not require testing or treatment.

7. DESILTING

- Install an appropriate painted desilting marker in the basin to indicate top of sediment storage zone. Basin must be desilted if the next storm event is likely to cause sediment to rise above this marker point; or if sediment is already above the marker; or if the sediment has exceeded 90% of the nominated sediment storage volume.
- Removal of all sediment/materials collected from the basin to be disposed of in a suitable manner that will not cause an erosion or pollution/environmental hazard.
- Refer to ESCP for recommended volume and dimensions for proposed sediment basin. Note that all dimensions are approximate and subject to verification with review of detailed ground survey and alignment.
- All earthen embankments (for basins or otherwise) greater than 1m in height to be certified by a qualified geotechnical specialist to ensure structural integrity for the desired design criteria and anticipated period of operation
- Upon decommissioning of sediment basins, all water contained within must be removed and disposed of appropriately before the removal of any basin embankments

8. OVERVIEW OF KEY ESC TECHNIQUES

Drainage Controls – Catch Drains (CD) and Diversion Banks (DB)

This ESCP identifies the location of topsoil diversion banks required to collect dirty runoff water from disturbed areas and stockpiles and direct it to a sediment trap and to control water flow through the worksite to avoid damage to unfinished areas of earthworks and infrastructure.



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Sediment Controls

The following key sediment controls are specified in this plan and have been applied to individual catchments based on the results of the RUSLE soil loss predictions (Section 3.5).

Sediment basin (Type 1) – Due to the low soil loss from all catchments, no Type 1 sediment basins are triggered for the works. However, Fill Area 2 will be directed to the existing adjacent wetland (Wetland 4) that is expected to function as a Type 1 sediment control.

Sediment trap (Type 2) – Type 2 sediment traps have been sized based on the total catchment areas from Fill Areas 1, 3 and 4. Additionally these catchments would then flow into grassed buffer areas and existing drainage depressions within the future North Harbour development footprint prior to reaching to the Caboolture River.

Mulch bund/ Sediment fence (Type/3) –Type 3/perimeter controls may be constructed from sediment fence or mulch bunds (where required).

Rock Check (Type 3) – Implemented in site drains to create flow breaks every 80 metres where the grade is 3%

Site Exit / Entry - To prevent sediment tracking onto public roads, stabilised rock pad entry locations have been identified. Associated drainage and sediment controls have been identified to contain and treat runoff in accordance with the adopted sediment control standard for individual catchments. Adjacent roads should be inspected regularly, and any sediment deposited on public roads should be removed in a safe manner and disposed of to an approved disposal facility

9. STOCKPILE MANAGEMENT

Place stripped soil at approved stockpile locations

Stockpile topsoil at a height no greater than 2m.

Stockpile any excess subsoil or spoil separately from topsoils and at designated stockpile locations upslope of sediment traps.

Install non-woven sediment fence (bidim A34 or equiv) around stockpiles as per SD-FF-1

Where topsoil stockpiles will remain undisturbed for greater than nominated erosion standard, apply seeding of a cover crop at the rate of 10kg/ha to topsoil stockpiles. Refer to revegetation specifications for seed mix.

Where subsoil / spoil stockpiles will remain undisturbed for greater than nominated erosion standard, apply temporary cover or soil binder.

Temporary Stabilisation Erosion Standard

Month	Temporary Stabilisation Erosion Standard
Jan - Mar & Dec	10 days
Apr – Jun, Oct – Nov	20 days
July – Sept	30 days

10. INSPECTIONS & MONITORING

All erosion and sediment control measures, including drainage measures, must be always maintained and in proper working order during their operational life.

All drainage, erosion and sediment controls shall be inspected daily when rain is occurring (if site access is available) weekly, prior to and following a rainfall event of sufficient intensity and duration to cause on-site runoff immediately prior to and following periods of site shutdown.

Inspections will include checks of all drainage, erosion and sediment control measures including site discharge points for:

- evidence of excessive sediment transport and or deposition either on or off site
- evidence of excessive erosion either on site or immediately downstream
- treatment and de-watering requirements for sediment basins / sediment traps
- the progress and stability of site rehabilitation and revegetation works.

Where inspections identify a non-conforming control measure, or issues that are likely to prevent the achievement of the erosion and sediment control objectives, corrective or preventative actions will be developed and implemented as necessary to achieve the required erosion and sediment control performance standards.

A written record / register of monitoring observations and maintenance tasks will be kept in the project Sharepoint/SEE Group WIR portal.

11. SITE REHABILITATION

Once earthworks are completed, stabilisation will be applied in the form of topsoil and drill seed or soilbinder.



EROSION & SEDIMENT CONTROL PLAN

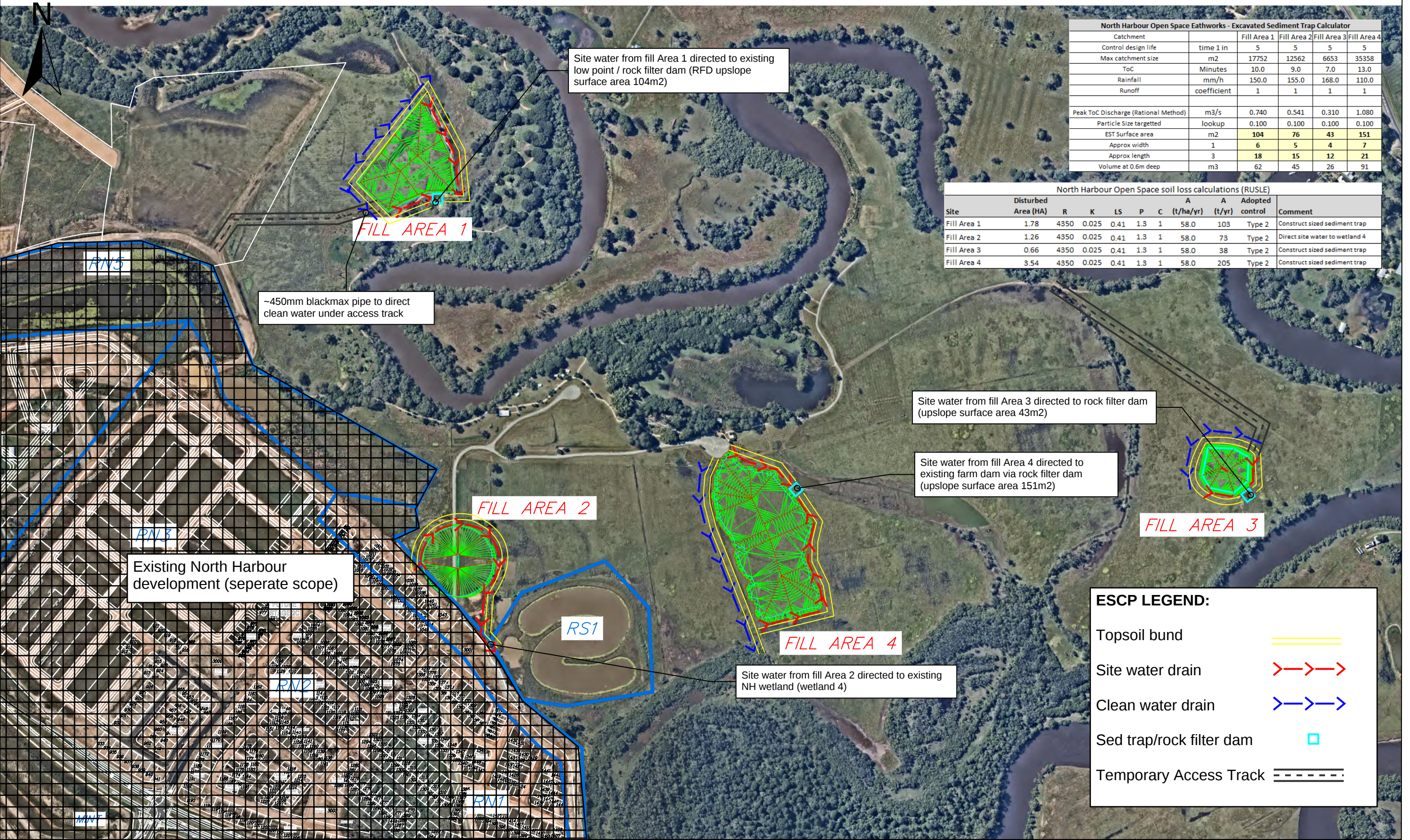
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Appendix A : Progressive Erosion and Sediment Control Drawings



Erosion and Sediment Control Plan

Project: North Harbour Open Space Earthworks

Stage: Early Works

PESCP Methodology:

1. Identify disturbance limits and construct any required access tracks.
2. Strip topsoil to form site/clean water diversion drains and construct sediment traps to the specified dimensions.
3. Construct earthworks embankments
4. Re-spread topsoil and drill seed in accordance with design.

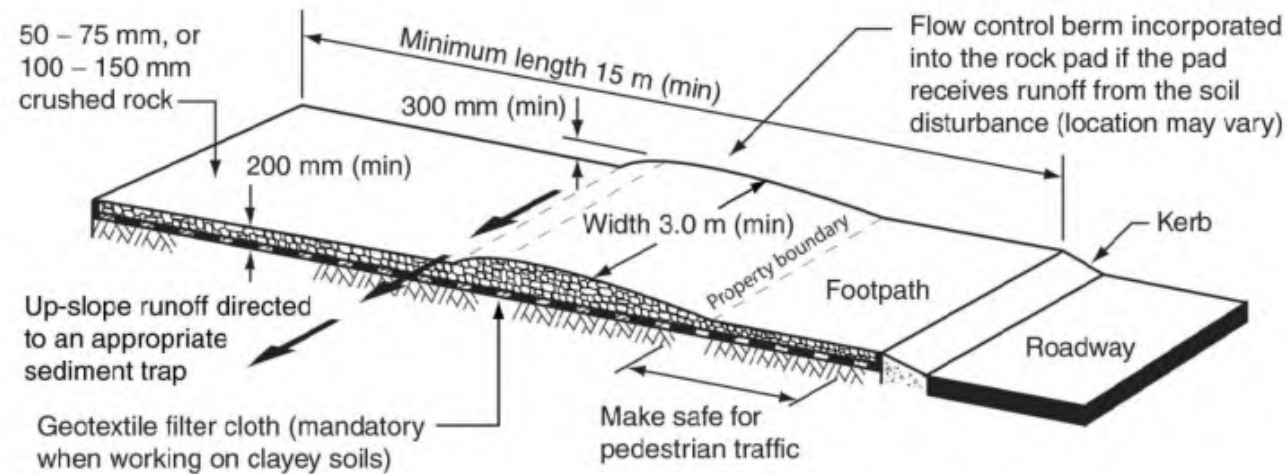


MATT MCDERMOTT
CPESC #8153

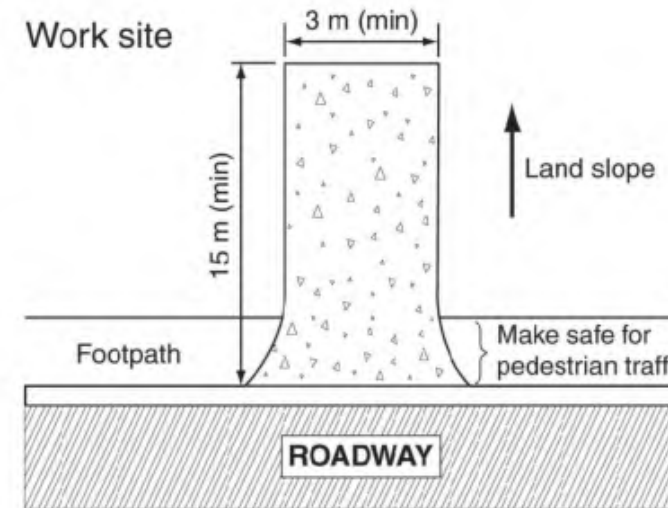


Figure 2 – Flow diversion bank formed from earth

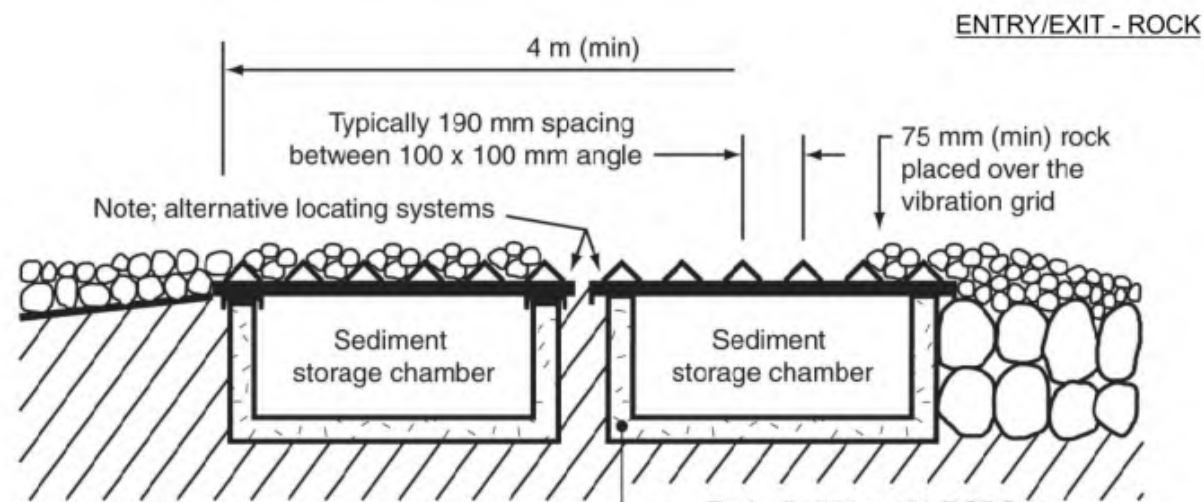
Site access Arrangement



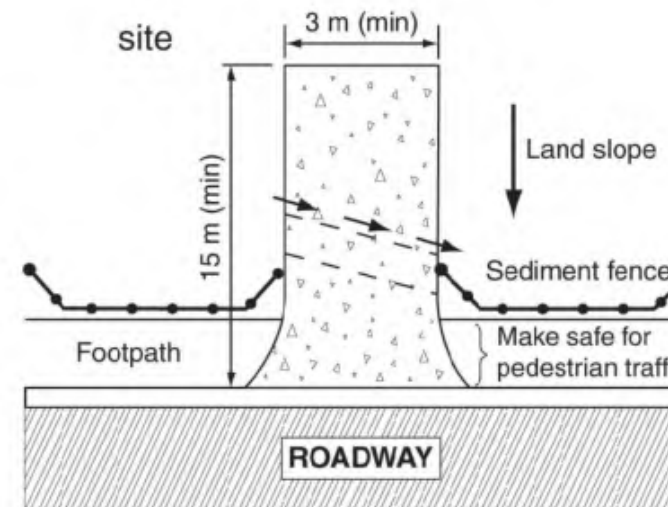
ENTRY/EXIT - ROCK



ENTRY/EXIT - ROCK
(SLOPING AWAY FROM ROAD)



ENTRY/EXIT - VIBRATION GRID



ENTRY/EXIT - ROCK
(SLOPING TOWARD ROAD)

APPENDIX 4 - ACID SULPHATE SOIL INVESTIGATION AND MANAGEMENT PLAN (TECTONIC GEOTECHNICAL 2025)

tectonic



Acid Sulfate Soil Investigation & Management Plan

Open Space Earthworks – North Harbour Business Park

14 May 2025 | Ref. 25096-001-Rev0



Document Review

Doc No.	Revision	Prepared By	Reviewed By	Date Issued
001	0	Mark Thomson	Ashley Davey	14 May 2025

Doc No.	Revision	Method of Delivery	Issued To
001	0	Electronic	Michael McErlean (michael@northharbour.com.au)

Prepared By

Mark Thomson B.Sc (Environmental) CPESC 7057
Senior Environmental Scientist

Reviewed By

Ashley Davey BEng (Geological) RPEQ 8159
Director/Principal Geotechnical Engineer



Executive Summary

This report has been prepared to assess the risk of disturbance of acid sulfate soil (ASS) associated with the placement of bulk fill for the development of open space areas at North Harbour Business Park. The proposed development includes the construction of four fill platforms (denoted Fill Areas 1 to 4), ranging from 0.6 to 3.5 hectares in area and from RL 2.5 m to 3.5 m AHD in elevation. Fill will be placed to a height of approximately 1.5 m, using material sourced from the North Harbour MIBA precinct. The resulting platforms will form level, open areas suitable for future recreational use.

Site investigations included the drilling of 12 boreholes to depths of 2 m to 3.5 m below ground level (BGL), along with 120 field pH screening tests, 29 quantitative laboratory analyses, and one groundwater test. Results indicate the subsurface profile typically consists firm, silty clay topsoil with variable organics to a depth of 0.2 m BGL, underlain by mostly firm to stiff alluvial clays, with relatively low potential for settlement under the proposed fill loads. Groundwater was encountered at depths of 0.8 m to 1.6 m BGL in some boreholes, but may rise to shallower depths, particularly in lower elevation areas near drainage pathways.

Analysis confirmed the presence of actual acid sulfate soils (AASS) with existing acidity up to 130 mol H⁺/tonne in some areas. However, oxidisable sulfur levels were consistently below relevant thresholds, classifying the material as non-potential acid sulfate soil (non-PASS). As such, significant acid generation due to soil disturbance is not anticipated. Ground disturbance will be minimal, limited to shallow stripping of topsoil for subgrade preparation, with no bulk excavation into deeper soil layers or dewatering planned.

Environmental risks for these works are considered low and can be effectively managed using conventional strategies. This includes the application of fine-grained agricultural lime (at a rate of 5 kg/m³) to any soils excavated during subgrade preparation. Verification testing will be conducted on treated soils at a rate of 1 test per 500 m³ to confirm effective neutralisation.

A lime 'guard layer' will also be applied (at a rate of 1 kg/m²) to the subgrade and at every 0.5 m lift during filling to mitigate residual or imported acidity.

Erosion and sediment controls will be implemented to manage stormwater and construction runoff. All runoff and potentially impacted water will be contained, tested, and treated prior to discharge. The contractor will be responsible for meeting the defined water quality criteria prior to any release from the site.



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1. Introduction

This report has been prepared to assess the risk of disturbing acid sulfate soil (ASS) risk associated with placement of bulk fill for construction of four open space areas, as part of ongoing development of North Harbour Business Park. The investigation was performed by Tectonic for North Harbour Holdings (NHH), generally in accordance with Proposal P25156-Rev0, dated 31 March 2025.

This report summarises the investigation findings, provides an assessment of the risk of ASS being disturbed by the proposed works, and provides recommended management strategies to mitigate potential environmental impacts associated with disturbance of acidic soil.

