Internal Memo

TO: Executive Manager Project Management Office

CC: Planning Advisor

FROM: [redacted]

DATE: 4 December 2024

SUBJECT: Review of Environmental Factors - Newcastle Foreshore Play Space

---

Newcastle Foreshore Play Space at Wharf Road Newcastle East is subject to Part 5 of *Environmental Planning and Assessment Act 1979,* and therefore requires the preparation of a Review of Environmental Factors (REF).

The attached project REF has been prepared by Gyde Consulting dated October 2024. I certify that to the best of my knowledge, the attached REF:

- accurately describes the proposed project works
- has been prepared by suitably qualified and competent people
- meets the requirements of section 5.5 and 5.7 and Part 5 of the *Environmental Planning and Assessment Act 1979*, and section 171 of the *Environmental Planning and Assessment Regulation 2021.*

Project Manager	[redacted]	[redacted]	04.12.24
	Name	*Signature*	*Date*
Manager Projects - Creative	[redacted]	[redacted]	*9/12/2024*
	Name	*Signature*	*Date*

Should you have further questions regarding the determination of the project please contact [redacted] on [redacted].

[redacted]
PROJECT MANAGER

Document Set ID: 9132530
Version: 1, Version Date: 16/01/2025

Delegated Officer Determination of REF

Under delegated authority, as City of Newcastle's representative as a determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979*, I determine the proposed Newcastle Foreshore Play Space **will not** significantly impact the environment, and the proposal can proceed subject to the mitigation measures outlined in the attached REF and the conditions of any relevant approvals, licences or permits.

	[redacted]	[redacted]	13 December 2024
Executive Manager Project Management Office	*Name*	*Signature*	*Date*

Document Set ID: 9132530
Version: 1, Version Date: 16/01/2025

Review of Environmental Factors

Newcastle Foreshore Play Space

Wharf Road, Newcastle East

Submitted to City Infrastructure I City of Newcastle

22 October 2024

Acknowledgment of Country



Towards Harmony by Aboriginal Artist Adam Laws

Gyde Consulting acknowledges and pays respect to Aboriginal and Torres Strait Islander peoples past, present, Traditional Custodians and Elders of this nation and the cultural, spiritual and educational practices of Aboriginal and Torres Strait Islander people. We recognise the deep and ongoing connections to Country – the land, water and sky – and the memories, knowledge and diverse values of past and contemporary Aboriginal and Torres Strait communities.

Gyde is committed to learning from Aboriginal and Torres Strait Islander people in the work we do across the country.

Disclaimer

This report has been prepared by Gyde Consulting with input from a number of other expert consultants (if relevant). To the best of our knowledge, the information contained herein is neither false nor misleading and the contents are based on information and facts that were correct at the time of writing. Gyde Consulting accepts no responsibility or liability for any errors, omissions or resultant consequences including any loss or damage arising from reliance in information in this publication.

Copyright © Gyde Consulting
ABN 58 133 501 774

All Rights Reserved. No material may be reproduced without prior permission.

Author Approval

Title	Review of Environmental Factors – Newcastle Foreshore Play Space
Site Location	Foreshore Park Precinct, which is located at Wharf Road, Newcastle East Lot 2 in DP729028.
Development	Newcastle Foreshore Play Space
Client Name	City Infrastructure I City of Newcastle
Document No.	N-21044
Revision	1
Project Manager	[redacted]
Author	[redacted]
Dated	22 October 2024

Document History and Status

Document status	Date	Prepared by	Reviewed by
Draft 1	9/08/2024	RB	MS
Final	22/10/2024	RB	MS

Determining Authority Certification

The, City Infrastructure Division, City of Newcastle, have examined and considered the Foreshore Park Play Space, Review of Environmental Factors in accordance with the provisions of s5.5 of the ***Environmental Planning and Assessment Act, 1979*** and State Environmental Planning Policy (Transport and Infrastructure) 2021, and determine that the proposed development may be carried out as development without consent, subject to compliance with the conditions to manage environmental impacts outlined within the REF.

Signature: .....

Position: ..... Date: .....