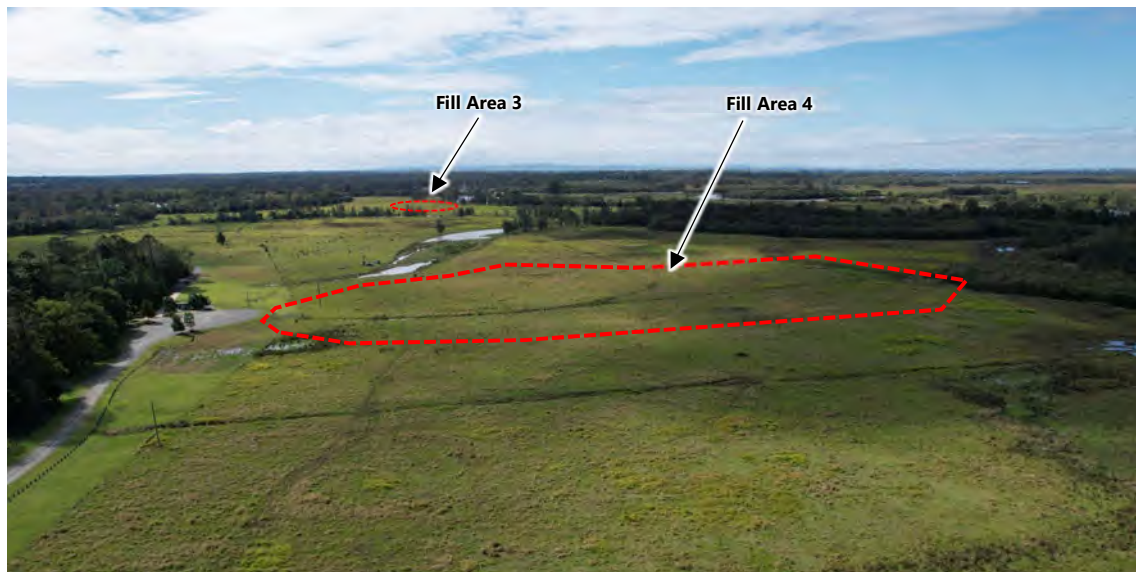
2. Site Description

The subject site comprises four individual open space areas, described as Fill Areas 1 to 4, located within existing open space to the north-east of the current North Harbour Mixed Industry and Business Area (MIBA). Each fill area generally comprises cleared and relatively flat pastoral land, with well-established grass groundcover. Existing ground surfaces across the proposed fill areas range from RL 2.5 m to about RL 3.5 m AHD.

Text Figure 1 below illustrates the site location and surrounds. Text Figure 2 over page shows the general site conditions at the time of investigation.



Text Figure 1: North Harbour Development Area & Subject Site



Text Figure 2: Looking east across Fill Areas 3 & 4

3. Proposed Development

The proposed works comprise construction of four fill platforms designated Fill Areas 1 to 4, using stripped topsoil and/or other materials unsuitable for reuse as controlled fill (non-select materials) previously won during the development of the North Harbour MIBA precinct.

Draft bulk earthworks plans prepared by KN Group (Dwg. No. 25-109 01-09, Mar 2025) show the four proposed fill areas ranging from 0.6 to 3.5 hectares in size, with fill to be placed up to about 1.5 m height. The fill zones will form relatively level, open space areas, which may be utilised for future recreational purposes.

Disturbance of natural soil across the proposed fill areas will be limited to stripping of vegetation and topsoil for subgrade preparation only. If required, such stripping would be generally limited to a depth of no more than about 0.5 m. No other excavations into the underlying soil profile are proposed.

An ASS investigation and management plan for the MIBA development was prepared in 2019 (Tectonic Report Ref. 19210-001-Rev0, dated 8 November 2019), which comprised a detailed characterisation of the site and soil profile and ASS hazard across the development area (including proposed Fill Area 1) and provided prescribed management measures for the neutralisation of disturbed acidic soil and mitigation of environmental risk throughout the MIBA development. Non-select fill materials which are to be used for filling are expected to comprise either non-ASS, or material which has been previously treated as part of the MIBA site development.



4. Information on Acid Sulfate Soil

ASS is common in low-lying coastal areas of Queensland, typically in Holocene to Pleistocene (Quaternary) age alluvial sediments, which typically exist below an elevation of RL 5.0 m AHD. Such areas are often characterised by the presence of estuaries, swamps, floodplains, salt marshes and mangroves. The affected soils contain iron sulfides, most frequently pyrite, which, when exposed to air, can oxidise to form sulfuric acid.

Soils containing iron sulphides are commonly termed *potential ASS (PASS)*. Existing acidity attributed to the past oxidation of ASS may also be present as a result of the previous exposure of PASS material to aerobic conditions. This is commonly termed *actual ASS (AASS)*. Also included in the definition of AASS are soils that contain sparingly soluble salts such as jarosite, that can form during the oxidation of sulfides and are capable of generating further acidity as they later dissolve or hydrolyse under acidic conditions. Potential acidity bound up in these salts is referred to as '*retained acidity*'.

Sulfuric acidity created by disturbance of ASS presents an environmental risk due to its potential to rapidly alter the pH of soil and water within an environment and increase the mobility of metals which may be naturally present in the soil (i.e. iron and aluminium), thereby producing a leachate contaminated by both high levels of acidity and metals. Associated chemical reactions in highly affected waters can also strip the leachate and the receiving environment of dissolved oxygen. Such leachate, if released into sensitive environments, can have significant adverse effects including degradation of the water quality in receiving areas, fish disease/kills, reduced crop productivity, corrosion of built structures and health related issues. In view of these potential effects, it is critical that any development that occurs within an area likely to contain ASS is planned, managed and monitored appropriately so as to minimise or remove the risk of adverse environmental outcomes.

5. ASS Investigation & Assessment

The first stage of the assessment comprised a review of information from previous site investigations together with published geological and ASS risk mapping. This was followed by a site investigation comprising sampling and laboratory analysis of soil and groundwater samples, to characterise and assess the risk of ASS disturbance across proposed fill areas. Site investigation was carried out in general accordance with "*Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland*" (Ahern et al., 1998), and "*Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines v4.0*" (Dear et al., 2014), being the applicable guidelines for identification and management of ASS in Queensland.

5.1 Regional Geology & ASS Hazard Mapping

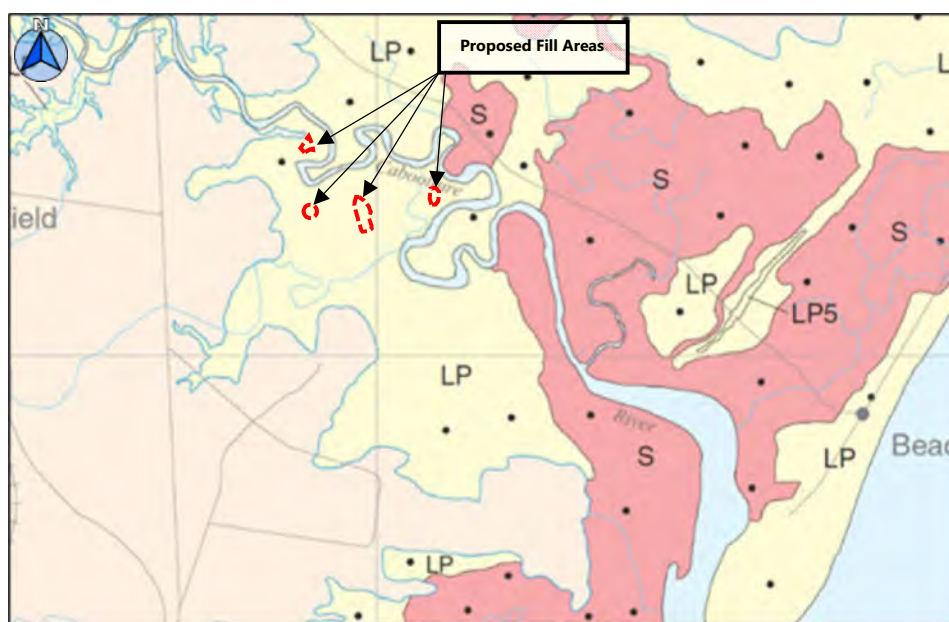
Geological Survey of Queensland 1:100,000 scale Caboolture and Brisbane maps indicate that the soil profile across the proposed fill areas comprises Holocene age river terrace alluvium, as lower and secondary terrace deposits, associated with the nearby Caboolture River. It is inferred that these strata are underlain at depth by a basement of much older residual soils and weathered sedimentary rocks of the Landsborough Sandstone formation which is indicated to outcrop to the west.

The Queensland Government's *Acid Sulfate Soils Redcliffe to Teewah Map 2* (NR&M-SEA-I-A0 3261) covering the region indicates the presence of primarily low probability (LP) land types for ASS across the proposed fill areas (Ref. Text Figure 3 overleaf). This description of the LP land type, especially across



lower lying Quaternary estuarine alluvium located nearer Caboolture River, does not match with regional geological mapping discussed above, or past site experience. Our experience is that some weak, non-sulfuric acidity exists throughout the soil profile in these lower lying areas, and that some potential for AASS and PASS also exists, where low strength estuarine sediments are encountered. It is noted that the boundaries and risk probability were established for the regional mapping using ground surface contours and broad-scale geological information, with limited field checking. While the ASS risk mapping does indicate a low probability of ASS being present across the proposed fill sites, our experience at the site indicates that there would be some potential for ASS to exist.

Assessment of the presence or absence of ASS at a site may only be confirmed by completion of a site investigation, involving soil sampling and quantitative analyses.



Text Figure 3: Redcliffe - Teewah Acid Sulfate Soils Map 2

5.2 Existing Site Information

Four boreholes (designated BH16 to BH19) were previously drilled across proposed Fill Area 1 to a depth of 3.5 m below ground level (BGL), as part of a site investigation in 2019 for development of the MIBA Precinct. Laboratory testing of soil samples from these boreholes comprised 56 pH screening tests and 13 quantitative tests using the chromium reducible sulfur (CRS) suite. These results have been used to assess the potential ASS risk for proposed Fill Area 1 and have been incorporated into this report.

5.3 Fieldwork and Laboratory Testing Methodology

Fieldwork to investigate the ASS hazard across Fill Areas 2 to 4 was carried out on 16 April 2025. Eight boreholes (BH1 to BH8) were drilled to a depth of 2 m BGL across the proposed fill areas using a solid flight auger rig mounted on a 4WD utility. Due to access limitations, boreholes BH4, BH5 and BH6 were drilled as close as possible, but outside of the proposed fill area footprint.

Borehole locations are illustrated in the Site Plan attached as Figure 1.

All boreholes were logged in accordance with the Unified Soil Classification system. Soil samples were collected at 0.25 m depth intervals from all boreholes for laboratory assessment. Selected soil samples were dispatched to Eurofins MGT, a NATA accredited analytical laboratory located in Brisbane. ASS



sampling protocols in the field were observed to minimise potential for oxidation prior to laboratory testing and followed the guidelines.

All borehole logs, together with explanatory notes, are attached in Appendix A.

Recovered ASS samples from the recent boreholes (64 No.) were screened to assess field pH (pH_F) and pH after oxidation (pH_{FOX}). Using the pH screening testing results and borehole logs, a total of 16 samples were selected to undergo quantitative analysis by the Total Actual Acidity (TAA) and CRS suite in accordance with ASS Method 23F (TAA) and 22B (CRS) laboratory procedures. Quantitative testing undertaken was specifically targeted at samples which indicated a high potential for occurrence of ASS based on pH field screen testing and was sufficient to quantify the ASS hazard across all soil profiles encountered. On this basis, the amount of testing undertaken is considered sufficient to provide an acceptable quantification of the ASS hazard present, with low level of uncertainty between test locations.

Where encountered, details of groundwater seepage and/or depth to the standing groundwater table were recorded on borehole logs. A groundwater standpipe was installed in borehole BH6, with a sample recovered for laboratory analysis. ASS related physio-chemical parameters of the groundwater sample including pH, electrical conductivity (EC), reduction-oxidation (REDOX) potential and turbidity were tested in the field, with total and dissolved aluminium and iron, chloride and sulphate subsequently tested at a NATA accredited analytical laboratory.

pH screening and CRS laboratory test results for both past and current investigations are tabulated in Table B1 (Appendix B), where ASS laboratory test certificates are also presented.

Groundwater laboratory test certificates are attached in Appendix C.

5.4 Subsurface Conditions

Subsurface conditions encountered in the boreholes across the proposed fill areas were relatively consistent with geology mapping, in general comprising of interlayered alluvial soil, with the following typical soil units:

- **Topsoil:** firm, dark brown or grey, silty clays, with organics, extending to about 0.2 m BGL; overlying
- **Alluvium:** firm to very stiff, dark brown and dark grey, silty clays, to depths of about 1.0 m to 1.5 m becoming stiff to hard, grey and/or orange/brown clays, extending to the respective investigation depth of 2 m to 3.5 m BGL.

The subsurface profile across the respective fill areas typically comprised firm or stiffer clay soils, which are unlikely to result in significant settlement, displacement or consolidation under the proposed fill loads.

5.5 Groundwater Conditions

Groundwater seepage and/or standing groundwater was encountered in boreholes BH1, BH5 and BH6 (generally associated with Fill Areas 2 and 4) at depths of between 0.8 m to 1.6 m BGL, with shallower depth to groundwater typically occurring in boreholes situated at lower elevations and in closer proximity to existing drainage pathways. Groundwater was generally not encountered in boreholes associated with Fill Areas 1 and 3.

Ponded surface water was observed within the existing drainage pathways adjacent Fill Areas 2 and 4, which is expected to be closely interconnected with surrounding unconfined groundwater conditions.



Depth to standing groundwater level would be expected to vary with proximity to standing surface water and relative topography and would also fluctuate with prevailing weather conditions.

A groundwater sample was recovered from the standpipe of BH6 which was tested for ASS related physio-chemical parameters. Results are summarised in Table 1.

Table 1: Summary of Groundwater Testing – 16 April 2025

Parameter	Units	BH6
Depth (Standing Water Level)	m BGL	1.0
pH	pH unit	6.30
Electrical Conductivity	$\mu\text{S}/\text{cm}$	488
REDOX Potential	mV	130
Turbidity	NTU	> 1000
Total Aluminium	mg/L	860
Dissolved Aluminium	mg/L	0.68
Total Iron	mg/L	880
Dissolved Iron	mg/L	5.9
Chloride	mg/L	500
Sulfate	mg/L	190

Groundwater pH indicates slightly acidic to neutral conditions. This is consistent with typical alluvial conditions encountered across North Harbour. EC levels indicate that the groundwater is generally fresh ($< 1500 \mu\text{S}/\text{cm}$). REDOX values of 130 mV indicate that the groundwater conditions tend towards chemically oxidative, which is typical of naturally unconfined alluvial groundwater conditions, where relatively permeable upper soil profile and variable groundwater conditions allow the presence and availability of *in situ* oxygen.

Total aluminium and iron concentrations are considered high when compared to guideline levels for recreational surface waters, however these levels are attributed to the high suspended sediment loads present at the time of sample collection (confirmed by high turbidity value). Dewatering will not be required for proposed construction, therefore potential for disturbance of groundwater, and subsequently for high metals loads to impact surface water conditions, is negligible.

During construction, stormwater runoff from works area will be managed using conventional erosion and sediment control practices. Appropriate water treatment may be required to adjust pH, reduce total suspended sediment (thus also reducing potential for iron and aluminium loads), prior to discharge or release.



5.6 ASS Investigation Results

Site and laboratory investigation methods are described earlier in this report, with the ASS investigation component generally consisting of a total of 12 boreholes across the proposed fill areas. Based on the nature of the proposed disturbance, an action criterion of 0.03 %S (18 mol H⁺ per tonne) was adopted for comparison with the combined actual and potential acidity results. The soil analyses results are discussed below.

5.6.1 Field Screening Analysis

A total of 120 samples were assessed by pH field screen analyses. Test results indicate that the soils tested generally have field pH (pH_F) values ranging from about 3.8 to 9.0, a wide range indicating naturally acidic to alkaline *in situ* soil conditions.

Oxidised pH (pH_{FOX}) test results consistently recorded pH_{FOX} values of between 3 and 4, indicating a moderate, but generally inconclusive, likelihood for potential ASS to be present within the subsurface soil horizons. Only 1 of the 120 samples recorded pH_{FOX} below 3, indicating high likelihood for ASS, generally located within topsoil material close to the ground surface level (typically above the groundwater table), being counterintuitive to the occurrence of potential ASS. It is likely that the presence of organic material near surface may have skewed the oxidised pH results. A number of these samples were tested by quantitative analysis to confirm the absence or presence of ASS within this lithology.

It is noted that pH screening cannot definitively confirm the presence of ASS, nor can it quantify the nature or strength of any acidity present. Further quantitative laboratory testing was therefore carried out on a range of samples in order to assess the strength of any acidity present, and to quantify the oxidisable sulfur content present.

5.6.2 Quantitative Laboratory Analysis

No significant levels of oxidisable sulfur (S_{CR} %) were recorded in any of the 29 samples tested by quantitative analysis, with most samples (26 of 29) reporting S_{CR} levels below the lowest recordable limit of 0.005%. This lack of oxidisable sulfur confirms that soils underlying the proposed fill areas do not contain potential ASS.

Eighteen of the 29 samples tested recorded actual acidity (TAA) values above the 18 mol H⁺ per tonne action criteria defining the presence of actual acidity. Levels of actual acidity recorded were up to 130 mol H⁺ per tonne, with an average acidity of 38 mol H⁺ per tonne. Levels of soluble pre-oxidation sulfur (S_{KCl}) exceeded 0.03% in 11 of these 18 samples, indicating this acidity to be mostly attributed to AASS.

Levels of jarosite and similar acid-producing iron or aluminium hydroxy-sulfate minerals (S_{NAS}) were generally below 0.02% for all samples, with the exception of clay samples from boreholes BH1 and BH2 at depths greater than 1.5 m BGL. These soils are not expected to be disturbed by proposed works.



5.7 ASS Characterisation Summary

Investigation results confirm that soils underlying proposed Fill Areas 1 to 4 contain levels of existing acidity, including AASS, of up to 130 mol H⁺ per tonne. If disturbed by the proposed works these soils must be treated to neutralise the levels of acidity present, to mitigate the potential environmental risk associated with acid migration/mobilisation.

Reported levels of oxidisable sulfur were typically below the relevant threshold limits, confirming the subsurface profile across the fill areas to be non-PASS. Ground disturbance across such areas would not be expected to result in the creation of any additional sulfuric acidity.

Based on our understanding of the proposed works, the disturbance of existing acidity would mostly be avoided. Proposed stripping for subgrade preparation, prior to placement of fill, will be limited to relatively shallow depth and will not require dewatering. The risk associated with these works is relatively low and can be managed through application of conventional ASS management strategies, which are described below.

6. Acidic Soil Management Strategy

As limited potential exists for disturbance of ASS and groundwater by the proposed works, environmental management measures during construction will comprise basic soil and water management strategies. This will include implementation of conventional erosion and sediment control measures to manage stormwater and construction runoff, a methodology for the neutralisation of ASS disturbed during subgrade preparation and verification testing to confirm successful treatment.

Contractor's staff involved in civil earthworks on the site should be informed of site management responsibilities, to be delivered as part of site induction. Information should be provided prior to the commencement of works to ensure that staff are fully aware of soil and water management requirements, and their roles and responsibilities in achieving the desired management outcomes.

6.1 Management of Disturbed Material

To mitigate risk associated with existing acidity, any soil disturbed during subgrade preparation (such as stripped topsoil), will be treated with fine grained agricultural lime to neutralise any acidity within the excavated materials. Fine grained agricultural lime should be applied at a rate of **5 kg per cubic metre** of disturbed soil, as calculated from the available quantitative testing results. Once limed, the materials should be mechanically mixed to ensure homogeneous mixing of the lime throughout the treated soil, prior to reuse.

Please note, treatment requires the application and mixing of fine grained calcium carbonate (agricultural lime), which is an inert product. Other lime products such as hydrated lime, present their own health and safety and environmental risks, and must not be used for soil neutralisation purposes. Furthermore, the site exists in an environment that is naturally acidic. The use of excessively high liming rates or inappropriate forms of lime have the potential to alter that environment. The recommended liming rate has thus been calculated to mitigate the risk of possible acid leachate without excessively impacting the pH of the existing environment.



6.1.1 Verification Testing

Verification testing will be undertaken on treated topsoil at a rate of 1 test per 500 m³. Each verification sample will be taken by compositing treated material from no less than six subsample locations (including at depth) from treated soil. The laboratory test regime for validation testing will involve the measurement of pH, net acidity (the sum of actual, potential and residual acidity) and acid neutralising capacity (ANC). Where the pH post treatment is greater than 6.5 and the ANC is not less than 1.5 times the net acidity, then the validation shall be deemed successful.

6.1.1 Management of Fill Material

To mitigate risk associated with the possible incomplete treatment of fill soils or presence of non-sulfuric acidity (imported from MBA development), a lime guard layer should be applied to the subgrade, prior to placement of fill. Subsequent guard layers should also be placed at every 0.5 m lift within the fill platform. Lime guard layers should be applied evenly at a rate of **1 kg per square meter**.

Verification testing is not required for application of guard layers, however receipts indicating volume of lime used on site should be maintained by the Contractor to in order to demonstrate that appropriate quantities of lime have been used.

6.2 Water Quality & Stormwater Management

Erosion and sediment control measures are expected to be applied in accordance with current industry best practice to contain and control site runoff waters during construction. All runoff generated from areas of excavation or soil treatment, must be contained, tested and treated (if necessary) prior to discharge or re-use onsite. Uncontrolled discharge of stormwater runoff must not be allowed to occur.

The construction site must be graded to ensure that stormwater runoff drains inward toward established site erosion and sediment controls. Captured surface water runoff and groundwater extracted from shallow excavations will be treated to ensure that water quality is within the acceptable release criteria prior to discharge.

If discharge from the site is required, all waters must achieve the water quality performance criteria detailed in Table 2 below prior to release from the site. The Contractor will be responsible for ensuring relevant water quality criteria are met prior to discharge.

Table 2: Water Quality Release Criteria

Indicator	Release Limit
pH	6.5 to 8.5
Total Suspended Solids	< 50 mg/L
Aluminium	< 0.2 mg/L
Iron	< 0.3 mg/L
Litter/ Gross Pollutants	No visible litter sheen or odour washed from the site or deposited in waters downstream of any discharge

Waters meeting the quality criteria will be released, to adjacent surface water drainage in a controlled manner.



All aspects of water quality management, including any testing, treatment and releases of construction waters will be documented by the Contractor within a project/site diary. The site diary and all other construction records shall be clearly detailed and will be maintained by the Contractor for review upon request by the superintendent or administering authority.

7. Limitations

Your attention is drawn to the document *Limitations*, which is included in Appendix D of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be, and to present you with recommendations on how to minimise the risks associated with the services provided by Tectonic for this project.



LEGEND



APPROX. BOREHOLE LOCATIONS 2019



APPROX. BOREHOLE LOCATIONS 2025

CLIENT NORTH HARBOUR HOLDING PTY LTD		PROJECT ACID SULFATE SOIL INVESTIGATION & MANAGEMENT PLAN OPEN SPACE EARTHWORKS – NORTH HARBOUR BUSINESS PARK			
DRAWN BY KAB	DATE 12/05/2025	DRAWING TITLE SITE PLAN		NOTES BASEMAP COURTESY OF NEARMAP, DATED 17 MARCH 2025 OVERLAY IMAGE COURTESY NORTH HARBOUR (DWG NO. 2.5-105-01 SHEET NO. 1 REV. A DATED MARCH 2025)	
CHECKED BY MT	DATE 12/05/2025	PROJECT NO. 25096		FIGURE NO. 1	REVISION 0
SCALE AS SHOWN	SHEET SIZE A3	DOC NO. 001			

Appendix A

Borehole Logs and Explanatory Sheets



Engineering Log - Borehole

Project No.: 25096

Client:		North Harbour Holdings Pty Ltd				Commenced:		16/4/2025										
Project Name:		Acid Sulfate Soil Investigation and Management Plan				Completed:		16/4/2025										
Hole Location:		North Harbour Business Park				Logged By:		KAB										
Hole Position:		499318.0 m E 7001521.0 m N MGA2020 Zone 56				Checked By:		MT										
Drill Model and Mounting:		4WD Auger		Inclination:		-90°		RL Surface:		No survey								
Hole Diameter:		100 mm		Bearing:		360°		Datum:		AHD Operator: WD								
Drilling Information						Material Description and Observations												
Method	Penetration	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description soil type: plasticity or particle characteristics, secondary and minor components, colour	Moisture Condition	Consistency Relative Density	Pocket Penetrometer UCS (kPa)	DCP TEST Blows per 100 mm					
AD/T			ASS 0.0-2.0m @0.25m intervals			0.5		F	Silty CLAY (TOPSOIL), medium plasticity, dark grey, with organics,	w = PL	F	100 200 300 400 500	0	5	10	15	20	25
								CI	Silty CLAY, medium plasticity, dark brown									
								CI-CH	CLAY, medium to high plasticity, pale grey mottled brown									
									becoming red brown with sand									
						2.0			Hole Terminated at 2.00 m Target depth			300						
Method		Penetration		Water		Samples and Tests		Moisture Condition		Consistency/Relative Density								
AD/T- Auger Drilling TC Bit AD/V- Auger Drilling V Bit RT - Rotary Tri-cone Bit RD - Rotary Drilling NMLC- Rock Core HA - Hand Auger		 VE - Very Easy E - Easy F - Firm H - Hard VH - Very hard		 Level (Date) Inflow Partial Loss Complete Loss		 U## - Undisturbed Sample (## mm) DS - Disturbed Sample BDS- Bulk Disturbed Sample SPT - Standard Penetration Test		 D - Dry M - Moist W - Wet		 VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense Fr - Friable								
Graphic Log/Core Loss		Classification Symbols and Soil Descriptions		Plastic Limit														
 Core recovered (hatching indicates material) Core loss		Based on Unified Soil Classification System		 < PL = PL > PL														

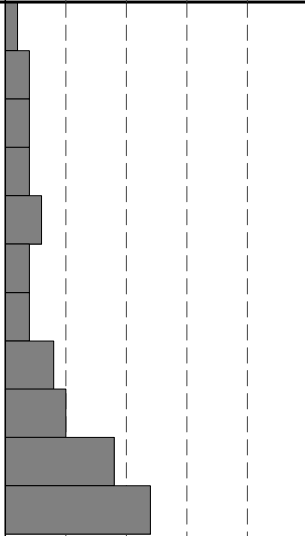
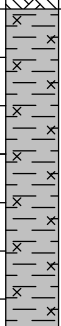
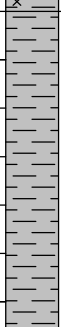
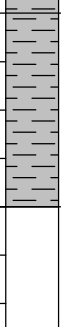
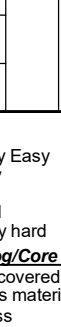
Engineering Log - Borehole

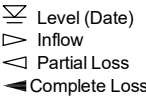
Project No.: 25096

Client: North Harbour Holdings Pty Ltd
 Project Name: Acid Sulfate Soil Investigation and Management Plan
 Hole Location: North Harbour Business Park
 Hole Position: 499319.0 m E 7001626.0 m N MGA2020 Zone 56

Commenced: 16/4/2025
 Completed: 16/4/2025
 Logged By: KAB
 Checked By: MT

Drill Model and Mounting: 4WD Auger Inclin: -90° RL Surface: No survey
 Hole Diameter: 100 mm Bearing: 360° Datum: AHD Operator: WD

Drilling Information						Material Description and Observations													
Method	Penetration	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description soil type: plasticity or particle characteristics, secondary and minor components, colour	Moisture Condition	Consistency Relative Density	Pocket Penetrometer UCS (kPa)	DCP TEST Blows per 100 mm						
AD/T		Not Encountered	ASS 0.0-2.0m @0.25m intervals			0.0			Silty CLAY (TOPSOIL), medium plasticity, dark grey, with organics,	w = PL	F	100		0	5	10	15	20	25
						0.5		CI	Silty CLAY, medium plasticity, dark brown			160							
						1.0		CH	CLAY, high plasticity, pale grey mottled orange brown			160							
						1.5			becoming pale grey mottled pale yellow brown			115							
						2.0			Hole Terminated at 2.00 m Target depth			110							

Method	Penetration	Water	Samples and Tests	Moisture Condition	Consistency/Relative Density
AD/T- Auger Drilling TC Bit AD/V- Auger Drilling V Bit RT - Rotary Tri-cone Bit RD - Rotary Drilling NMLC- Rock Core HA - Hand Auger	 VE - Very Easy E - Easy F - Firm H - Hard VH - Very hard	 Level (Date) Inflow Partial Loss Complete Loss	U## - Undisturbed Sample (## mm) DS - Disturbed Sample BDS- Bulk Disturbed Sample SPT- Standard Penetration Test	D - Dry M - Moist W - Wet	VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense Fr - Friable
Graphic Log/Core Loss  Core recovered (hatching indicates material)  Core loss			Classification Symbols and Soil Descriptions Based on Unified Soil Classification System		
			Plastic Limit < PL = PL < PL		

Method
 AD/T-Auger Drilling TC Bit
 AD/V-Auger Drilling V Bit
 RT - Rotary Tri-cone Bit
 RD - Rotary Drilling
 NMLC - Rock Core
 HA - Hand Auger

Penetration
 VE - Very Easy
 E - Easy
 F - Firm
 H - Hard
 VH - Very hard

Water
 Level (Date)
 Inflow
 Partial Loss
 Complete Loss

Samples and Tests
 U## - Undisturbed Sample (## mm)
 DS - Disturbed Sample
 BDS - Bulk Disturbed Sample
 SPT - Standard Penetration Test

Moisture Condition
 D - Dry
 M - Moist
 W - Wet

Consistency/Relative Density
 VS - Very Soft
 S - Soft
 F - Firm
 VSt - Very Stiff
 H - Hard
 VL - Very Loose
 L - Loose
 MD - Medium Dense
 D - Dense
 VD - Very Dense
 Fr - Friable

Graphic Log/Core Loss
 Core recovered (hatching indicates material)
 Core loss

Classification Symbols and Soil Descriptions
 Based on Unified Soil Classification System

Plastic Limit
 < PL
 = PL
 < PL

Engineering Log - Borehole

Project No.: 25096

Client:		North Harbour Holdings Pty Ltd		Commenced:		16/4/2025	
Project Name:		Acid Sulfate Soil Investigation and Management Plan		Completed:		16/4/2025	
Hole Location:		North Harbour Business Park		Logged By:		KAB	
Hole Position:		499772.0 m E 7001714.0 m N MGA2020 Zone 56		Checked By:		MT	
Drill Model and Mounting:		4WD Auger		Inclination:		-90°	
Hole Diameter:		100 mm		Bearing:		360°	
				RL Surface:		No survey	
				Datum:		AHD	
				Operator:		WD	

Drilling Information				Material Description and Observations													
Method	Penetration	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description soil type: plasticity or particle characteristics, secondary and minor components, colour	Moisture Condition	Consistency Relative Density	Pocket Penetrometer UCS (kPa)	DCP TEST Blows per 100 mm				
AD/T		Not Encountered	ASS 0.0-2.0m @0.25m intervals			0.0			Silty CLAY (TOPSOIL), medium plasticity, dark grey, with organics,	w = PL	F						
						0.25		CI	Silty CLAY, medium plasticity, dark brown, trace sand		St	150					
						0.5			becoming grey mottled brown								
						0.75											
						1.0					VSt	220					
						1.5			CH CLAY, high plasticity, pale grey mottled orange brown		St	110					
						2.0			Hole Terminated at 2.00 m Target depth		VSt	270					

Method AD/T-Auger Drilling TC Bit AD/V-Auger Drilling V Bit RT - Rotary Tri-cone Bit RD - Rotary Drilling NMLC - Rock Core HA - Hand Auger	Penetration VE - Very Easy E - Easy F - Firm H - Hard VH - Very hard Core recovered (hatching indicates material) Core loss	Water Level (Date) Inflow Partial Loss Complete Loss	Samples and Tests U## - Undisturbed Sample (## mm) DS - Disturbed Sample BDS - Bulk Disturbed Sample SPT - Standard Penetration Test	Moisture Condition D - Dry M - Moist W - Wet Plastic Limit < PL = PL < PL	Consistency/Relative Density VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense Fr - Friable
Graphic Log/Core Loss Based on Unified Soil Classification System					

Engineering Log - Borehole

Project No.: 25096

Client: North Harbour Holdings Pty Ltd		Commenced: 16/4/2025	
Project Name: Acid Sulfate Soil Investigation and Management Plan		Completed: 16/4/2025	
Hole Location: North Harbour Business Park		Logged By: KAB	
Hole Position: 499618.0 m E 7001647.0 m N MGA2020 Zone 56		Checked By: MT	
Drill Model and Mounting: 4WD Auger		Inclination: -90°	RL Surface: No survey
Hole Diameter: 100 mm		Bearing: 360°	Datum: AHD Operator: WD

Drilling Information					Material Description and Observations													
Method	Penetration	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description soil type: plasticity or particle characteristics, secondary and minor components, colour	Moisture Condition	Consistency Relative Density	Pocket Penetrometer UCS (kPa)	DCP TEST Blows per 100 mm					
AD/T	Not Encountered		DS_1.3-1.5m			0.0			Silty CLAY (TOPSOIL), medium plasticity, dark grey, with organics,	w = PL	F	100	0					
						0.5		CI	Silty CLAY, medium plasticity, grey brown, trace sand			200						
						1.0			becoming red brown mottled pale grey			300						
						1.5			without sand and gravel		St	400						
						2.0			Hole Terminated at 2.00 m Target depth			500						

Method AD/T-Auger Drilling TC Bit AD/V-Auger Drilling V Bit RT - Rotary Tri-cone Bit RD - Rotary Drilling NMLC - Rock Core HA - Hand Auger	Penetration VE - Very Easy E - Easy F - Firm H - Hard VH - Very hard Core recovered (hatching indicates material) Core loss	Water Level (Date) Inflow Partial Loss Complete Loss	Samples and Tests U## - Undisturbed Sample (## mm) DS - Disturbed Sample BDS - Bulk Disturbed Sample SPT - Standard Penetration Test	Moisture Condition D - Dry M - Moist W - Wet Plastic Limit < PL = PL < PL	Consistency/Relative Density VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense Fr - Friable
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Engineering Log - Borehole

Project No.: 25096

Client:		North Harbour Holdings Pty Ltd		Commenced:		16/4/2025	
Project Name:		Acid Sulfate Soil Investigation and Management Plan		Completed:		16/4/2025	
Hole Location:		North Harbour Business Park		Logged By:		KAB	
Hole Position:		499958.0 m E 7001710.0 m N MGA2020 Zone 56		Checked By:		MT	
Drill Model and Mounting:		4WD Auger		Inclination:		-90°	
Hole Diameter:		100 mm		Bearing:		360°	
				RL Surface:		No survey	
				Datum:		AHD	
				Operator:		WD	

Drilling Information				Material Description and Observations													
Method	Penetration	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description soil type: plasticity or particle characteristics, secondary and minor components, colour	Moisture Condition	Consistency Relative Density	Pocket Penetrometer UCS (kPa)	DCP TEST Blows per 100 mm				
AD/T			ASS 0.0-0.1m @0.25m intervals			0.0			Silty CLAY (TOPSOIL), medium plasticity, dark grey, with organics		F		HW				
						0.5		CH	Silty CLAY, high plasticity, orange brown, trace sand	w = PL		110					
						1.0			becoming pale grey, without sand	St		110					
						1.5				w = PL to w > PL							
						2.0			Hole Terminated at 2.00 m Target depth								

Method
AD/T-Auger Drilling TC Bit
AD/V-Auger Drilling V Bit
RT - Rotary Tri-cone Bit
RD - Rotary Drilling
NMLC - Rock Core
HA - Hand Auger

Penetration
VE - Very Easy
E - Easy
F - Firm
H - Hard
VH - Very hard

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Samples and Tests
U## - Undisturbed Sample (## mm)
DS - Disturbed Sample
BDS - Bulk Disturbed Sample
SPT - Standard Penetration Test

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense
Fr - Friable

Plastic Limit
< PL
= PL
< PL

Engineering Log - Borehole

Project No.: 25096

Client: North Harbour Holdings Pty Ltd
 Project Name: Acid Sulfate Soil Investigation and Management Plan
 Hole Location: North Harbour Business Park
 Hole Position: 499646.0 m E 7001487.0 m N MGA2020 Zone 56

Commenced: 16/4/2025
 Completed: 16/4/2025
 Logged By: KAB
 Checked By: MT

Drill Model and Mounting: 4WD Auger Inclination: -90° RL Surface: No survey
 Hole Diameter: 100 mm Bearing: 360° Datum: AHD Operator: WD

Drilling Information						Material Description and Observations																
Method	Penetration	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description soil type: plasticity or particle characteristics, secondary and minor components, colour	Moisture Condition	Consistency	Relative Density	Pocket Penetrometer UCS (kPa)					DCP TEST Blows per 100 mm				
AD/T		16/04/25, Groundwater level at 1.0m	ASS 0.0-2.0m @0.25m intervals			0.0			Silty CLAY (TOPSOIL), medium plasticity, dark grey, with organics,	w = PL	F											
						0.5		CI	Silty CLAY, medium plasticity, dark brown		St											
						1.0			trace sand		F											
						1.5		CH	CLAY, high plasticity, pale grey, trace sand		F - St											
						2.0			Hole Terminated at 2.00 m Target depth													

Method	Penetration	Water	Samples and Tests	Moisture Condition	Consistency/Relative Density
AD/T-Auger Drilling TC Bit AD/V-Auger Drilling V Bit RT - Rotary Tri-cone Bit RD - Rotary Drilling NMLC - Rock Core HA - Hand Auger	 VE - Very Easy E - Easy F - Firm H - Hard VH - Very hard	 Level (Date) Inflow Partial Loss Complete Loss	U## - Undisturbed Sample (## mm) DS - Disturbed Sample BDS- Bulk Disturbed Sample SPT - Standard Penetration Test	D - Dry M - Moist W - Wet	VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense Fr - Friable
Graphic Log/Core Loss Core recovered (hatching indicates material) Core loss			Classification Symbols and Soil Descriptions Based on Unified Soil Classification System		
			Plastic Limit < PL = PL < PL		