Contents

1. Executive Summary 1
1.1 The Proposal 1
2. Site and Context 2
3. Proposed development 6
3.1 Overview 6
3.2 Construction activities 7
3.2.1 Other construction items 8
3.2.2 Construction Environmental Management Plan 9
3.2.3 Public utilities 9
3.2.4 Project documentation 9
3.3 Project Need 9
3.4 Project Objectives 10
3.5 Project alternatives 10
4. Statutory Planning Considerations 11
4.1 Overview 11
4.1.1 Consistency with the objectives of the Act 12
4.1.2 Section 5.5 - Duty to Consider Environmental Impact 13
4.2 Environmental Planning and Assessment Regulation 2021 13
4.2.1 Section 171 of the EP&A Regulations 13
4.3 Infrastructure State Environment Planning Policy (Transport and Infrastructure) 2021 16
4.3.1 Overview 16
4.3.2 Part 2.1 Preliminary 16
4.3.3 Part 2.2 General, Division 1 Consultation 16
4.4 Part 2.3 Development controls 20
4.5 Foreshore Plan of Management 21
4.6 Other Legislation 22
4.7 Other Environmental Planning Instruments 26
4.8 Consultation 28
4.8.1 City of Newcastle 29
4.8.2 Government Agency or Authority 29
5. Environmental Impact Assessment 30
5.1 Introduction 30
5.2 Assessment Methodology 30
5.2.1 Overview 30
5.3 Consideration of Key Issues 30
5.3.1 Landscape character and visual amenity 30
5.3.2 Social Impacts 31
5.3.3 Aboriginal heritage 31
5.3.4 Heritage Impacts 33
5.3.5 Water Management 34
5.3.6 Trees and vegetation 34
5.3.7 Ecology 37
5.3.8 Noise and Vibration 37
5.3.9 Lighting 38
5.3.10 Air Quality and Dust 38
5.3.11 Traffic and Access 38

5.3.12 Services and Utilities 40
5.3.13 Excavation, earthworks and contamination 40
5.3.14 Site Suitability 42
5.3.15 Other potential environmental impacts 42
5.4 Section 5.5 – Environmental Planning and Assessment Act 1979 47
6. Conclusion 47
7. SUMMARY OF MITIGATION MEASURES 49

Figures

Towards Harmony by Aboriginal Artist Adam Laws ii
Figure 1 Aerial view of entire Foreshore Park (Source: NearMap) 2
Figure 2 Foreshore Park locality plan (Source: CN) 3
Figure 3 Location of works proposed that relate to this REF (Source: Northrop Civil Engineering Package) 3
Figure 4 Photo of site looking north-east (Source: Gyde Consulting) 4
Figure 5 Photo of existing playground looking north (Source: Google Street View) 4
Figure 5 Photo of existing playground looking north-west (Source: Google Street View) 5
Figure 6 State Heritage curtilage map, cross-hatched in blue and proposed works location outlined in red (Source: NSW Planning Portal Spatial Viewer) 6
Figure 7 Scope of works (Source: Northrop Civil Engineering Package) 7
Table 3: Community and Stakeholder Consultation Engagement Criteria 28
Figure 9 Study area of the ACA (outlined in red) and AHIMS Registered sites within the locality (green and yellow dots) (Source: Umwelt Archaeological Constraints Analysis) 32

Maps

No table of contents entries found.

Plans

No table of contents entries found.

Tables

Table 1 Factors for consideration under Section 171 of the EP&A Regulations 13
Table 3 Transport and Infrastructure SEPP Consultation Requirements 17
Table 5 Transport and Infrastructure SEPP Development permitted without consent 20
Table 6 Commonwealth legislation considered 22
Table 7 NSW Legislation Considered 23
Table 8 Other Environmental Planning Instruments 26
Table 8 Section 5.5 of the EP&A Act Compliance Table 47

APPENDICES

The following plans and technical reports accompany the development application. GYDE has relied on the information in these reports, prepared by professionals in their field, for the preparation of this statement of environmental effects.

Appendix	Document	Prepared by
A	Architectural Plans	TCL
B	Arborist Report	Ha-Bra-Cul-Cha
C	Archaeological Constraints Analysis	Umwelt Environmental & Social Consultants
D	Contamination Report	Douglas Partners
D1	Contamination Assessment	SESL
E	Lighting Plan	Electro Light
F	Civil and Hydraulic Plans	Northrop
G	Flood Impact Assessment	Torrent Consulting
H	Access and Inclusion	Funktion

Glossary and Abbreviations

Term/Acronym	Description
AS	Australian Standards
BCA	Building Code of Australia
BC Act	***Biodiversity Conservation Act 2016***
CEMP	Construction Environmental Management Plan
CN	The City of Newcastle
CPTED	Crime Prevention through Environmental Design
DA	Development Application
DCP	Development Control Plan
EIS	Environmental Impact Statement
EP&A Act	***Environmental Planning and Assessment Act 1979***
The Regulations	Environmental Planning and Assessment Regulations 2021
ESD	Ecologically Sustainable Development
GFA	Gross Floor Area
INP	Industrial Noise Policy
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
NCC	National Construction Code
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy
WSUD	Water Sensitive Urban Design

1. Executive Summary

1.1 The Proposal

This Review of Environmental Factors (REF) has been prepared by Gyde Consulting (Gyde) on behalf of the City Infrastructure team at City of Newcastle (CN). It assesses the environmental impacts of proposed upgrades to the play space and associated works at Foreshore Park, Newcastle East (Wharf Road, Newcastle East).

CN's objectives for the precinct, as established within the Newcastle Foreshore Masterplan are to provide for improved user experience for visitors of all ages. The proposal seeks to build a regional level, large scale, fully inclusive, all ages play space.

This REF has been prepared to:

- Satisfy the requirements of relevant NSW environmental legislation, in particular the requirements of the ***Environmental Planning and Assessment Act, 1979*** (the Act).
- Identify, assess, and mitigate any environmental impacts that are likely to result from the activity, during its construction and operation.

The proposal incorporates a range of works within the park to facilitate the delivery of a regional play space. This includes 4 themed play spaces, earthworks, pedestrian pathways, lighting landscaping and supporting infrastructure.

The works can be carried out by a public authority (with approval / Notice to Crown Lands in accordance with Land Manager Requirements under Crown Lands Act) without development consent on land owned or controlled by the public authority pursuant to Division 12, Section 2.73(3) of the ***State Environmental Planning Policy (Transport and Infrastructure) 2021***. In accordance with Part 5 of the ***Environmental Planning and Assessment Act 1979*** (the Act), the public authority is required to consider the likely impact of the proposed activity by undertaking a review of environmental factors (REF).

The preparation of this REF has taken into consideration the environmental factors prescribed in the ***Environmental Planning and Assessment Regulation 2021*** and other relevant legislation. This REF includes an analysis of the key environmental considerations and any relevant recommendations made by experts to assess potential impacts.

The proposed activity, carried out in accordance with the environmental mitigation measures outlined in this REF, is not likely to significantly affect the environment and therefore does not require the preparation of an Environmental Impact Statement. The proposed activity has beneficial effects by increasing the range of recreation opportunities available to the community. In this respect the proposed activity is recommended to be approved to proceed subject to the recommended mitigation measures in Section 5.

2. Site and Context

The site is located within the Foreshore Park Precinct, which is located at 32 Wharf Road, Newcastle East Lot 2 DP729028.

Foreshore Park is located within the Newcastle local government area (LGA), adjoins Wharf Road to the north, Nobbys Road to the east, R3: Medium Density Residential to the south and several land uses to the west. An aerial image of Foreshore Park is provided below at **Figure 1**.



Figure 1 Aerial view of entire Foreshore Park (Source: NearMap)

Foreshore Park is one several parkland areas within Newcastle East and is the largest. Refer to **Figure 2** (below) demonstrating the context of the site in relation to the surrounding land uses within the Newcastle East End. The park is part of the Newcastle Harbour Foreshore and subject to the Newcastle Harbour Foreshore Masterplan (HFMP).