Method
 AD/T-Auger Drilling TC Bit
 AD/V-Auger Drilling V Bit
 RT - Rotary Tri-cone Bit
 RD - Rotary Drilling
 NMLC - Rock Core
 HA - Hand Auger

Penetration
 VE - Very Easy
 E - Easy
 F - Firm
 H - Hard
 VH - Very hard

Water
 Level (Date)
 Inflow
 Partial Loss
 Complete Loss

Graphic Log/Core Loss
 Core recovered (hatching indicates material)
 Core loss

Samples and Tests
 U## - Undisturbed Sample (## mm)
 DS - Disturbed Sample
 BDS - Bulk Disturbed Sample
 SPT - Standard Penetration Test

Classification Symbols and Soil Descriptions
 Based on Unified Soil Classification System

Moisture Condition
 D - Dry
 M - Moist
 W - Wet

Plastic Limit
 < PL
 = PL
 > PL

Consistency/Relative Density
 VS - Very Soft
 S - Soft
 F - Firm
 VSt - Very Stiff
 H - Hard
 VL - Very Loose
 L - Loose
 MD - Medium Dense
 D - Dense
 VD - Very Dense
 Fr - Friable

Engineering Log - Borehole

Project No.: 25096

Client: North Harbour Holdings Pty Ltd
 Project Name: Acid Sulfate Soil Investigation and Management Plan
 Hole Location: North Harbour Business Park
 Hole Position: 499646.0 m E 7001487.0 m N MGA2020 Zone 56

Commenced: 16/4/2025
 Completed: 16/4/2025
 Logged By: KAB
 Checked By: MT

Drill Model and Mounting: 4WD Auger Inclination: -90° RL Surface: No survey
 Hole Diameter: 100 mm Bearing: 360° Datum: AHD Operator: WD

Drilling Information						Material Description and Observations									
Method	Penetration	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description soil type: plasticity or particle characteristics, secondary and minor components, colour	Moisture Condition	Consistency	Relative Density	Pocket Penetrometer UCS (kPa)	Piezometer Construction	
AD/T		16/04/25, Groundwater level at 1.0m	ASS 0.0-2.0m @0.25m intervals			0.0			Silty CLAY (TOPSOIL), medium plasticity, dark grey, with organics,	w = PL	F				
						0.5		CI	Silty CLAY, medium plasticity, dark brown		St				
						1.0			trace sand		F				
						1.5		CH	CLAY, high plasticity, pale grey, trace sand		F - St				
						2.0			Hole Terminated at 2.00 m Target depth						

Method	Penetration	Water	Samples and Tests	Moisture Condition	Consistency/Relative Density
AD/T- Auger Drilling TC Bit AD/V- Auger Drilling V Bit RT - Rotary Tri-cone Bit RD - Rotary Drilling NMLC- Rock Core HA - Hand Auger	 Core recovered (hatching indicates material) Core loss	VE - Very Easy E - Easy F - Firm H - Hard VH - Very hard Level (Date) Inflow Partial Loss Complete Loss	U## - Undisturbed Sample (## mm) DS - Disturbed Sample BDS- Bulk Disturbed Sample SPT- Standard Penetration Test	D - Dry M - Moist W - Wet Plastic Limit < PL = PL < PL	VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense Fr - Friable
Graphic Log/Core Loss			Classification Symbols and Soil Descriptions		
			Based on Unified Soil Classification System		

Method
 AD/T-Auger Drilling TC Bit
 AD/V-Auger Drilling V Bit
 RT - Rotary Tri-cone Bit
 RD - Rotary Drilling
 NMLC - Rock Core
 HA - Hand Auger

Penetration
 VE - Very Easy
 E - Easy
 F - Firm
 H - Hard
 VH - Very hard

Water
 Level (Date)
 Inflow
 Partial Loss
 Complete Loss

Samples and Tests
 U## - Undisturbed Sample (## mm)
 DS - Disturbed Sample
 BDS - Bulk Disturbed Sample
 SPT - Standard Penetration Test

Moisture Condition
 D - Dry
 M - Moist
 W - Wet

Consistency/Relative Density
 VS - Very Soft
 S - Soft
 F - Firm
 VSt - Very Stiff
 H - Hard
 VL - Very Loose
 L - Loose
 MD - Medium Dense
 D - Dense
 VD - Very Dense
 Fr - Friable

Graphic Log/Core Loss
 Core recovered (hatching indicates material)
 Core loss

Classification Symbols and Soil Descriptions
 Based on Unified Soil Classification System

Plastic Limit
 < PL
 = PL
 > PL

Engineering Log - Borehole

Project No.: 25096

Client:		North Harbour Holdings Pty Ltd		Commenced:		16/4/2025	
Project Name:		Acid Sulfate Soil Investigation and Management Plan		Completed:		16/4/2025	
Hole Location:		North Harbour Business Park		Logged By:		KAB	
Hole Position:		500619.0 m E 7001731.0 m N MGA2020 Zone 56		Checked By:		MT	
Drill Model and Mounting:		4WD Auger		Inclination:		-90°	
Hole Diameter:		100 mm		Bearing:		360°	
				RL Surface:		No survey	
				Datum:		AHD	
				Operator:		WD	

Drilling Information				Material Description and Observations														
Method	Penetration	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description soil type: plasticity or particle characteristics, secondary and minor components, colour	Moisture Condition	Consistency Relative Density	Pocket Penetrometer UCS (kPa)	DCP TEST Blows per 100 mm					
												100 200 300 400 500	0	5	10	15	20	25
AD/T		Not Encountered	ASS 0.0-2.0m @0.25m intervals			0.5		CI-CH	Silty CLAY (TOPSOIL), medium plasticity, dark grey, with organics,	w = PL	F							
									Silty CLAY, medium plasticity, brown, trace sand									
						1.0			becoming pale grey mottled orange brown		St							
						1.5					F							
						2.0			Hole Terminated at 2.00 m Target depth									

Method AD/T-Auger Drilling TC Bit AD/V-Auger Drilling V Bit RT - Rotary Tri-cone Bit RD - Rotary Drilling NMLC - Rock Core HA - Hand Auger	Penetration VE - Very Easy E - Easy F - Firm H - Hard VH - Very hard	Water Level (Date) Inflow Partial Loss Complete Loss	Samples and Tests U## - Undisturbed Sample (## mm) DS - Disturbed Sample BDS - Bulk Disturbed Sample SPT - Standard Penetration Test	Moisture Condition D - Dry M - Moist W - Wet	Consistency/Relative Density VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense Fr - Friable
Graphic Log/Core Loss Core recovered (hatching indicates material) Core loss			Classification Symbols and Soil Descriptions Based on Unified Soil Classification System	Plastic Limit < PL = PL < PL	

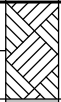
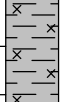
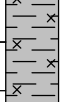
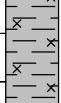
Engineering Log - Borehole

Project No.: 25096

Client: North Harbour Holdings Pty Ltd
 Project Name: Acid Sulfate Soil Investigation and Management Plan
 Hole Location: North Harbour Business Park
 Hole Position: 500641.0 m E 7001684.0 m N MGA2020 Zone 56

Commenced: 16/4/2025
 Completed: 16/4/2025
 Logged By: KAB
 Checked By: MT

Drill Model and Mounting: 4WD Auger Inclination: -90° RL Surface: No survey
 Hole Diameter: 100 mm Bearing: 360° Datum: AHD Operator: WD

Drilling Information						Material Description and Observations												
Method	Penetration	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description soil type: plasticity or particle characteristics, secondary and minor components, colour	Moisture Condition	Consistency Relative Density	Pocket Penetrometer UCS (kPa)	DCP TEST Blows per 100 mm					
AD/T		Not Encountered	ASS 0.0-2.0m @0.25m intervals			0.5		CI	Silty CLAY (TOPSOIL), medium plasticity, dark grey, with organics,	W = PL	St	100	0					
						1.0			Silty CLAY, medium to high plasticity, brown, with fine to medium grained sand			200						
						1.5			pale grey mottled orange brown			300						
						2.0			Hole Terminated at 2.00 m Target depth			400						
												500						

Method	Penetration	Water	Samples and Tests	Moisture Condition	Consistency/Relative Density
AD/T- Auger Drilling TC Bit AD/V- Auger Drilling V Bit RT - Rotary Tri-cone Bit RD - Rotary Drilling NMLC- Rock Core HA - Hand Auger	 VE - Very Easy E - Easy F - Firm H - Hard VH - Very hard	 Level (Date)  Inflow  Partial Loss  Complete Loss	U## - Undisturbed Sample (## mm) DS - Disturbed Sample BDS- Bulk Disturbed Sample SPT- Standard Penetration Test	D - Dry M - Moist W - Wet	VS - Very Soft S - Soft F - Firm VSt - Very Stiff H - Hard VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense Fr - Friable
Graphic Log/Core Loss  Core recovered (hatching indicates material)  Core loss			Classification Symbols and Soil Descriptions Based on Unified Soil Classification System		
			Plastic Limit < PL = PL < PL		

Method
 AD/T-Auger Drilling TC Bit
 AD/V-Auger Drilling V Bit
 RT - Rotary Tri-cone Bit
 RD - Rotary Drilling
 NMLC - Rock Core
 HA - Hand Auger

Penetration
 VE - Very Easy
 E - Easy
 F - Firm
 H - Hard
 VH - Very hard

Water
 Level (Date)
 Inflow
 Partial Loss
 Complete Loss

Samples and Tests
 U## - Undisturbed Sample (## mm)
 DS - Disturbed Sample
 BDS - Bulk Disturbed Sample
 SPT - Standard Penetration Test

Moisture Condition
 D - Dry
 M - Moist
 W - Wet

Consistency/Relative Density
 VS - Very Soft
 S - Soft
 F - Firm
 VSt - Very Stiff
 H - Hard
 VL - Very Loose
 L - Loose
 MD - Medium Dense
 D - Dense
 VD - Very Dense
 Fr - Friable

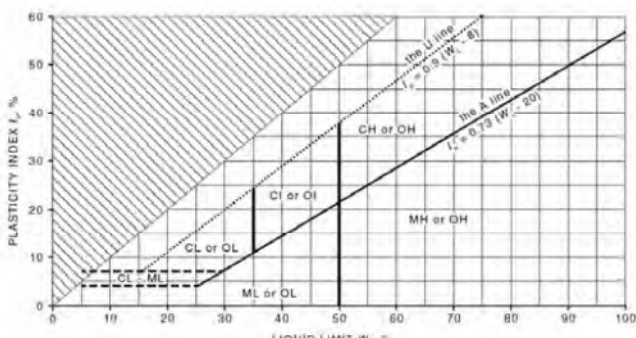
Graphic Log/Core Loss
 Core recovered (hatching indicates material)
 Core loss

Classification Symbols and Soil Descriptions
 Based on Unified Soil Classification System

Plastic Limit
 < PL
 = PL
 > PL

CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil is classified and described in borehole and test pit logs using the preferred method given in AS1726 – 2017. The material properties are assessed in the field by visual/tactile methods.

Particle Size			Plasticity Properties
Major Division	Sub Division	Particle Size	
BOULDERS		> 200 mm	
COBBLES		63 to 200 mm	
GRAVEL	Coarse	19 to 63 mm	
	Medium	6.7 to 19 mm	
	Fine	2.36 to 6.7 mm	
SAND	Coarse	0.6 to 2.36 mm	
	Medium	0.21 to 0.6 mm	
	Fine	0.075 to 0.21	
SILT		0.002 to 0.075	
CLAY		< 0.002 mm	

NOTE: The U line is an approximate upper bound for most materials. Data which plot above the U line may represent unusual/problem soil behavior, or unreliable data and should be considered carefully.

MOISTURE CONDITION			AS1726 - 2017
Coarse Grained Soils			
Symbol	Term	Description	
D	Dry	Sands and gravels are free flowing.	
M	Moist	Soils are darker than in the dry condition & may feel cool. Sands and gravels tend to cohere.	
W	Wet	Soils exude free water. Sands and gravels tend to cohere	

Fine Grained Soils	
Symbol	Description
w < PL	Moist, dry of plastic limit, (hard and friable or powdery)
w = PL	Moist, near plastic limit, (soils can be moulded at a moisture content approximately equal to the plastic limit)
w > PL	Moist, wet of plastic limit, (soils usually weakened and free water forms on hands when handling)
w = LL	Wet, near liquid limit
w > LL	Wet, wet of liquid limit

CONSISTENCY AND DENSITY				AS1726 - 2017			
Symbol	Term	Undrained Shear Strength		Symbol	Term	Density Index %	SPT "N" #
VS	Very Soft	0 to 12 kPa		VL	Very Loose	Less than 15	0 to 4
S	Soft	12 to 25 kPa		L	Loose	15 to 35	4 to 10
F	Firm	25 to 50 kPa		MD	Medium Dense	35 to 65	10 to 30
St	Stiff	50 to 100 kPa		D	Dense	65 to 85	30 to 50
VSt	Very Stiff	100 to 200 kPa		VD	Very Dense	Above 85	Above 50
H	Hard	Above 200 kPa					

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material.
SPT correlations are not stated in AS1726 – 2017, and may be subject to corrections for overburden pressure and equipment type.

Appendix B

Table B1 – ASS Testing Summary & ASS Laboratory Test Certificates



Ref: 25096

Ref: 25096

Location & Depth (m)	Soil Type	pH _F		AASS likelihood ¹	pH _{FOX}		PASS likelihood ²	Reaction	pH KCl	Titratable Actual Acidity		S _{KCl}	Chromium Reducible Sulfur		S _{NAS}	ANC _{bt}	Net Acidity (Existing + Potential)	Indicative Lime Rate	
		pH Unit			pH Unit					mole H+ / t	mole H+ / t	%S	mole H+ / t	%S	mole H+ / t	mole H+ / t	mole H+ / t	kg CaCO ₃ /t	kg CaCO ₃ /m ³
BH6	Silty CLAY (Topsoil)	0.0-0.25		L	4.1		L	4											
		0.25-0.5		L	3.6		M	4	4.9	46		0.01	0.009	5.8	N/A	N/A	51.8	3.9	6.6
		0.5-0.75		M	3.6		M	4											
		0.75-1.0		M	4.0		L	4											
	CLAY	1.0-1.25		M	3.9		M	4											
		1.25-1.5		L	3.5		M	2	4.4	60		0.03	< 0.005	< 3	2.2	N/A	62.2	4.7	7.9
		1.5-1.75		M	4.0		L	4											
		1.75-2.0		M	3.9		M	4											
BH7	Silty CLAY (Topsoil)	0.0-0.25		L	3.1		M	4											
		0.25-0.5		L	3.3		M	4	4.6	53		< 0.005	< 0.005	< 3	N/A	N/A	53	4.0	6.8
		0.5-0.75		L	3.6		M	4											
		0.75-1.0		L	4.1		L	4											
	Silty CLAY	1.0-1.25		L	4.1		L	4											
		1.25-1.5		L	3.9		M	4											
		1.5-1.75		L	3.8		M	4	4.6	46		< 0.005	< 0.005	< 3	N/A	N/A	46	3.5	5.9
		1.75-2.0		M	2.6		M	4											
BH8	Silty CLAY (Topsoil)	0.0-0.25		L	3.6		M	4											
		0.25-0.5		L	4.2		L	4	4.9	51		< 0.005	< 0.005	< 3	N/A	N/A	51	3.8	6.5
		0.5-0.75		L	4.5		L	4											
		0.75-1.0		L	4.9		L	4											
	Silty CLAY	1.0-1.25		L	5.2		L	4											
		1.25-1.5		L	5.1		L	4	5.4	17		< 0.005	< 0.005	< 3	N/A	N/A	17	N/R	N/R
		1.5-1.75		L	4.2		L	4											
		1.75-2.0		M	4.2		L	4											
BH16	Silty Clay (Topsoil)	0.0-0.25		L	3.2		M	3											
		0.25-0.5		L	3.4		M	3											
		0.5-0.75		L	4.2		M	2	4.8	25		< 0.02	< 0.005	< 3	n/a	n/a	25	1.3	2.1
		0.75-1.0		L	6.0		L	4											
	Sandy CLAY	1.0-1.25		L	6.4		L	4											
		1.25-1.5		L	6.5		L	4											
		1.5-1.75		L	8.6		L	4											
		1.75-2.0		L	8.5		L	4	6.7	< 2		< 0.02	< 0.005	< 3	n/a	110	0	0.0	0.0
		2.0-2.25		L	8.2		L	4											
		2.25-2.5		L	8.1		L	4											
		2.5-2.75		L	8.2		L	4	6.6	< 2		< 0.02	< 0.005	< 3	n/a	180	0	0.0	0.0
		2.75-3.0		L	8.2		L	4											
		3.0-3.25		L	8.3		L	4											
		3.25-3.5		L	8.2		L	4											
BH17	Silty CLAY (Topsoil)	0.0-0.25		L	3.5		M	3	5.0	22		< 0.02	< 0.005	< 3	n/a	n/a	22	1.1	1.9
		0.25-0.5		L	3.7		M	2											
		0.5-0.75		L	4.9		M	4											
		0.75-1.0		L	6.3		L	4											
	Silty CLAY	1.0-1.25		L	7.0		L	4	5.6	13		< 0.02	< 0.005	< 3	n/a	n/a	13	0.7	1.1
		1.25-1.5		L	6.9		L	4											
		1.5-1.75		L	7.6		L	4											
		1.75-2.0		L	7.5		L	4											
		2.0-2.25		L	6.7		L	4											
		2.25-2.5		L	7.5		L	4	5.7	5.4		< 0.02	< 0.005	< 3	n/a	n/a	5.4	0.3	0.5
		2.5-2.75		L	7.1		L	2											
		2.75-3.0		L	6.7		L	4											
		3.0-3.25		L	6.4		L	2											
		3.25-3.5		L	6.3		L	2	5.6	5.8		< 0.02	< 0.005	< 3	n/a	n/a	5.8	0.3	0.5