Figure 2 **Foreshore Park locality plan (Source: CN)**

The works subject to this REF are proposed over the southern portion of Foreshore Park, which is occupied by a playground, amenities building and adjoining landscaped areas (see **Figure 3**).



Figure 3 **Location of works proposed that relate to this REF (Source: Northrop Civil Engineering Package)**

A site inspection was conducted by Gyde Consulting. Site images are provided below at Figure 4 to Figure 6.



Figure 4 **Photo of site looking north-east (Source: Gyde Consulting)**



Figure 5 **Photo of existing playground looking north (Source: Google Street View)**



Figure 5 **Photo of existing playground looking north-west (Source: Google Street View)**

Gyde have been advised by CN that the land is part CN owned and part Crown Land. Gyde have been advised that CN is the Crown Land manager for Foreshore Park, responsible for maintaining the built form features and vegetation. As such, it is a matter for delegate to be satisfied that CN have the requisite authority to approve the proposed works.

The park is a destination for tourism, events, and education. It contains several recreational facilities, including open space, play equipment and active transport infrastructure.

The site is zoned RE1 Public Recreation pursuant to the Newcastle Local Environmental Plan 2012 (NLEP). The site is within the Newcastle East Heritage Conservation Area and is partially identified on the State Heritage Register. The proposed works for this REF do not fall within the State Heritage curtilage (see **Figure 6**).

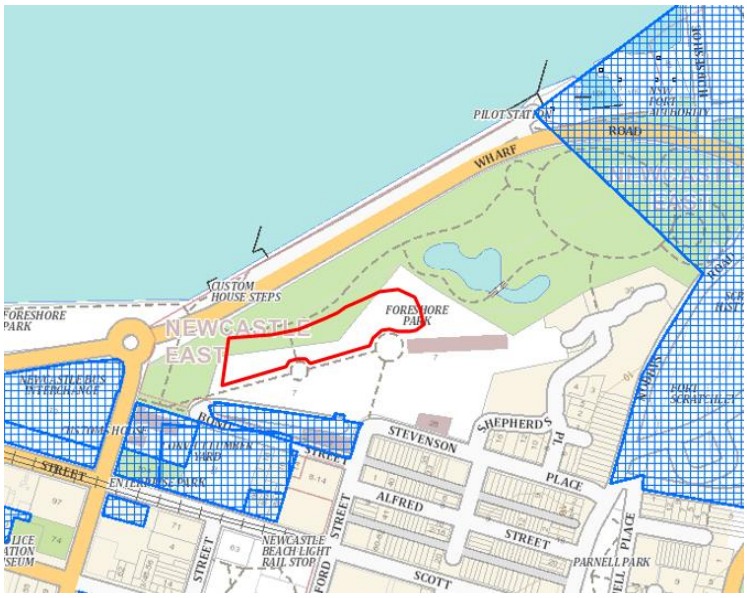


Figure 6 **State Heritage curtilage map, cross-hatched in blue and proposed works location outlined in red (Source: NSW Planning Portal Spatial Viewer)**

3. Proposed development

3.1 Overview

The proposed works are to improve the play facilities and surrounding amenities. This is comprised of the following:

- Demolition and removal of existing structures:
  - Removal of 44 trees (identified as 135, 137, 139, 140, 141, 143-160, 182, 183, 228-232, 234-236, 238, 241 – None of the trees are identified as having high conservation value);
  - Existing amenities and worker's lunch room building
  - Footpaths, pavements and landscaping; and
  - A portion of the stormwater, associated pits and drainage network to allow for the construction of upgraded utility services.
- Construction of four (4) new play space areas with the following themes:
  - An industrial area;
  - An indigenous area
  - A coastal waterplay area; and
  - Junior sand dunes area.
- Construction of amenities and infrastructure including:
  - Garden beds and lawns;
  - Dedicated quiet spaces;
  - Three (3) Picnic areas and seating;
  - Three (3) accessible drinking fountains;
  - Coastal waterplay area pump room;
  - Connecting pedestrian pathways;
  - Fencing
  - Signage and wayfinding; and

– Lighting.

An overview of the extent of the works proposed is shown in **Figure 7** below**.** For a detailed list of the proposed works please refer to the Landscape Architectural Plans found in Appendix A.

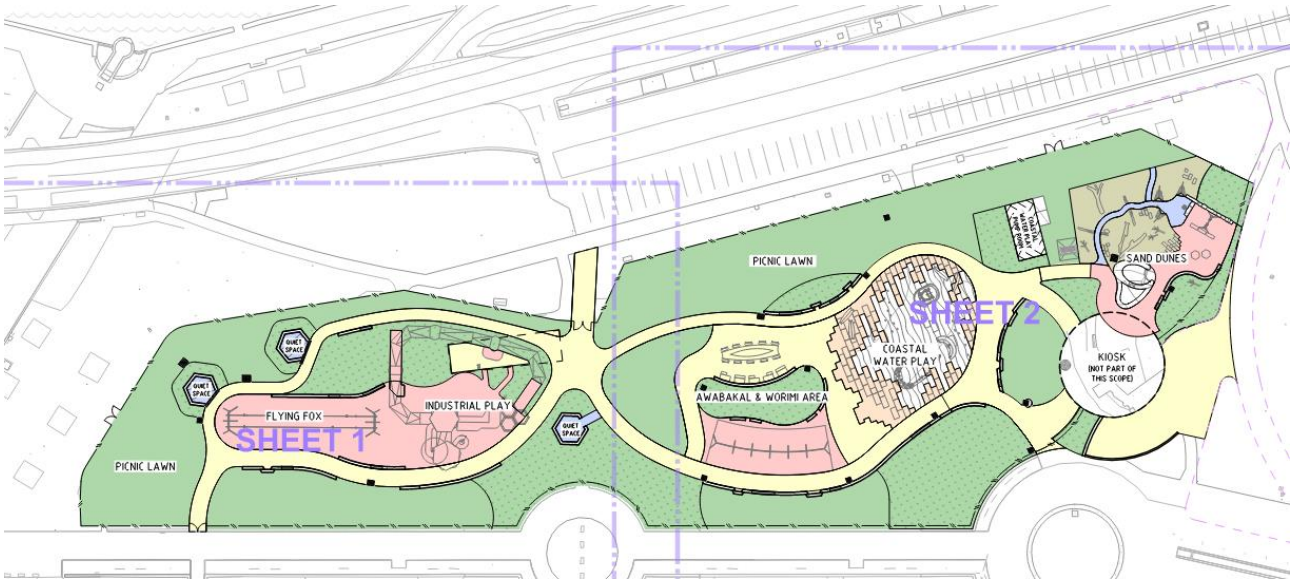


Figure 7 Scope of works (Source: Northrop Civil Engineering Package)

3.2 Construction activities

The construction works required for the proposed works include (but are not limited to):

- Demolition of existing infrastructure;
- Delivery and unloading of goods associated with the works;
- Designate a working area and materials laydown/stockpile area;
- Confirmation of working areas by the construction contractor;
- Delivery of associated infrastructure (i.e. landscaping and material);
- Checking of existing services infrastructure;
- General delivery of other construction materials and construction equipment;
- Installation of erosion and sediment controls for earthworks;
- Erection of safety fencing;
- Materials management in and around site as necessary;
- Excavation for footings and buried infrastructure;
- Tree removal, including stump removal or grinding and mulching/chipping;
- Removal of pavement and structures from Tree Protection Zones and non-destructive root exploration (hand-digging or Air Vac);
- Construction of utilities infrastructure including pump room;
- Construction of and changes to electrical utilities including cabling and conduits;
- Construction of and changes to stormwater infrastructure including, kerbs, gutters, drainage pipelines, stormwater pits;
- Construction of and changes to pathways and footpaths;
- Construction of electrical infrastructure including pathway lighting and ornamental lighting to play equipment;

- Landscaping works and planting for the new common lawn and tree lined footpaths;
- New landscaping works (installation of play equipment and footings for play equipment, fencing, lighting, signage, and surfacing such as concrete and rubber softfall);
- Removal of excess excavated material from site if not possible to reuse; and
- Restoration of the works area.