Location & Depth (m)		Soil Type		pH _F		AASS likelihood ¹		pH _{Fox}		PASS likelihood ²		Reaction		pH KCl		Titratable Actual Acidity		S _{KCl}		Chromium Reducible Sulfur		S _{NAS}		ANC _{bt}		Net Acidity (Existing + Potential)		Indicative Lime Rate		
				pH Unit		pH Unit		pH Unit									mole H+ / t		%S	%S	mole H+ / t		mole H+ / t	mole H+ / t	mole H+ / t	mole H+ / t	kg CaCO ₃ /t	kg CaCO ₃ /m ³		
BH18	0.0-0.25	Silty CLAY (Topsoil)		6.0	L	3.5	M	4				4																		
	0.25-0.5			6.6	L	4.7	L	4				4																		
	0.5-0.75			7.8	L	7.7	L	4				4	6.2	4.9	< 0.02	< 0.005	< 3	n/a					n/a		n/a	4.9	0.2	0.4		
	0.75-1.0			8.5	L	8.4	L	4				4																		
	1.0-1.25			8.6	L	8.6	L	4				4																		
	1.25-1.5			8.8	L	8.7	L	4				4																		
	1.5-1.75			8.7	L	8.8	L	4				4																		
	1.75-2.0			8.8	L	8.9	L	4				4	7.5	< 2	< 0.02	< 0.005	< 3	n/a					n/a	190	0	0.0	0.0			
	2.0-2.25			8.9	L	8.9	L	4				4																		
	2.25-2.5			9.0	L	9.0	L	4				4																		
	2.5-2.75			8.9	L	8.9	L	4				4																		
	2.75-3.0			8.8	L	8.8	L	4				4																		
	3.0-3.25			9.0	L	9.2	L	4				4																		
	3.25-3.5			8.7	L	9.0	L	4				4																		
BH19	0.0-0.25	Silty CLAY (Topsoil)		5.8	L	3.1	M	3				3																		
	0.25-0.5			6.2	L	3.3	M	4				4	4.8	38	< 0.02	< 0.005	< 3	n/a					n/a	n/a	38	1.9	3.2			
	0.5-0.75			6.5	L	3.7	M	4				4																		
	0.75-1.0			7.1	L	4.9	M	2				2																		
	1.0-1.25			7.0	L	5.2	L	4				4	5.6	8	< 0.02	< 0.005	< 3	n/a					n/a	n/a	8	0.4	0.7			
	1.25-1.5			6.8	L	6.0	L	4				4																		
	1.5-1.75			7.5	L	6.8	L	4				4																		
	1.75-2.0			7.3	L	6.9	L	4				4																		
	2.0-2.25			7.5	L	6.1	L	2				2																		
	2.25-2.5			7.9	L	6.0	L	2				2	5.7	5.4	< 0.02	< 0.005	< 3	n/a					n/a	n/a	5.4	0.3	0.5			
	2.5-2.75			7.6	L	6.4	L	4				4																		
	2.75-3.0			7.6	L	6.5	L	4				4																		
	3.0-3.25			7.6	L	6.7	L	4				4	5.6	7.9	< 0.02	< 0.005	< 3	n/a					n/a	n/a	7.9	0.4	0.7			
	3.25-3.5			7.5	L	7.0	L	4				4																		

Notes:

- Actual Acid Sulfate Soil (AASS) likelihood is indicated by Low (L & no shading)(pH > 5), Medium (M & yellow shade)(pH 5 ≤ pH < 4) and High (H & red shade)(pH ≤ 4).
- Potential Acid Sulfate Soil (PASS) likelihood is indicated by Low (L & no shading, where pHFOX is > 4 and Δ pH from pHF to pHFOX is ≥ 2 pH units OR pHFOX is < 4) and High (H and red shade)(change from pHF to pHFOX is ≥ 2 pH units AND pHFOX is < 3).
- Reaction 1 = Nil to slight reaction, 2 = Moderate reaction, 3 = Strong reaction (persistent froth), 4 = Extreme reaction.
- Shaded TAA & SCR results are those exceeding the QASSIT action levels of 18 mol H+/t or 0.03 %S (< 18 mol H+/t or 0.03 %S (< 18 mol H+/t Orange, > 63 mol H+/t Red).
- Required Lime Rate is calculated from the net Acid-Base Account (utilising 50% of existing ANC), with a factor of safety = 1.5 for ASS material and bulk density of 1.7 t/m³. NIR = Not Required

Tectonic Geotechnical Pty Ltd
924 David Low Way
Marcoola
QLD 4564



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 Arrangement for the mutual recognition of the
 equivalence of testing, medical testing, calibration,
 inspection, proficiency testing scheme providers and
 reference materials producers reports and certificates.

Attention: **Mark Thomson**

Report **1211452-S**
Project name **NORTH HARBOUR**
Project ID **25096**
Received Date **Apr 17, 2025**

Client Sample ID			BH1 - 0.0-0.25m	BH1 - 0.25-0.5m	BH1 - 0.5-0.75m	BH1 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054774	B25-Ap0054775	B25-Ap0054776	B25-Ap0054777
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.0	4.9	5.1	4.8
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.3	3.0	3.1	3.2
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	3.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	4.7	-	-
Titratable Actual Acidity (NLM-3.2)	2	mol H+/t	-	58	-	-
Titratable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	0.090	-	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	0.010	-	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	6.1	-	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	0.040	-	-
HCl Extractable Sulfur	0.005	% S	-	N/A	-	-
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	N/A	-	-
HCl Extractable Sulfur Correction Factor	1	factor	-	2.0	-	-
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	-	N/A	-	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	N/A	-	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	-	N/A	-	-
ANC Fineness Factor		factor	-	1.5	-	-
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	0.10	-	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	-	64	-	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	-	4.8	-	-
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	110	-	-
>2mm Fraction	0.005	g	-	1.1	-	-
Analysed Material	0.1	%	-	99	-	-
Extraneous Material	0.1	%	-	1.0	-	-
Sample Properties						
% Moisture	1	%	-	25	-	-

Client Sample ID			BH1 - 1.0-1.25m	BH1 - 1.25-1.5m	BH1 - 1.5-1.75m	BH1 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054778	B25-Ap0054779	B25-Ap0054780	B25-Ap0054781
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	4.4	4.9	4.5	4.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.3	3.4	3.6	3.4
Reaction Ratings**S05	0	comment	3.0	2.0	3.0	3.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	-	4.3	-
Titrateable Actual Acidity (NLM-3.2)	2	mol H+/t	-	-	70	-
Titrateable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	-	0.11	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	-	< 0.005	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	-	< 3	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	-	0.050	-
HCl Extractable Sulfur	0.005	% S	-	-	0.070	-
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	-	0.039	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	-	0.029	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	-	18	-
HCl Extractable Sulfur Correction Factor	1	factor	-	-	2.0	-
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	-	-	N/A	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	-	N/A	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	-	-	N/A	-
ANC Fineness Factor		factor	-	-	1.5	-
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	-	0.14	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	-	-	89	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	-	-	6.7	-
Chromium Suite (SKCl) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	-	72	-
>2mm Fraction	0.005	g	-	-	1.2	-
Analysed Material	0.1	%	-	-	98	-
Extraneous Material	0.1	%	-	-	1.7	-
Sample Properties						
% Moisture	1	%	-	-	23	-

Client Sample ID			BH2 - 0.0-0.25m	BH2 - 0.25-0.5m	BH2 - 0.5-0.75m	BH2 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054782	B25-Ap0054783	B25-Ap0054784	B25-Ap0054785
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	4.9	4.7	4.6	4.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	2.8	2.8	3.1	3.2
Reaction Ratings**S05	0	comment	4.0	4.0	3.0	3.0

Client Sample ID			BH2 - 0.0-0.25m	BH2 - 0.25-0.5m	BH2 - 0.5-0.75m	BH2 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054782	B25-Ap0054783	B25-Ap0054784	B25-Ap0054785
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	-	4.4	-
Titrateable Actual Acidity (NLM-3.2)	2	mol H+/t	-	-	70	-
Titrateable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	-	0.11	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	-	0.010	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	-	6.2	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	-	0.040	-
HCl Extractable Sulfur	0.005	% S	-	-	0.040	-
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	-	0.006	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	-	< 0.005	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	-	2.6	-
HCl Extractable Sulfur Correction Factor	1	factor	-	-	2.0	-
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	-	-	N/A	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	-	N/A	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	-	-	N/A	-
ANC Fineness Factor		factor	-	-	1.5	-
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	-	0.13	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	-	-	79	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	-	-	5.9	-
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	-	93	-
>2mm Fraction	0.005	g	-	-	< 0.005	-
Analysed Material	0.1	%	-	-	100	-
Extraneous Material	0.1	%	-	-	< 0.1	-
Sample Properties						
% Moisture	1	%	-	-	24	-

Client Sample ID			BH2 - 1.0-1.25m	BH2 - 1.25-1.5m	BH2 - 1.5-1.75m	BH2 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054786	B25-Ap0054787	B25-Ap0054788	B25-Ap0054789
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	4.0	4.1	3.8	3.9
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.0	3.0	2.9	2.9
Reaction Ratings ^{S05}	0	comment	3.0	3.0	3.0	3.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	-	-	4.2
Titrateable Actual Acidity (NLM-3.2)	2	mol H+/t	-	-	-	130
Titrateable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	-	-	0.21

Client Sample ID			BH2 - 1.0-1.25m	BH2 - 1.25-1.5m	BH2 - 1.5-1.75m	BH2 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054786	B25-Ap0054787	B25-Ap0054788	B25-Ap0054789
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	-	-	< 0.005
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	-	-	< 3
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	-	-	0.030
HCl Extractable Sulfur	0.005	% S	-	-	-	0.41
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	-	-	0.75
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	-	-	0.57
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	-	-	350
HCl Extractable Sulfur Correction Factor	1	factor	-	-	-	2.0
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	-	-	-	N/A
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	-	-	N/A
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	-	-	-	N/A
ANC Fineness Factor		factor	-	-	-	1.5
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	-	-	0.78
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	-	-	-	490
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	-	-	-	37
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	-	-	69
>2mm Fraction	0.005	g	-	-	-	< 0.005
Analysed Material	0.1	%	-	-	-	100
Extraneous Material	0.1	%	-	-	-	< 0.1
Sample Properties						
% Moisture	1	%	-	-	-	26

Client Sample ID			BH3 - 0.0-0.25m	BH3 - 0.25-0.5m	BH3 - 0.5-0.75m	BH3 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054790	B25-Ap0054791	B25-Ap0054792	B25-Ap0054793
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.6	5.7	6.8	7.0
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.1	3.6	3.9	5.4
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	3.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	-	5.7	-
Titratable Actual Acidity (NLM-3.2)	2	mol H+/t	-	-	19	-
Titratable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	-	0.030	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	-	< 0.005	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	-	< 3	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	-	0.010	-
HCl Extractable Sulfur	0.005	% S	-	-	N/A	-

Client Sample ID			BH3 - 0.0-0.25m	BH3 - 0.25-0.5m	BH3 - 0.5-0.75m	BH3 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054790	B25-Ap0054791	B25-Ap0054792	B25-Ap0054793
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	-	N/A	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	-	N/A	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	-	N/A	-
HCl Extractable Sulfur Correction Factor	1	factor	-	-	2.0	-
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	-	-	N/A	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	-	N/A	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	-	-	N/A	-
ANC Fineness Factor		factor	-	-	1.5	-
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	-	0.03	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	-	-	19	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	-	-	1.4	-
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	-	100	-
>2mm Fraction	0.005	g	-	-	< 0.005	-
Analysed Material	0.1	%	-	-	100	-
Extraneous Material	0.1	%	-	-	< 0.1	-
Sample Properties						
% Moisture	1	%	-	-	21	-

Client Sample ID			BH3 - 1.0-1.25m	BH3 - 1.25-1.5m	BH3 - 1.5-1.75m	BH3 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054794	B25-Ap0054795	B25-Ap0054796	B25-Ap0054797
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.7	4.7	4.7	4.5
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.2	3.5	3.5	3.6
Reaction Ratings* ^{S05}	0	comment	3.0	3.0	2.0	3.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	-	4.6	-
Titratable Actual Acidity (NLM-3.2)	2	mol H+/t	-	-	47	-
Titratable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	-	0.070	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	-	< 0.005	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	-	< 3	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	-	0.040	-
HCl Extractable Sulfur	0.005	% S	-	-	N/A	-
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	-	N/A	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	-	N/A	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	-	N/A	-
HCl Extractable Sulfur Correction Factor	1	factor	-	-	2.0	-

Client Sample ID			BH3 - 1.0-1.25m	BH3 - 1.25-1.5m	BH3 - 1.5-1.75m	BH3 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054794	B25-Ap0054795	B25-Ap0054796	B25-Ap0054797
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO ₃	-	-	N/A	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	-	N/A	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H ⁺ /t	-	-	N/A	-
ANC Fineness Factor		factor	-	-	1.5	-
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	-	0.07	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H ⁺ /t	-	-	47	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO ₃ /t	-	-	3.5	-
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	-	56	-
>2mm Fraction	0.005	g	-	-	< 0.005	-
Analysed Material	0.1	%	-	-	100	-
Extraneous Material	0.1	%	-	-	< 0.1	-
Sample Properties						
% Moisture	1	%	-	-	18	-

Client Sample ID			BH4 - 0.0-0.25m	BH4 - 0.25-0.5m	BH4 - 0.5-0.75m	BH4 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054798	B25-Ap0054799	B25-Ap0054800	B25-Ap0054801
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.6	5.8	7.1	6.6
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.5	3.7	5.3	5.2
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	3.0	3.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	5.2	-	-
Titrateable Actual Acidity (NLM-3.2)	2	mol H ⁺ /t	-	31	-	-
Titrateable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	0.050	-	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	< 0.005	-	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H ⁺ /t	-	< 3	-	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	0.010	-	-
HCl Extractable Sulfur	0.005	% S	-	N/A	-	-
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H ⁺ /t	-	N/A	-	-
HCl Extractable Sulfur Correction Factor	1	factor	-	2.0	-	-
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO ₃	-	N/A	-	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	N/A	-	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H ⁺ /t	-	N/A	-	-
ANC Fineness Factor		factor	-	1.5	-	-

Client Sample ID			BH4 - 0.0-0.25m	BH4 - 0.25-0.5m	BH4 - 0.5-0.75m	BH4 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054798	B25-Ap0054799	B25-Ap0054800	B25-Ap0054801
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	0.05	-	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	-	31	-	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	-	2.3	-	-
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	86	-	-
>2mm Fraction	0.005	g	-	< 0.005	-	-
Analysed Material	0.1	%	-	100	-	-
Extraneous Material	0.1	%	-	< 0.1	-	-
Sample Properties						
% Moisture	1	%	-	24	-	-

Client Sample ID			BH4 - 1.0-1.25m	BH4 - 1.25-1.5m	BH4 - 1.5-1.75m	BH4 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054802	B25-Ap0054803	B25-Ap0054804	B25-Ap0054805
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.0	4.8	4.9	4.8
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.9	3.9	3.9	3.9
Reaction Ratings ^{S05}	0	comment	3.0	3.0	3.0	3.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	-	4.6	-
Titrateable Actual Acidity (NLM-3.2)	2	mol H+/t	-	-	40	-
Titrateable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	-	0.060	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	-	< 0.005	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	-	< 3	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	-	0.060	-
HCl Extractable Sulfur	0.005	% S	-	-	N/A	-
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	-	N/A	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	-	N/A	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	-	N/A	-
HCl Extractable Sulfur Correction Factor	1	factor	-	-	2.0	-
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	-	-	N/A	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	-	N/A	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	-	-	N/A	-
ANC Fineness Factor		factor	-	-	1.5	-
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	-	0.06	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	-	-	40	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	-	-	3.0	-

Client Sample ID			BH4 - 1.0-1.25m	BH4 - 1.25-1.5m	BH4 - 1.5-1.75m	BH4 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054802	B25-Ap0054803	B25-Ap0054804	B25-Ap0054805
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	-	54	-
>2mm Fraction	0.005	g	-	-	< 0.005	-
Analysed Material	0.1	%	-	-	100	-
Extraneous Material	0.1	%	-	-	< 0.1	-
Sample Properties						
% Moisture	1	%	-	-	20	-

Client Sample ID			BH5 - 0.0-0.25m	BH5 - 0.25-0.5m	BH5 - 0.5-0.75m	BH5 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054806	B25-Ap0054807	B25-Ap0054808	B25-Ap0054809
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.8	5.9	6.0	6.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.3	3.9	3.7	3.8
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	3.0	3.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	5.4	-	-
Titrateable Actual Acidity (NLM-3.2)	2	mol H+/t	-	25	-	-
Titrateable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	0.040	-	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	< 0.005	-	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	< 3	-	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	0.030	-	-
HCl Extractable Sulfur	0.005	% S	-	N/A	-	-
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	N/A	-	-
HCl Extractable Sulfur Correction Factor	1	factor	-	2.0	-	-
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	-	N/A	-	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	N/A	-	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	-	N/A	-	-
ANC Fineness Factor		factor	-	1.5	-	-
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	0.04	-	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	-	25	-	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	-	1.9	-	-
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	97	-	-
>2mm Fraction	0.005	g	-	< 0.005	-	-
Analysed Material	0.1	%	-	100	-	-
Extraneous Material	0.1	%	-	< 0.1	-	-

Client Sample ID			BH5 - 0.0-0.25m	BH5 - 0.25-0.5m	BH5 - 0.5-0.75m	BH5 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054806	B25-Ap0054807	B25-Ap0054808	B25-Ap0054809
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Sample Properties						
% Moisture	1	%	-	24	-	-

Client Sample ID			BH5 - 1.0-1.25m	BH5 - 1.25-1.5m	BH5 - 1.5-1.75m	BH5 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054810	B25-Ap0054811	B25-Ap0054812	B25-Ap0054813
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	4.9	4.8	4.9	5.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.6	3.6	4.0	3.7
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	-	4.4	-
Titrateable Actual Acidity (NLM-3.2)	2	mol H+/t	-	-	85	-
Titrateable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	-	0.14	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	-	< 0.005	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	-	< 3	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	-	0.030	-
HCl Extractable Sulfur	0.005	% S	-	-	0.030	-
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	-	0.017	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	-	0.013	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	-	8.0	-
HCl Extractable Sulfur Correction Factor	1	factor	-	-	2.0	-
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	-	-	N/A	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	-	N/A	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	-	-	N/A	-
ANC Fineness Factor		factor	-	-	1.5	-
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	-	0.15	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	-	-	93	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	-	-	7.0	-
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	-	32	-
>2mm Fraction	0.005	g	-	-	< 0.005	-
Analysed Material	0.1	%	-	-	100	-
Extraneous Material	0.1	%	-	-	< 0.1	-
Sample Properties						
% Moisture	1	%	-	-	32	-

Client Sample ID			BH6 - 0.0-0.25m	BH6 - 0.25-0.5m	BH6 - 0.5-0.75m	BH6 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054814	B25-Ap0054815	B25-Ap0054816	B25-Ap0054817
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.7	5.8	4.8	4.8
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.1	3.6	3.6	4.0
Reaction Ratings**S05	0	comment	4.0	4.0	4.0	4.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	4.9	-	-
Titratable Actual Acidity (NLM-3.2)	2	mol H+/t	-	46	-	-
Titratable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	0.070	-	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	0.009	-	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	5.8	-	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	0.010	-	-
HCl Extractable Sulfur	0.005	% S	-	N/A	-	-
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	N/A	-	-
HCl Extractable Sulfur Correction Factor	1	factor	-	2.0	-	-
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	-	N/A	-	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	N/A	-	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	-	N/A	-	-
ANC Fineness Factor		factor	-	1.5	-	-
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	0.08	-	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	-	52	-	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	-	3.9	-	-
Chromium Suite (SKCl) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	91	-	-
>2mm Fraction	0.005	g	-	< 0.005	-	-
Analysed Material	0.1	%	-	100	-	-
Extraneous Material	0.1	%	-	< 0.1	-	-
Sample Properties						
% Moisture	1	%	-	33	-	-

Client Sample ID			BH6 - 1.0-1.25m	BH6 - 1.25-1.5m	BH6 - 1.5-1.75m	BH6 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054818	B25-Ap0054819	B25-Ap0054820	B25-Ap0054821
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	4.5	5.1	4.7	4.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.9	3.5	4.0	3.9
Reaction Ratings**S05	0	comment	4.0	2.0	4.0	4.0

Client Sample ID			BH6 - 1.0-1.25m	BH6 - 1.25-1.5m	BH6 - 1.5-1.75m	BH6 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054818	B25-Ap0054819	B25-Ap0054820	B25-Ap0054821
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	4.4	-	-
Titratable Actual Acidity (NLM-3.2)	2	mol H+/t	-	60	-	-
Titratable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	0.10	-	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	< 0.005	-	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	< 3	-	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	0.030	-	-
HCl Extractable Sulfur	0.005	% S	-	0.040	-	-
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	0.005	-	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	< 0.005	-	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	2.2	-	-
HCl Extractable Sulfur Correction Factor	1	factor	-	2.0	-	-
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	-	N/A	-	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	N/A	-	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	-	N/A	-	-
ANC Fineness Factor		factor	-	1.5	-	-
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	0.10	-	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	-	62	-	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	-	4.7	-	-
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	130	-	-
>2mm Fraction	0.005	g	-	< 0.005	-	-
Analysed Material	0.1	%	-	100	-	-
Extraneous Material	0.1	%	-	< 0.1	-	-
Sample Properties						
% Moisture	1	%	-	31	-	-

Client Sample ID			BH7 - 0.0-0.25m	BH7 - 0.25-0.5m	BH7 - 0.5-0.75m	BH7 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054822	B25-Ap0054823	B25-Ap0054824	B25-Ap0054825
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.5	5.8	5.6	5.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.1	3.3	3.6	4.1
Reaction Ratings ^{S05}	0	comment	4.0	4.0	4.0	4.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	4.6	-	-
Titratable Actual Acidity (NLM-3.2)	2	mol H+/t	-	53	-	-
Titratable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	0.080	-	-

Client Sample ID			BH7 - 0.0-0.25m	BH7 - 0.25-0.5m	BH7 - 0.5-0.75m	BH7 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054822	B25-Ap0054823	B25-Ap0054824	B25-Ap0054825
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	< 0.005	-	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	< 3	-	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	< 0.005	-	-
HCl Extractable Sulfur	0.005	% S	-	N/A	-	-
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	N/A	-	-
HCl Extractable Sulfur Correction Factor	1	factor	-	2.0	-	-
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	-	N/A	-	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	N/A	-	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	-	N/A	-	-
ANC Fineness Factor		factor	-	1.5	-	-
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	0.08	-	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	-	53	-	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	-	4.0	-	-
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	120	-	-
>2mm Fraction	0.005	g	-	< 0.005	-	-
Analysed Material	0.1	%	-	100	-	-
Extraneous Material	0.1	%	-	< 0.1	-	-
Sample Properties						
% Moisture	1	%	-	23	-	-

Client Sample ID			BH7 - 1.0-1.25m	BH7 - 1.25-1.5m	BH7 - 1.5-1.75m	BH7 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054826	B25-Ap0054827	B25-Ap0054828	B25-Ap0054829
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.5	5.5	5.2	4.5
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.1	3.9	3.8	2.6
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	-	4.6	-
Titrateable Actual Acidity (NLM-3.2)	2	mol H+/t	-	-	46	-
Titrateable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	-	0.070	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	-	< 0.005	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	-	< 3	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	-	< 0.005	-
HCl Extractable Sulfur	0.005	% S	-	-	N/A	-

Client Sample ID			BH7 - 1.0-1.25m	BH7 - 1.25-1.5m	BH7 - 1.5-1.75m	BH7 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054826	B25-Ap0054827	B25-Ap0054828	B25-Ap0054829
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	-	N/A	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	-	N/A	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	-	N/A	-
HCl Extractable Sulfur Correction Factor	1	factor	-	-	2.0	-
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	-	-	N/A	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	-	N/A	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	-	-	N/A	-
ANC Fineness Factor		factor	-	-	1.5	-
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	-	0.07	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	-	-	46	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	-	-	3.5	-
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	-	51	-
>2mm Fraction	0.005	g	-	-	< 0.005	-
Analysed Material	0.1	%	-	-	100	-
Extraneous Material	0.1	%	-	-	< 0.1	-
Sample Properties						
% Moisture	1	%	-	-	20	-

Client Sample ID			BH8 - 0.0-0.25m	BH8 - 0.25-0.5m	BH8 - 0.5-0.75m	BH8 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054830	B25-Ap0054831	B25-Ap0054832	B25-Ap0054833
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.7	5.9	6.4	6.5
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.6	4.2	4.5	4.9
Reaction Ratings* ^{S05}	0	comment	4.0	4.0	4.0	4.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	4.9	-	-
Titratable Actual Acidity (NLM-3.2)	2	mol H+/t	-	51	-	-
Titratable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	0.080	-	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	< 0.005	-	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	-	< 3	-	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	< 0.005	-	-
HCl Extractable Sulfur	0.005	% S	-	N/A	-	-
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	-	N/A	-	-
HCl Extractable Sulfur Correction Factor	1	factor	-	2.0	-	-

Client Sample ID			BH8 - 0.0-0.25m	BH8 - 0.25-0.5m	BH8 - 0.5-0.75m	BH8 - 0.75-1.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054830	B25-Ap0054831	B25-Ap0054832	B25-Ap0054833
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO ₃	-	N/A	-	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	N/A	-	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H ⁺ /t	-	N/A	-	-
ANC Fineness Factor		factor	-	1.5	-	-
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	0.08	-	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H ⁺ /t	-	51	-	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO ₃ /t	-	3.8	-	-
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	52	-	-
>2mm Fraction	0.005	g	-	< 0.005	-	-
Analysed Material	0.1	%	-	100	-	-
Extraneous Material	0.1	%	-	< 0.1	-	-
Sample Properties						
% Moisture	1	%	-	24	-	-

Client Sample ID			BH8 - 1.0-1.25m	BH8 - 1.25-1.5m	BH8 - 1.5-1.75m	BH8 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054834	B25-Ap0054835	B25-Ap0054836	B25-Ap0054837
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.5	6.6	5.2	4.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.2	5.1	4.2	4.2
Reaction Ratings ^{S05}	0	comment	4.0	4.0	4.0	4.0
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	-	5.4	-	-
Titrateable Actual Acidity (NLM-3.2)	2	mol H ⁺ /t	-	17	-	-
Titrateable Actual Acidity (NLM-3.2)	0.003	% pyrite S	-	0.030	-	-
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	-	< 0.005	-	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H ⁺ /t	-	< 3	-	-
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	-	< 0.005	-	-
HCl Extractable Sulfur	0.005	% S	-	N/A	-	-
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.005	% S	-	N/A	-	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H ⁺ /t	-	N/A	-	-
HCl Extractable Sulfur Correction Factor	1	factor	-	2.0	-	-
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO ₃	-	N/A	-	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	-	N/A	-	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H ⁺ /t	-	N/A	-	-
ANC Fineness Factor		factor	-	1.5	-	-

Client Sample ID			BH8 - 1.0-1.25m	BH8 - 1.25-1.5m	BH8 - 1.5-1.75m	BH8 - 1.75-2.0m
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B25-Ap0054834	B25-Ap0054835	B25-Ap0054836	B25-Ap0054837
Date Sampled			Apr 14, 2025	Apr 14, 2025	Apr 14, 2025	Apr 14, 2025
Test/Reference	LOR	Unit				
Net Acidity (Including ANC)						
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	-	0.03	-	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H ⁺ /t	-	17	-	-
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO ₃ /t	-	1.3	-	-
Chromium Suite (SKCI) - NASSG (Excluding ANC)						
<2mm Fraction	0.005	g	-	81	-	-
>2mm Fraction	0.005	g	-	< 0.005	-	-
Analysed Material	0.1	%	-	100	-	-
Extraneous Material	0.1	%	-	< 0.1	-	-
Sample Properties						
% Moisture	1	%	-	19	-	-

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Acid Sulfate Soils Field pH Test	Brisbane	Apr 23, 2025	7 Days
- Method: LTM-GEN-7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests			
Chromium Suite (SKCI) - NASSG (Excluding ANC)	Brisbane	Apr 23, 2025	6 Week
- Method: LTM-GEN-7070			
% Moisture	Brisbane	Apr 22, 2025	14 Days
- Method: LTM-GEN-7080 Moisture			

email: EnviroSales@eurofinsanz.com

Marcoola
QLD 4564

NORTH HARBOUR
25096

Phone: 07 5478 9642
Fax:

Priority: 5 Day
Contact Name: Mark Thomson

Eurofins Analytical Services Manager : Paige Howarth

Sample Detail								
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780								
External Laboratory								
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID			
1	BH1 - 0.0-0.25m	Apr 14, 2025		Soil	B25-Ap0054774	X		X
2	BH1 - 0.25-0.5m	Apr 14, 2025		Soil	B25-Ap0054775	X		X
3	BH1 - 0.5-0.75m	Apr 14, 2025		Soil	B25-Ap0054776	X		X
4	BH1 - 0.75-1.0m	Apr 14, 2025		Soil	B25-Ap0054777	X		X
5	BH1 - 1.0-1.25m	Apr 14, 2025		Soil	B25-Ap0054778	X		X
6	BH1 - 1.25-1.5m	Apr 14, 2025		Soil	B25-Ap0054779	X		X
7	BH1 - 1.5-1.75m	Apr 14, 2025		Soil	B25-Ap0054780	X		X
8	BH1 - 1.75-2.0m	Apr 14, 2025		Soil	B25-Ap0054781	X		X
9	BH2 - 0.0-	Apr 14, 2025		Soil	B25-Ap0054782	X		X



ABN: 50 005 085 521

NZBN: 9429046024954

ABN: 91 05 0159 898

				Geelong		Sydney		Canberra		Brisbane		Newcastle		Perth		Auckland		Auckland (Focus)		Christchurch		Tauranga	
Melbourne				19/8 Lewalan Street		179 Magowar Road		Unit 1, 2 Dacre Street		1/21 Smallwood Place		1/2 Frost Drive		46-48 Banksia Road		35 O'Rourke Road		Unit C/14 Pacific Rise		43 Detroit Drive		1277 Cameron Road	
6 Monterey Road				Grovedale		Girraween		Mitchell		Murarie		Mayfield West		Welshpool		Penrose		Mount Wellington		Rolleston		Gate Pa	
VIC 3175				VIC 3216		NSW 2145		ACT 2911		QLD 4172		NSW 2304		WA 6106		Auckland 1061		Auckland 1061		Christchurch 7675		Tauranga 3112	
+61 3 8564 5000				+61 3 8564 5000		+61 2 9900 8400		+61 2 6113 8091		+61 7 3902 4600		+61 2 4968 8448		+61 8 6253 4444		+64 9 526 4551		+64 9 525 0568		+64 3 343 5201		+64 9 525 0568	
NATA# 1261				NATA# 1261		NATA# 1261		NATA# 1261		NATA# 1261		NATA# 1261		NATA# 2377		NATA# 1327		IANZ# 1290		IANZ# 1290		IANZ# 1402	
Site# 1254				Site# 25403		Site# 18217		Site# 25466		Site# 20794 & 2780		Site# 25079		Site# 2370 & 2554				IANZ# 1308					

web: www.eurofins.com.au
email: EnviroSales@eurofinsanz.com

Company Name: Tectonic Geotechnical Pty Ltd
Address: 924 David Low Way
Marcoola
QLD 4564

Project Name: NORTH HARBOUR
Project ID: 25096

Order No.: 25096
Report #: 1211452
Phone: 07 5478 9642
Fax:

Received: Apr 17, 2025 6:10 PM
Due: Apr 30, 2025
Priority: 5 Day
Contact Name: Mark Thomson

Eurofins Analytical Services Manager : Paige Howarth

Sample Detail												Chromium Suite (SKCI) - NASSG (Excluding ANC)
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780												Moisture Set
10	BH2 - 0.25-0.5m	Apr 14, 2025			Soil						B25-Ap0054783	X
11	BH2 - 0.5-0.75m	Apr 14, 2025			Soil						B25-Ap0054784	X
12	BH2 - 0.75-1.0m	Apr 14, 2025			Soil						B25-Ap0054785	X
13	BH2 - 1.0-1.25m	Apr 14, 2025			Soil						B25-Ap0054786	X
14	BH2 - 1.25-1.5m	Apr 14, 2025			Soil						B25-Ap0054787	X
15	BH2 - 1.5-1.75m	Apr 14, 2025			Soil						B25-Ap0054788	X
16	BH2 - 1.75-2.0m	Apr 14, 2025			Soil						B25-Ap0054789	X
17	BH3 - 0.0-0.25m	Apr 14, 2025			Soil						B25-Ap0054790	X
18	BH3 - 0.25-0.5m	Apr 14, 2025			Soil						B25-Ap0054791	X
19	BH3 - 0.5-	Apr 14, 2025			Soil						B25-Ap0054792	X



ABN: 50 005 085 521

ABN: 91 05 0159 898

NZBN: 9429046024954

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle	Perth	Auckland	Auckland (Focus)	Christchurch	Tauranga
6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1, 2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarie QLD 4172 +61 7 3902 4600 NATA# 1261 Site# 20794 & 2780	1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079	46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370 & 2554	35 O'Rourke Road Penrose Auckland 1061 +64 9 526 4551 IANZ# 1327	Unit C/14 Pacific Rise Mount Wellington Auckland 1061 +64 9 525 0568 IANZ# 1308	43 Detroit Drive Rolleston Christchurch 7675 +64 3 343 5201 IANZ# 1290	1277 Cameron Road Gate Pa Tauranga 3112 +64 9 525 0568 IANZ# 1402

web: www.eurofins.com.au
email: EnviroSales@eurofinsanz.com

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Address: 924 David Low Way
Marcoola
QLD 4564

Project Name: NORTH HARBOUR
Project ID: 25096

Order No.: 25096
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Phone: 07 5478 9642
Fax:

Received: Apr 17, 2025 6:10 PM
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Contact Name: Mark Thomson

Eurofins Analytical Services Manager : Paige Howarth

Sample Detail										Aluminium	Aluminium (filtered)	Chloride	Iron	Iron (filtered)	Sulphate (as SO4)	Acid Sulfate Soils Field pH Test	Moisture Set	Chromium Suite (SKCI) - NASSG (Excluding ANC)
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780										X	X	X	X	X	X	X	X	X
19	BH3 - 0.5-0.75m	Apr 14, 2025		Soil					B25-Ap0054792									
20	BH3 - 0.75-1.0m	Apr 14, 2025		Soil					B25-Ap0054793						X			
21	BH3 - 1.0-1.25m	Apr 14, 2025		Soil					B25-Ap0054794						X			
22	BH3 - 1.25-1.5m	Apr 14, 2025		Soil					B25-Ap0054795						X			
23	BH3 - 1.5-1.75m	Apr 14, 2025		Soil					B25-Ap0054796						X		X	
24	BH3 - 1.75-2.0m	Apr 14, 2025		Soil					B25-Ap0054797						X			
25	BH4 - 0.0-0.25m	Apr 14, 2025		Soil					B25-Ap0054798						X			
26	BH4 - 0.25-0.5m	Apr 14, 2025		Soil					B25-Ap0054799						X		X	
27	BH4 - 0.5-0.75m	Apr 14, 2025		Soil					B25-Ap0054800						X			
28	BH4 - 0.75-1.0m	Apr 14, 2025		Soil					B25-Ap0054801						X			



ABN: 50 005 085 521

NZBN: 9429046024954

ABN: 91 05 0159 898

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle	Perth	Auckland	Auckland (Focus)	Christchurch	Tauranga
6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarie QLD 4172 +61 7 3902 4600 NATA# 1261 Site# 20794 & 2780	1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079	46/48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370 & 2554	35 O'Rourke Road Penrose Auckland 1061 +64 9 526 4551 IANZ# 1327	Unit C/14 Pacific Rise Mount Wellington Auckland 1061 +64 9 525 0568 IANZ# 1308	43 Detroit Drive Rolleston Christchurch 7675 +64 3 343 5201 IANZ# 1290	1277 Cameron Road Gate Pa Tauranga 3112 +64 9 525 0568 IANZ# 1402

web: www.eurofins.com.au
email: EnviroSales@eurofinsanz.com

Company Name: Tectonic Geotechnical Pty Ltd
Address: 924 David Low Way
Marcoola
QLD 4564

Project Name: NORTH HARBOUR
Project ID: 25096

Order No.: 25096
Report #: 1211452
Phone: 07 5478 9642
Fax:

Received: Apr 17, 2025 6:10 PM
Due: Apr 30, 2025
Priority: 5 Day
Contact Name: Mark Thomson

Eurofins Analytical Services Manager : Paige Howarth

Sample Detail										Aluminium	Aluminium (filtered)	Chloride	Iron	Iron (filtered)	Sulphate (as SO4)	Acid Sulfate Soils Field pH Test	Moisture Set	Chromium Suite (SKCI) - NASSG (Excluding ANC)
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780										X	X	X	X	X	X	X	X	X
29	BH4 - 1.0-1.25m	Apr 14, 2025		Soil					B25-Ap0054802							X		
30	BH4 - 1.25-1.5m	Apr 14, 2025		Soil					B25-Ap0054803						X			
31	BH4 - 1.5-1.75m	Apr 14, 2025		Soil					B25-Ap0054804						X	X		
32	BH4 - 1.75-2.0m	Apr 14, 2025		Soil					B25-Ap0054805						X			
33	BH5 - 0.0-0.25m	Apr 14, 2025		Soil					B25-Ap0054806						X			
34	BH5 - 0.25-0.5m	Apr 14, 2025		Soil					B25-Ap0054807						X	X		
35	BH5 - 0.5-0.75m	Apr 14, 2025		Soil					B25-Ap0054808						X			
36	BH5 - 0.75-1.0m	Apr 14, 2025		Soil					B25-Ap0054809						X			
37	BH5 - 1.0-1.25m	Apr 14, 2025		Soil					B25-Ap0054810						X	X		
38	BH5 - 1.25-1.5m	Apr 14, 2025		Soil					B25-Ap0054811						X	X		



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Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780													
39	BH5 - 1.5-1.75m	Apr 14, 2025		Soil									
40	BH5 - 1.75-2.0m	Apr 14, 2025		Soil									
41	BH6 - 0.0-0.25m	Apr 14, 2025		Soil									
42	BH6 - 0.25-0.5m	Apr 14, 2025		Soil									
43	BH6 - 0.5-0.75m	Apr 14, 2025		Soil									
44	BH6 - 0.75-1.0m	Apr 14, 2025		Soil									
45	BH6 - 1.0-1.25m	Apr 14, 2025		Soil									
46	BH6 - 1.25-1.5m	Apr 14, 2025		Soil									
47	BH6 - 1.5-1.75m	Apr 14, 2025		Soil									
48	BH6 - 1.75-2.0m	Apr 14, 2025		Soil									