Plant and equipment likely to be used in the works (but are not limited to) include:

- Chainsaw and woodchippers;
- Excavators;
- Tipper trucks;
- Light vehicles;
- Flat-bed delivery trucks;
- Service vehicles;
- Mobile cranes;
- Rollers;
- Skid steers;
- Water carts;
- Jackhammers and generators;
- Pressure testing equipment;
- Compactor;
- Concrete agitators (or similar);
- Concrete pumps;
- Concrete saws;
- Air compressors;
- Mobile lighting; and
- Various hand tools and small machinery.

Access to the works construction site would be established to allow for heavy vehicles and turning movements. The ancillary sites would be kept secure with temporary fencing. Signs would be erected advising the public of access restrictions and contact details in the event of emergency or incident.

The exact location and proposed use of works construction sites would be confirmed by the construction contractor before the start of construction through the required Construction Environmental Management Plan (CEMP). Where amendments or additional ancillary facilities are identified during construction outside of the proposal area, the contractor would consult with CN's lead environment advisor to confirm the suitability of the proposed amendment or additional facility, and whether any additional environmental assessment is required.

Following construction, the works construction sites, work areas and stockpiles would be removed, cleared of rubbish and materials, and rehabilitated to their existing condition.

3.2.1 Other construction items

Construction workforce

Allowance of up to 10-20 full time equivalents for the duration of the works may be required. The appointed contractor will determine the number of workers.

Construction period

Construction works are planned to commence in mid-2025. Construction works will take approximately 12-18 months.

Construction hours

Construction would generally occur during the standard working hours set out in the Draft Construction Noise Guideline (NSW EPA, 2020):

- Mondays to Fridays between 7am and 6pm;
- Saturdays between 8am and 1pm with approval from CN representative; and
- No work would normally occur on Sundays or public holidays.

Construction may be required outside the recommended standard hours to install/construct public infrastructure. Night works may be required. This will not occur unless approval is granted by the relevant authority in accordance with a Noise and Vibration Plan.

3.2.2 Construction Environmental Management Plan

The appointed contractor will prepare a Construction Environmental Management Plan (CEMP) in consultation with relevant stakeholders and in accordance with relevant standards as part of the CEMP. The plan would provide information on traffic flow, vehicle moments, site access and parking arrangements during construction, and the measures to minimise the impacts on the relevant road network.

3.2.3 Public utilities

Public utilities/services exist in the vicinity of the works. It will be the contractor's responsibility to locate all services prior to commencement of works

3.2.4 Project documentation

The scope of works is detailed in the drawings prepared by CN, namely:

- Appendix A – Landscape Architectural Plans
- Appendix B – Arborist Report
- Appendix C – Archaeological Constraints Analysis
- Appendix D – Contamination Report
- Appendix E – Lighting Plan
- Appendix F – Civil Plans
- Appendix G – Flood Impact Assessment
- Appendix H – Access and Inclusion report

3.3 Project Need

City of Newcastle (CN) worked closely with the community from 2020-2022 to develop a masterplan with a vision for Newcastle Harbour Foreshore. The Newcastle Harbour Foreshore Masterplan (HFMP) was unanimously adopted by Council on 13 December 2022. It encompasses Foreshore Park, and includes a guide to development over 10 years promoting the Harbour Foreshore Precinct as a:

- Destination valued by residents, visitors and the wider community of Newcastle;
- Relevant to a growing and changing population;
- Able to respond to increasing and changing community pressures;
- Responsive to planned urban renewal and revitalisation of the Newcastle and East End precinct;
- Balances the foreshore's competing uses and interests, and accommodates the social, political, environmental and economic changes likely to occur within the planning horizon;

- Responsive to forecast climate change impacts, including urban heat island effects;
- Celebrates the rich cultural history of the precinct; and
- Considers CPTED principles throughout the design.

The works associated are also consistent with the Newcastle Foreshore Plan of Management (2015) which outlines necessary improvements to improve functionality of Foreshore Park.

The works associated with this REF will transform the existing local scale playground in Foreshore Park into a regional play space providing much needed upgrades to the community facilities within the park. As identified by the HFMP, a regional play space will offer spaces for multiple activities and play experiences for all abilities providing a variety of inclusive equipment and supporting infrastructure.