Melbourne

6 Monterey Road
Dandenong South
VIC 3175
+61 3 8564 5000
Site# 1254

Geelong

19/8 Lewalan Street
Grovedale
VIC 3216
+61 3 8564 5000
NATA# 1261
Site# 25403

Sydney

179 Magowar Road
Girraheen
NSW 2145
+61 2 9900 8400
NATA# 1261
Site# 18217

Canberra

Unit 1, 2 Dacre Street
Mitchell
ACT 2911
+61 2 6113 8091
NATA# 1261
Site# 25466

Brisbane

1/21 Smallwood Place
Murarie
QLD 4172
+61 7 3902 4600
NATA# 1261
Site# 20794 & 2780

Newcastle

1/2 Frost Drive
Mayfield West
NSW 2304
+61 2 4968 8448
NATA# 1261
Site# 25079

Perth

46-48 Banksia Road
Welshpool
WA 6106
+61 8 6253 4444
NATA# 2377
Site# 2370 & 2554

www.eurofins.com.au

email: EnviroSales@eurofinsanz.com

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5 Day

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Eurofins Analytical Services Manager : Paige Howarth

Sample Detail					Aluminium	Aluminium (filtered)	Chloride	Iron	Iron (filtered)	Sulphate (as SO4)	Acid Sulfate Soils Field pH Test	Moisture Set	Chromium Suite (SKCI) - NASSG (Excluding ANC)
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780													
49	BH7 - 0.0-0.25m	Apr 14, 2025		Soil					X	X	X	X	X
50	BH7 - 0.25-0.5m	Apr 14, 2025		Soil						X	X	X	X
51	BH7 - 0.5-0.75m	Apr 14, 2025		Soil						X	X		
52	BH7 - 0.75-1.0m	Apr 14, 2025		Soil						X	X		
53	BH7 - 1.0-1.25m	Apr 14, 2025		Soil						X	X		
54	BH7 - 1.25-1.5m	Apr 14, 2025		Soil						X	X		
55	BH7 - 1.5-1.75m	Apr 14, 2025		Soil						X	X	X	X
56	BH7 - 1.75-2.0m	Apr 14, 2025		Soil						X	X		
57	BH8 - 0.0-0.25m	Apr 14, 2025		Soil						X	X		
58	BH8 - 0.25-0.5m	Apr 14, 2025		Soil						X	X	X	X

Date Reported: Apr 30, 2025

Eurofins Environment Testing 1/21 Smallwood Place, Murarie, QLD, Australia 4172

ABN : 50 005 085 521 Tel: +61 7 3902 4600

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Melbourne

6 Monterey Road
Dandenong South
VIC 3175
+61 3 8564 5000
NATA# 1261
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Geelong

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Eurofins Analytical Services Manager : Paige Howarth

Sample Detail										Chromium Suite (SKCI) - NASSG (Excluding ANC)			
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780										Moisture Set			
59	BH8 - 0.5-0.75m	Apr 14, 2025	Soil				B25-Ap0054832			X	X		
60	BH8 - 0.75-1.0m	Apr 14, 2025	Soil				B25-Ap0054833		X				
61	BH8 - 1.0-1.25m	Apr 14, 2025	Soil				B25-Ap0054834		X				
62	BH8 - 1.25-1.5m	Apr 14, 2025	Soil				B25-Ap0054835		X	X	X		
63	BH8 - 1.5-1.75m	Apr 14, 2025	Soil				B25-Ap0054836		X				
64	BH8 - 1.75-2.0m	Apr 14, 2025	Soil				B25-Ap0054837		X				
65	BH6	Apr 14, 2025	Water				B25-Ap0054838	X	X	X	X		
Test Counts										1	1	1	16

Date Reported: Apr 30, 2025

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ABN : 50 005 085 521 Tel: +61 7 3902 4600

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
2. Unless otherwise stated, all soil/sediment/solid results are reported on a dry weight basis.
3. Unless otherwise stated, all biota/food results are reported on a wet weight basis on the edible portion.
4. For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
5. Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
6. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds where annotated.
7. SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
8. Samples were analysed on an 'as received' basis.
9. Information identified in this report with **blue** colour indicates data provided by customers that may have an impact on the results.
10. This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the sampling date; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is seven days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ppm: parts per million
µg/L: micrograms per litre	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony Forming Unit	Colour: Pt-Co Units (CU)	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is ≤30%; however, the following acceptance guidelines are equally applicable:

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 50 – 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test				Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery										
Actual Acidity (NLM-3.2)										
pH-KCL (NLM-3.1)				%	100			80-120	Pass	
Titratable Actual Acidity (NLM-3.2)				%	98			80-120	Pass	
LCS - % Recovery										
Potential Acidity - Chromium Reducible Sulfur										
Chromium Reducible Sulfur (s-SCr) (NLM-2.1)				%	96			80-120	Pass	
LCS - % Recovery										
Extractable Sulfur										
HCl Extractable Sulfur				%	120			80-120	Pass	
Test	Lab Sample ID	QA Source		Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate										
Actual Acidity (NLM-3.2)					Result 1	Result 2	RPD			
pH-KCL (NLM-3.1)	B25-Ap0054775	CP	pH Units		4.7	4.7	1.0	20%	Pass	
Titratable Actual Acidity (NLM-3.2)	B25-Ap0054775	CP	mol H+/t		58	60	4.0	20%	Pass	
Titratable Actual Acidity (NLM-3.2)	B25-Ap0054775	CP	% pyrite S		0.090	0.10	4.0	30%	Pass	
Duplicate										
Potential Acidity - Chromium Reducible Sulfur					Result 1	Result 2	RPD			
Chromium Reducible Sulfur (s-SCr) (NLM-2.1)	B25-Ap0054775	CP	% S		0.010	0.009	4.0	20%	Pass	
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	B25-Ap0054775	CP	mol H+/t		6.1	5.8	4.0	30%	Pass	
Duplicate										
Extractable Sulfur					Result 1	Result 2	RPD			
Sulfur - KCl Extractable	B25-Ap0054775	CP	% S		0.040	0.040	3.0	30%	Pass	
HCl Extractable Sulfur	B25-Ap0054775	CP	% S		N/A	N/A	N/A	20%	Pass	
Duplicate										
Retained Acidity (S-NAS)					Result 1	Result 2	RPD			
Net Acid soluble sulfur (SNAS) NLM-4.1	B25-Ap0054775	CP	% S		N/A	N/A	N/A	30%	Pass	
Net Acid soluble sulfur (s-SNAS) NLM-4.1	B25-Ap0054775	CP	% S		N/A	N/A	N/A	30%	Pass	
Net Acid soluble sulfur (a-SNAS) NLM-4.1	B25-Ap0054775	CP	mol H+/t		N/A	N/A	N/A	30%	Pass	
Duplicate										
Acid Neutralising Capacity (ANCbt)					Result 1	Result 2	RPD			
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	B25-Ap0054775	CP	% CaCO ₃		N/A	N/A	N/A	20%	Pass	
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2)	B25-Ap0054775	CP	% S		N/A	N/A	N/A	30%	Pass	
ANC Fineness Factor	B25-Ap0054775	CP	factor		1.5	1.5	<1	30%	Pass	
Duplicate										
Net Acidity (Including ANC)					Result 1	Result 2	RPD			
s-CRS Suite - Net Acidity - NASSG (including ANC)	B25-Ap0054775	CP	% S		0.10	0.11	3.0	30%	Pass	
CRS Suite - Net Acidity - NASSG (Including ANC)	B25-Ap0054775	CP	mol H+/t		64	66	3.0	30%	Pass	
CRS Suite - Liming Rate - NASSG (Including ANC)	B25-Ap0054775	CP	kg CaCO ₃ /t		4.8	5.0	3.0	30%	Pass	
Duplicate										
Sample Properties					Result 1	Result 2	RPD			
% Moisture	B25-Ap0054775	CP	%		25	25	1.0	30%	Pass	
Duplicate										
Acid Sulfate Soils Field pH Test					Result 1	Result 2	RPD			
pH-F (Field pH test)*	B25-Ap0054777	CP	pH Units		4.8	4.9	pass	20%	Pass	

Duplicate								
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD		
pH-F (Field pH test)*	B25-Ap0054782	CP	pH Units	4.9	4.9	pass	20%	Pass
Duplicate								
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD		
pH-F (Field pH test)*	B25-Ap0054805	CP	pH Units	4.8	4.8	pass	20%	Pass
Duplicate								
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD		
pH-F (Field pH test)*	B25-Ap0054810	CP	pH Units	4.9	5.1	pass	20%	Pass
Duplicate								
Actual Acidity (NLM-3.2)				Result 1	Result 2	RPD		
pH-KCL (NLM-3.1)	B25-Ap0054815	CP	pH Units	4.9	4.9	<1	20%	Pass
Titrateable Actual Acidity (NLM-3.2)	B25-Ap0054815	CP	mol H+/t	46	46	<1	20%	Pass
Titrateable Actual Acidity (NLM-3.2)	B25-Ap0054815	CP	% pyrite S	0.070	0.070	<1	30%	Pass
Duplicate								
Potential Acidity - Chromium Reducible Sulfur				Result 1	Result 2	RPD		
Chromium Reducible Sulfur (s-SCr) (NLM-2.1)	B25-Ap0054815	CP	% S	0.009	0.010	6.0	20%	Pass
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	B25-Ap0054815	CP	mol H+/t	5.8	6.2	6.0	30%	Pass
Duplicate								
Extractable Sulfur				Result 1	Result 2	RPD		
Sulfur - KCl Extractable	B25-Ap0054815	CP	% S	0.010	0.010	30	30%	Pass
HCl Extractable Sulfur	B25-Ap0054815	CP	% S	N/A	N/A	N/A	20%	Pass
Duplicate								
Retained Acidity (S-NAS)				Result 1	Result 2	RPD		
Net Acid soluble sulfur (SNAS) NLM-4.1	B25-Ap0054815	CP	% S	N/A	N/A	N/A	30%	Pass
Net Acid soluble sulfur (s-SNAS) NLM-4.1	B25-Ap0054815	CP	% S	N/A	N/A	N/A	30%	Pass
Net Acid soluble sulfur (a-SNAS) NLM-4.1	B25-Ap0054815	CP	mol H+/t	N/A	N/A	N/A	30%	Pass
Duplicate								
Acid Neutralising Capacity (ANCbt)				Result 1	Result 2	RPD		
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	B25-Ap0054815	CP	% CaCO ₃	N/A	N/A	N/A	20%	Pass
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2)	B25-Ap0054815	CP	% S	N/A	N/A	N/A	30%	Pass
ANC Fineness Factor	B25-Ap0054815	CP	factor	1.5	1.5	<1	30%	Pass
Duplicate								
Net Acidity (Including ANC)				Result 1	Result 2	RPD		
s-CRS Suite - Net Acidity - NASSG (including ANC)	B25-Ap0054815	CP	% S	0.08	0.08	1.0	30%	Pass
CRS Suite - Net Acidity - NASSG (Including ANC)	B25-Ap0054815	CP	mol H+/t	52	52	1.0	30%	Pass
CRS Suite - Liming Rate - NASSG (Including ANC)	B25-Ap0054815	CP	kg CaCO ₃ /t	3.9	3.9	1.0	30%	Pass
Duplicate								
Sample Properties				Result 1	Result 2	RPD		
% Moisture	B25-Ap0054815	CP	%	33	33	3.0	30%	Pass
Duplicate								
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD		
pH-F (Field pH test)*	B25-Ap0054823	CP	pH Units	5.8	5.7	pass	20%	Pass
Duplicate								
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD		
pH-F (Field pH test)*	B25-Ap0054826	CP	pH Units	5.5	5.5	pass	20%	Pass
Duplicate								
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD		
pH-F (Field pH test)*	B25-Ap0054834	CP	pH Units	6.5	6.6	pass	20%	Pass

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within Holding Time	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
S01	Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO ₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m ³ in-situ soil' multiply 'reported results' x 'wet bulk density of soil in t/m ³ '
S02	Retained Acidity is Reported when the pHKCl is less than pH 4.5
S03	Acid Neutralising Capacity is only required if the pHKCl is greater than or equal to pH 6.5
S04	Acid Sulfate Soil Samples have a 24 hour holding time unless frozen or dried within that period
S05	Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction.

Authorised by:

Paige Howarth	Analytical Services Manager
Jonathon Angell	Senior Analyst-Sample Properties
Jonathon Angell	Senior Analyst-SPOCAS



Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

Appendix C

Groundwater Laboratory Test Certificates



Tectonic Geotechnical Pty Ltd
924 David Low Way
Marcoola
QLD 4564



NATA Accredited
Accreditation Number 1261
Site Number 20794 & 2780

Accredited for compliance with ISO/IEC 17025 – Testing
 NATA is a signatory to the ILAC Mutual Recognition
 Arrangement for the mutual recognition of the
 equivalence of testing, medical testing, calibration,
 inspection, proficiency testing scheme providers and
 reference materials producers reports and certificates.

Attention: **Mark Thomson**

Report **1211452-W**
Project name **NORTH HARBOUR**
Project ID **25096**
Received Date **Apr 17, 2025**

Client Sample ID			BH6
Sample Matrix			Water
Eurofins Sample No.			B25- Ap0054838
Date Sampled			Apr 14, 2025
Test/Reference	LOR	Unit	
Chloride	1	mg/L	500
Sulphate (as SO4)	5	mg/L	190
Heavy Metals			
Aluminium	0.05	mg/L	860
Aluminium (filtered)	0.05	mg/L	0.68
Iron	0.05	mg/L	880
Iron (filtered)	0.05	mg/L	5.9

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chloride - Method: LTM-INO-4090 Chloride by Discrete Analyser	Brisbane	Apr 24, 2025	28 Day
Sulphate (as SO ₄) - Method: LTM-INO-4110 Sulfate by Discrete Analyser	Brisbane	Apr 24, 2025	28 Day
Heavy Metals - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Brisbane	Apr 23, 2025	28 Days
Heavy Metals (filtered) - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Brisbane	Apr 23, 2025	180 Days



ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South
VIC 3175
+61 3 8564 5000
NATA# 1261
Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
+61 3 8564 5000
NATA# 1261
Site# 25403

Sydney
179 Magowar Road
Girraheen
NSW 2145
+61 2 9900 8400
NATA# 1261
Site# 18217

Canberra
Unit 1, 2 Dacre Street
Mitchell
ACT 2911
+61 2 6113 8091
NATA# 1261
Site# 25466

Perth
46-48 Banksia Road
Welshpool
WA 6106
+61 8 6253 4444
NATA# 2377
Site# 2370 & 2554

Auckland
35 O'Rourke Road
Penrose
Auckland 1061
+64 9 526 4551
IANZ# 1327

Auckland (Focus)
Unit C/14 Pacific Rise
Mount Wellington
Auckland 1061
+64 9 525 0568
IANZ# 1308

Christchurch
43 Detroit Drive
Rolleston
Christchurch 7675
+64 3 343 5201
IANZ# 1290

Tauranga
1277 Cameron Road
Gate Pa
Tauranga 3112
+64 9 525 0568
IANZ# 1402

Company Name: Tectonic Geotechnical Pty Ltd
Address: 924 David Low Way
Marcoola
QLD 4564

Project Name: NORTH HARBOUR
Project ID: 25096

Order No.: 25096
Report #: 1211452
Phone: 07 5478 9642
Fax:

Received: Apr 17, 2025 6:10 PM
Due: Apr 30, 2025
Priority: 5 Day
Contact Name: Mark Thomson

Eurofins Analytical Services Manager : Paige Howarth

Sample Detail							Aluminium	Aluminium (filtered)	Chloride	Iron	Iron (filtered)	Sulphate (as SO4)	Acid Sulfate Soils Field pH Test	Moisture Set	Chromium Suite (SKCI) - NASSG (Excluding ANC)
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780							X	X	X	X	X	X	X	X	X
External Laboratory															
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID										
1	BH1 - 0.0-0.25m	Apr 14, 2025		Soil	B25-Ap0054774								X		
2	BH1 - 0.25-0.5m	Apr 14, 2025		Soil	B25-Ap0054775							X	X	X	
3	BH1 - 0.5-0.75m	Apr 14, 2025		Soil	B25-Ap0054776							X			
4	BH1 - 0.75-1.0m	Apr 14, 2025		Soil	B25-Ap0054777							X			
5	BH1 - 1.0-1.25m	Apr 14, 2025		Soil	B25-Ap0054778							X			
6	BH1 - 1.25-1.5m	Apr 14, 2025		Soil	B25-Ap0054779							X			
7	BH1 - 1.5-1.75m	Apr 14, 2025		Soil	B25-Ap0054780							X	X	X	
8	BH1 - 1.75-2.0m	Apr 14, 2025		Soil	B25-Ap0054781							X			
9	BH2 - 0.0-	Apr 14, 2025		Soil	B25-Ap0054782							X			



ABN: 50 005 085 521

NZBN: 9429046024954

ABN: 91 05 0159 898

				Geelong		Sydney		Canberra		Brisbane		Newcastle		Perth		Auckland		Auckland (Focus)		Christchurch		Tauranga	
Melbourne				19/8 Lewalan Street		179 Magowar Road		Unit 1, 2 Dacre Street		1/21 Smallwood Place		1/2 Frost Drive		46-48 Banksia Road		35 O'Rourke Road		Unit C/14 Pacific Rise		43 Detroit Drive		1277 Cameron Road	
6 Monterey Road				Grovedale		Girraween		Mitchell		Murarie		Mayfield West		Welshpool		Penrose		Mount Wellington		Rolleston		Gate Pa	
VIC 3175				VIC 3216		NSW 2145		ACT 2911		QLD 4172		NSW 2304		WA 6106		Auckland 1061		Auckland 1061		Christchurch 7675		Tauranga 3112	
+61 3 8564 5000				+61 3 8564 5000		+61 2 9900 8400		+61 2 6113 8091		+61 7 3902 4600		+61 2 4968 8448		+61 8 6253 4444		+64 9 526 4551		+64 9 525 0568		+64 3 343 5201		+64 9 525 0568	
NATA# 1261				NATA# 1261		NATA# 1261		NATA# 1261		NATA# 1261		NATA# 1261		NATA# 2377		NATA# 1327		IANZ# 1290		IANZ# 1290		IANZ# 1402	
Site# 1254				Site# 25403		Site# 18217		Site# 25466		Site# 20794 & 2780		Site# 25079		Site# 2370 & 2554				IANZ# 1308					

web: www.eurofins.com.au
email: EnviroSales@eurofinsanz.com

Company Name: Tectonic Geotechnical Pty Ltd
Address: 924 David Low Way
Marcoola
QLD 4564

Project Name: NORTH HARBOUR
Project ID: 25096

Order No.: 25096
Report #: 1211452
Phone: 07 5478 9642
Fax:

Received: Apr 17, 2025 6:10 PM
Due: Apr 30, 2025
Priority: 5 Day
Contact Name: Mark Thomson

Eurofins Analytical Services Manager : Paige Howarth

Sample Detail												Chromium Suite (SKCl) - NASSG (Excluding ANC)
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780												Moisture Set
10	BH2 - 0.25-0.5m	Apr 14, 2025			Soil						B25-Ap0054783	X
11	BH2 - 0.5-0.75m	Apr 14, 2025			Soil						B25-Ap0054784	X
12	BH2 - 0.75-1.0m	Apr 14, 2025			Soil						B25-Ap0054785	X
13	BH2 - 1.0-1.25m	Apr 14, 2025			Soil						B25-Ap0054786	X
14	BH2 - 1.25-1.5m	Apr 14, 2025			Soil						B25-Ap0054787	X
15	BH2 - 1.5-1.75m	Apr 14, 2025			Soil						B25-Ap0054788	X
16	BH2 - 1.75-2.0m	Apr 14, 2025			Soil						B25-Ap0054789	X
17	BH3 - 0.0-0.25m	Apr 14, 2025			Soil						B25-Ap0054790	X
18	BH3 - 0.25-0.5m	Apr 14, 2025			Soil						B25-Ap0054791	X
19	BH3 - 0.5-	Apr 14, 2025			Soil						B25-Ap0054792	X

Melbourne

61 Monterey Road

Dandenong South

VIC 3175

+61 3 8564 5000

NATA# 1261

Site# 1254

Geelong

19/8 Lewalan Street

Grovedale

VIC 3216

+61 3 8564 5000

NATA# 1261

Site# 25403

Sydney

179 Magowar Road

Girraheen

NSW 2145

+61 2 9900 8400

NATA# 1261

Site# 18217

Canberra

Unit 1, 2 Dacre Street

Mitchell

ACT 2911

+61 2 6113 8091

NATA# 1261

Site# 25466

Brisbane

1/21 Smallwood Place

Murarie

QLD 4172

+61 7 3902 4600

NATA# 1261

Site# 20794 & 2780

Newcastle

1/2 Frost Drive

Mayfield West

NSW 2304

+61 2 4968 8448

NATA# 1261

Site# 25079

Perth

46/48 Banksia Road

Welshpool

WA 6106

+61 8 6253 4444

NATA# 2377

Site# 2370 & 2554

web: www.eurofins.com.au

email: EnviroSales@eurofinsanz.com

Auckland

35 O'Rourke Road

Pentrose

Auckland 1061

+64 9 526 4551

IANZ# 1327

Auckland (Focus)

Unit C/14 Pacific Rise

Mount Wellington

Auckland 1061

+64 9 525 0568

IANZ# 1308

Christchurch

43 Detroit Drive

Rolliston

Christchurch 7675

+64 3 343 5201

IANZ# 1290

Tauranga

1277 Cameron Road

Gate Pa

Tauranga 3112

+64 9 525 0568

IANZ# 1402

Company Name:

Tectonic Geotechnical Pty Ltd

Address:

924 David Low Way

Marcoola

QLD 4564

Project Name:

NORTH HARBOUR

Project ID:

25096

Order No.:

25096

Report #:

1211452

Phone:

07 5478 9642

Fax:

Received:

Apr 17, 2025 6:10 PM

Due:

Apr 30, 2025

Priority:

5 Day

Contact Name:

Mark Thomson

Eurofins Analytical Services Manager : Paige Howarth

Sample Detail					Aluminium	Aluminium (filtered)	Chloride	Iron	Iron (filtered)	Sulphate (as SO4)	Acid Sulfate Soils Field pH Test	Moisture Set	Chromium Suite (SKCI) - NASSG (Excluding ANC)
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780					X	X	X	X	X	X	X	X	X
19	BH3 - 0.5-0.75m	Apr 14, 2025	Soil	B25-Ap0054792									
20	BH3 - 0.75-1.0m	Apr 14, 2025	Soil	B25-Ap0054793						X			
21	BH3 - 1.0-1.25m	Apr 14, 2025	Soil	B25-Ap0054794						X			
22	BH3 - 1.25-1.5m	Apr 14, 2025	Soil	B25-Ap0054795						X			
23	BH3 - 1.5-1.75m	Apr 14, 2025	Soil	B25-Ap0054796						X	X	X	
24	BH3 - 1.75-2.0m	Apr 14, 2025	Soil	B25-Ap0054797						X			
25	BH4 - 0.0-0.25m	Apr 14, 2025	Soil	B25-Ap0054798						X			
26	BH4 - 0.25-0.5m	Apr 14, 2025	Soil	B25-Ap0054799						X	X	X	X
27	BH4 - 0.5-0.75m	Apr 14, 2025	Soil	B25-Ap0054800						X			
28	BH4 - 0.75-1.0m	Apr 14, 2025	Soil	B25-Ap0054801						X			

Date Reported: Apr 30, 2025

Eurofins Environment Testing 1/21 Smallwood Place, Murarie, QLD, Australia 4172

ABN : 50 005 085 521 Tel: +61 7 3902 4600

Page 5 of 12



ABN: 50 005 085 521

NZBN: 9429046024954

ABN: 91 05 0159 898

				Geelong		Sydney		Canberra		Brisbane		Newcastle		Perth		Auckland		Auckland (Focus)		Christchurch		Tauranga	
Melbourne				19/8 Lewalan Street		179 Magowar Road		Unit 1, 2 Dacre Street		1/21 Smallwood Place		1/2 Frost Drive		46-48 Banksia Road		35 O'Rourke Road		Unit C/14 Pacific Rise		43 Detroit Drive		1277 Cameron Road	
Dandenong South				Grovedale		Girraween		Mitchell		Murarie		Mayfield West		Welshpool		Penrose		Mount Wellington		Rolleston		Gate Pa	
VIC 3175				VIC 3216		NSW 2145		ACT 2911		QLD 4172		NSW 2304		WA 6106		Auckland 1061		Auckland 1061		Christchurch 7675		Tauranga 3112	
+61 3 8564 5000				+61 3 8564 5000		+61 2 9900 8400		+61 2 6113 8091		+61 7 3902 4600		+61 2 4968 8448		+61 8 6253 4444		+64 9 526 4551		+64 9 525 0568		+64 3 343 5201		+64 9 525 0568	
NATA# 1261				NATA# 1261		NATA# 1261		NATA# 1261		NATA# 1261		NATA# 1261		NATA# 2377		IANZ# 1327		IANZ# 1308		IANZ# 1290		IANZ# 1402	
Site# 1254				Site# 25403		Site# 18217		Site# 25466		Site# 20794 & 2780		Site# 25079		Site# 2370 & 2554									

web: www.eurofins.com.au
email: EnviroSales@eurofinsanz.com

Company Name: Tectonic Geotechnical Pty Ltd
Address: 924 David Low Way
Marcoola
QLD 4564

Project Name: NORTH HARBOUR
Project ID: 25096

Order No.: 25096
Report #: 1211452
Phone: 07 5478 9642
Fax:

Received: Apr 17, 2025 6:10 PM
Due: Apr 30, 2025
Priority: 5 Day
Contact Name: Mark Thomson

Eurofins Analytical Services Manager : Paige Howarth

Sample Detail										Aluminium	Aluminium (filtered)	Chloride	Iron	Iron (filtered)	Sulphate (as SO4)	Acid Sulfate Soils Field pH Test	Moisture Set	Chromium Suite (SKCl) - NASSG (Excluding ANC)
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780																		
29	BH4 - 1.0-1.25m	Apr 14, 2025			Soil				B25-Ap0054802									X
30	BH4 - 1.25-1.5m	Apr 14, 2025			Soil				B25-Ap0054803									
31	BH4 - 1.5-1.75m	Apr 14, 2025			Soil				B25-Ap0054804								X	
32	BH4 - 1.75-2.0m	Apr 14, 2025			Soil				B25-Ap0054805									
33	BH5 - 0.0-0.25m	Apr 14, 2025			Soil				B25-Ap0054806									
34	BH5 - 0.25-0.5m	Apr 14, 2025			Soil				B25-Ap0054807								X	
35	BH5 - 0.5-0.75m	Apr 14, 2025			Soil				B25-Ap0054808									
36	BH5 - 0.75-1.0m	Apr 14, 2025			Soil				B25-Ap0054809									
37	BH5 - 1.0-1.25m	Apr 14, 2025			Soil				B25-Ap0054810									
38	BH5 - 1.25-1.5m	Apr 14, 2025			Soil				B25-Ap0054811									

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle	Perth	Auckland	Auckland (Focus)	Christchurch	Tauranga
6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarie QLD 4172 +61 7 3902 4600 NATA# 1261 Site# 20794 & 2780	1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079	46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370 & 2554	35 O'Rourke Road Penrose Auckland 1061 +64 9 526 4551 IANZ# 1327	Unit C/14 Pacific Rise Mount Wellington Auckland 1061 +64 9 525 0568 IANZ# 1308	43 Detroit Drive Rolleston Christchurch 7675 +64 3 343 5201 IANZ# 1290	1277 Cameron Road Gate Pa Tauranga 3112 +64 9 525 0568 IANZ# 1402

Company Name: Tectonic Geotechnical Pty Ltd
Address: 924 David Low Way
Marcoola
QLD 4564

Project Name: NORTH HARBOUR
Project ID: 25096

Order No.: 25096
Report #: 1211452
Phone: 07 5478 9642
Fax:

Received: Apr 17, 2025 6:10 PM
Due: Apr 30, 2025
Priority: 5 Day
Contact Name: Mark Thomson

Eurofins Analytical Services Manager : Paige Howarth

Sample Detail										Aluminium	Aluminium (filtered)	Chloride	Iron	Iron (filtered)	Sulphate (as SO4)	Acid Sulfate Soils Field pH Test	Moisture Set	Chromium Suite (SKCI) - NASSG (Excluding ANC)
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780										X	X	X	X	X	X	X	X	X
39	BH5 - 1.5-1.75m	Apr 14, 2025	Soil						B25-Ap0054812								X	X
40	BH5 - 1.75-2.0m	Apr 14, 2025	Soil						B25-Ap0054813							X		
41	BH6 - 0.0-0.25m	Apr 14, 2025	Soil						B25-Ap0054814							X		
42	BH6 - 0.25-0.5m	Apr 14, 2025	Soil						B25-Ap0054815							X	X	X
43	BH6 - 0.5-0.75m	Apr 14, 2025	Soil						B25-Ap0054816							X		
44	BH6 - 0.75-1.0m	Apr 14, 2025	Soil						B25-Ap0054817							X		
45	BH6 - 1.0-1.25m	Apr 14, 2025	Soil						B25-Ap0054818							X		
46	BH6 - 1.25-1.5m	Apr 14, 2025	Soil						B25-Ap0054819							X	X	X
47	BH6 - 1.5-1.75m	Apr 14, 2025	Soil						B25-Ap0054820							X		
48	BH6 - 1.75-2.0m	Apr 14, 2025	Soil						B25-Ap0054821							X		

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle	Perth
6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarie QLD 4172 +61 7 3902 4600 NATA# 1261 Site# 20794 & 2780	1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079	46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370 & 2554

web: www.eurofins.com.au
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Received: Apr 17, 2025 6:10 PM
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Contact Name: Mark Thomson

Eurofins Analytical Services Manager : Paige Howarth

Sample Detail					Aluminium	Aluminium (filtered)	Chloride	Iron	Iron (filtered)	Sulphate (as SO4)	Acid Sulfate Soils Field pH Test	Moisture Set	Chromium Suite (SKCI) - NASSG (Excluding ANC)
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780													
49	BH7 - 0.0-0.25m	Apr 14, 2025		Soil									
50	BH7 - 0.25-0.5m	Apr 14, 2025		Soil									
51	BH7 - 0.5-0.75m	Apr 14, 2025		Soil									
52	BH7 - 0.75-1.0m	Apr 14, 2025		Soil									
53	BH7 - 1.0-1.25m	Apr 14, 2025		Soil									
54	BH7 - 1.25-1.5m	Apr 14, 2025		Soil									
55	BH7 - 1.5-1.75m	Apr 14, 2025		Soil									
56	BH7 - 1.75-2.0m	Apr 14, 2025		Soil									
57	BH8 - 0.0-0.25m	Apr 14, 2025		Soil									
58	BH8 - 0.25-0.5m	Apr 14, 2025		Soil									

Melbourne

6 Monterey Road

Dandenong South

VIC 3175

+61 3 8564 5000

NATA# 1261

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+61 3 8564 5000

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Site# 25403

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179 Magowar Road

Girraheen

NSW 2145

+61 2 9900 8400

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Site# 18217

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Unit 1,2 Dacre Street

Mitchell

ACT 2911

+61 2 6113 8091

NATA# 1261

Site# 25466

Brisbane

1/21 Smallwood Place

Murarie

QLD 4172

+61 7 3902 4600

NATA# 1261

Site# 20794 & 2780

Newcastle

1/2 Frost Drive

Mayfield West

NSW 2304

+61 2 4968 8448

NATA# 1261

Site# 25079

Perth

46-48 Banksia Road

Welshpool

WA 6106

+61 8 6253 4444

NATA# 2377

Site# 2370 & 2554

Auckland

35 O'Rourke Road

Penrose

Auckland 1061

+64 9 526 4551

IANZ# 1327

Auckland (Focus)

Unit C/14 Pacific Rise

Mount Wellington

Auckland 1061

+64 9 525 0568

IANZ# 1308

Christchurch

43 Detroit Drive

Rolliston

Christchurch 7675

+64 3 343 5201

IANZ# 1290

Tauranga

1277 Cameron Road

Gate Pa

Tauranga 3112

+64 9 525 0568

IANZ# 1402

web: www.eurofins.com.au
email: EnviroSales@eurofinsanz.com

Company Name: Tectonic Geotechnical Pty Ltd
Address: 924 David Low Way
Marcoola
QLD 4564

Project Name: NORTH HARBOUR
Project ID: 25096

Order No.: 25096
Report #: 1211452
Phone: 07 5478 9642
Fax:

Received: Apr 17, 2025 6:10 PM
Due: Apr 30, 2025
Priority: 5 Day
Contact Name: Mark Thomson

Eurofins Analytical Services Manager : Paige Howarth

Sample Detail									
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780									
59	BH8 - 0.5-0.75m	Apr 14, 2025	Soil			B25-Ap0054832		X	Chromium Suite (SKCl) - NASSG (Excluding ANC)
60	BH8 - 0.75-1.0m	Apr 14, 2025	Soil			B25-Ap0054833		X	Moisture Set
61	BH8 - 1.0-1.25m	Apr 14, 2025	Soil			B25-Ap0054834		X	Acid Sulfate Soils Field pH Test
62	BH8 - 1.25-1.5m	Apr 14, 2025	Soil			B25-Ap0054835		X	Sulphate (as SO4)
63	BH8 - 1.5-1.75m	Apr 14, 2025	Soil			B25-Ap0054836		X	Iron (filtered)
64	BH8 - 1.75-2.0m	Apr 14, 2025	Soil			B25-Ap0054837		X	Iron
65	BH6	Apr 14, 2025	Water			B25-Ap0054838		X	Chloride
Test Counts									Aluminium (filtered)
									Aluminium
								1	
								1	64
								1	16
								1	16

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
2. Unless otherwise stated, all soil/sediment/solid results are reported on a dry weight basis.
3. Unless otherwise stated, all biota/food results are reported on a wet weight basis on the edible portion.
4. For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
5. Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
6. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds where annotated.
7. SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
8. Samples were analysed on an 'as received' basis.
9. Information identified in this report with **blue** colour indicates data provided by customers that may have an impact on the results.
10. This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the sampling date; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is seven days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ppm: parts per million
µg/L: micrograms per litre	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony Forming Unit	Colour: Pt-Co Units (CU)	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is ≤30%; however, the following acceptance guidelines are equally applicable:

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 50 – 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Chloride			mg/L	< 1			1	Pass	
Sulphate (as SO4)			mg/L	< 5			5	Pass	
Method Blank									
Heavy Metals									
Aluminium			mg/L	< 0.05			0.05	Pass	
Aluminium (filtered)			mg/L	< 0.05			0.05	Pass	
Iron			mg/L	< 0.05			0.05	Pass	
Iron (filtered)			mg/L	< 0.05			0.05	Pass	
LCS - % Recovery									
Chloride			%	85			70-130	Pass	
Sulphate (as SO4)			%	89			70-130	Pass	
LCS - % Recovery									
Heavy Metals									
Aluminium			%	98			80-120	Pass	
Aluminium (filtered)			%	96			80-120	Pass	
Iron			%	83			80-120	Pass	
Iron (filtered)			%	96			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	B25-Ap0004443	NCP	%	70			70-130	Pass	
Sulphate (as SO4)	B25-Ap0004443	NCP	%	75			70-130	Pass	
Spike - % Recovery									
				Result 1					
Aluminium	B25-Ap0052342	NCP	%	84			75-125	Pass	
Aluminium (filtered)	B25-Ap0054838	CP	%	88			75-125	Pass	
Iron	B25-Ap0052342	NCP	%	87			75-125	Pass	
Iron (filtered)	B25-Ap0054838	CP	%	78			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chloride	B25-Ap0004443	NCP	mg/L	21	20	1.0	30%	Pass	
Sulphate (as SO4)	B25-Ap0004443	NCP	mg/L	67	67	1.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Aluminium	B25-Ap0052340	NCP	mg/L	< 0.05	0.06	28	30%	Pass	
Aluminium (filtered)	B25-Ap0059509	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Iron	B25-Ap0052340	NCP	mg/L	0.55	0.58	5.0	30%	Pass	
Iron (filtered)	B25-Ap0059509	NCP	mg/L	0.05	< 0.05	4.0	30%	Pass	

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Paige Howarth	Analytical Services Manager
Jonathon Angell	Senior Analyst-Inorganic
Jonathon Angell	Senior Analyst-Metal



Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Appendix D

Limitations



Limitations

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tectonic



PO Box 899
Buderim QLD 4555



tectonicgeo.com.au



admin@tectonicgeo.com.au

APPENDIX 5 - EXAMPLE OF CORRECTIVE ACTION REPORT FORM

CORRECTIVE ACTION REPORT			
Report No.			
Prepared By:		Position:	
Date		Time:	
Details Of Non-Conformance:			
Date:		Time:	
Location:			
Inspected By:		Position:	
Description of Event:			
Likely Causes:			
Details of Corrective Action/s:			
Proposed Corrective Action/s:			
Dated Submitted to Developer:		Reply Required By:	
Dated Submitted to Regulator:		Reply Required By:	
Consultant/Expert/Regulator Advice (if required):			
Date Corrective Action Required By:			
Person Responsible for Corrective Action:			
Corrective Action Authorised By:		Date/Signed:	
Date Corrective Action/s Implemented:			
Corrective Action Follow-up Required/Completed:			
Circulation:		Developer	

Land Based Environmental Management Plan - Sub-plan 09
North Harbour - Regional Park Additional Fill Areas

		Department of Environment
		Moreton Bay Regional Council
		Other