3.4 Project Objectives

This REF will achieve the overall objectives of the Newcastle HFMP and is consistent with CN's Plan of Management for Newcastle Foreshore. The objectives within the Plan are:

- A revitalised and aesthetically pleasing precinct in response to the inherent opportunities and constraints;
- The balance of facilities, structured and casual spaces and how this supports the visitor experiences available at the park and foreshore;
- A unified landscape composed of accessible and diverse spaces;
- Legibility and hierarchy in the proposed elements defining the landscape;
- Pedestrian and cycle connectivity to surrounding facilities and communities;
- Opportunities to explore the diversity of visitation, both casual and event-based;
- Expands upon the quantity and diversity of park spaces available for the community balancing recreation and the staging of major events;
- Protection and enhancement of amenity, environmental, historical and conservation values.
- Sustainable water management;
- Adaptive and responsive to a shifting climate;
- Celebrating the distinctive character and heritage of the Harbour Foreshore Precinct;
- Integration with design outcomes of the wider public domain of the East End, and
- A regional-scale water and play space commensurate with the rich and vibrant histories of the Foreshore.

The proposed works are necessary to deliver the objectives of the Plan.

3.5 Project alternatives

The proposed works are consistent with the objectives and maintenance requirements to manage and maintain the Foreshore as a city park with ongoing progressive upgrade of the area being essential for the Harbour Foreshore Masterplan to be progressed.

The project plans were developed through an iterative design process in which ideas were tested and validated.

Three project alternatives were identified as a part of this process which are:

1. A 'do nothing' scenario where the future park upgrades envisaged would not be achieved, limiting community use of the area
2. Provide a smaller play space which would be insufficient given the anticipated future demand
3. Provide a larger play space which may envelop the park and reduce the amenity of surrounding facilities for a range of users of the park.

These are not a viable alternative to replace the intended scope of works and it would not deliver on the masterplan and envisaged future of the area.

4. Statutory Planning Considerations

4.1 Overview

The ***Environmental Planning and Assessment Act 1979*** (the Act) is the primary legislation in NSW which governs development and activity approvals.

A person is not permitted to carry out development unless the works are identified as exempt or obtained development consent / activity approval through one of alternate pathways from the relevant consent / approval authority.

For the subject works, the relevant approval pathway is under Part 5 Infrastructure and environmental impact assessment of the Act. The proposed works are consistent with the definition of 'activity' as prescribed in Section 5.1 (Part 5 – Infrastructure and Environmental Impact Assessment) of the EP&A Act.

Before endorsing the activity, the determining authority, which in this case is CN, must examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of that activity, in accordance with Section 5.5(1) of the Act.

This assessment is made under the ***State Environmental Planning Policy (Transport and Infrastructure) 2021*** (Transport and Infrastructure SEPP Part 2.3 Development Controls, Division 12 Parks and other public reserves, Section 2.73(3)(a)(i, ii, iv, v, vi)(b)(c) being:

2.73 Development permitted without consent

(3) Any of the following development may be carried out by or on behalf of a public authority without consent on land owned or controlled by the public authority—

(a) development for any of the following purposes—

(i) roads, pedestrian pathways, cycleways, single storey car parks, ticketing facilities, viewing platforms and pedestrian bridges,

(ii) recreation areas and recreation facilities (outdoor), but not including grandstands,

(iii) visitor information centres, information boards and other information facilities,

(iv) lighting, if light spill and artificial sky glow is minimised in accordance with the Lighting for Roads and Public Spaces Standard,

(v) landscaping, including landscape structures or features (such as art work) and irrigation systems,

(vi) amenities for people using the reserve, including toilets and change rooms,

(vii) food preparation and related facilities for people using the reserve,

(viii) maintenance depots,

(ix) portable lifeguard towers,

(b) environmental management works,

(c) demolition of buildings (other than any building that is, or is part of, a State or local heritage item or is within a heritage conservation area).

Note—

The term building is defined in the Environmental Planning and Assessment Act 1979 as including any structure.

Clause 2.73(3) states that development may be carried out by or on behalf of a public authority without consent on land owned or controlled by the public authority as the development is for the purpose of Parks and other public reserves. This includes development for the purposes of pedestrian pathways, recreation aeras and facilities, lighting, landscaping and amenities, environmental management works and the demolition of buildings.

The proposal does not require the lodgement, assessment or determination of a development application or consent pursuant to Part 4 of the Act.

This report undertakes the required environmental assessment with consideration to the following:

- Part 5 of the Act;
- Part 8 of the EP&A Regulations;
- Any relevant environmental planning instruments including State Environmental Planning Policy's and the Newcastle Local Environmental Plan 2012
- The Secretary's 'Guidelines for Division 5.1 Assessments' dated June 2022 published by the Department of Planning and Environment
- Any other relevant legislation and key environmental matters identified in the assessment of the proposed activity.

4.1.1 Consistency with the objectives of the Act

The objectives of the Act are as follows:

(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,

(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,

(c) to promote the orderly and economic use and development of land,

(d) to promote the delivery and maintenance of affordable housing,

(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,

(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),

(g) to promote good design and amenity of the built environment,

(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,

(i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,

(j) to provide increased opportunity for community participation in environmental planning and assessment

The activity is consistent with the relevant objects of the Act for the following reasons:

- It promotes the social welfare of the community by providing a better environment through improved play equipment and associated facilities that are properly managed in accordance with the HFMP.
- It has no identifiable impacts on the conservation of threatened and other species of native animals, plans, ecological communities and their habitats.
- It will facilitate the delivery of social infrastructure for recreational uses for the Foreshore Precinct which promote the built and cultural heritage of the area.
- The play space has been well-designed and informed by the surrounding context to provide amenity for community uses.

4.1.2 Section 5.5 - Duty to Consider Environmental Impact

Section 5.5 of the Act requires the Determining Authority to consider the effect of an activity on certain prescribed matters. An assessment of this activity against those matters is provided in Section 5.

4.2 Environmental Planning and Assessment Regulation 2021

The ***Environmental Planning and Assessment Regulation 2021*** (EP&A Regulations) is a set of additional provisions which support achieving the requirements of the EP&A Act. Of particular relevance is Part 8 Infrastructure and environmental impact assessment of the EP&A Regulations outlines specific requirements for consideration in REFs including:

Relevant Provision	Comment
Clause 169 Development that is not an activity	The proposed works are consistent with the definition of 'activity' as prescribed in Section 5.1 (Part 5 – Infrastructure and Environmental Impact Assessment) of the EP&A Act and is not excluded by any matter detailed within the clause.
Clause 170 Planning Secretary guidelines about review of environmental factors – the Act, s 5.10(a)	Section 170 nominates that the Planning Secretary may issue guidelines on how to evaluate the likely impact of an activity, and that consideration need to be given to section 171. This document has been prepared considering the Secretary's 'Guidelines for Division 5.1 Assessments' dated June 2022 published by the Department of Planning and Environment.
Clause 171 Review of environmental factors – the Act, s 5.10(a)	Section 171 of the EP&A Regulations nominates those factors which must be taken into account when considering the impact of an activity on the environment. Those factors are listed and addressed in section 7 of this report below.

4.2.1 Section 171 of the EP&A Regulations

Section 170 nominates that the Planning Secretary may issue guidelines on how to evaluate the likely impact of an activity, and that consideration need to be given to section 171. The assessment of this REF has been undertaken in accordance with the Secretary's 'Guidelines for Division 5.1 Assessments' published by the Department of Planning and Environment (June 2022).

Section 171 Review of environmental factors – the Act, s 5.10(a) of the EP&A Regulations prescribes factors that must be taken into account concerning the impact of an activity on the environment for the purpose of Part 5 of the Act. The prescribed matters and an assessment of the proposed activity against those matters are outlined in Table 1 below. In summary, the proposal has appropriately considered the impact of the activity on the environment and is not considered to affect the environment negatively.

Relevant sections of the report are referenced which provides a more detailed assessment of the potential impacts. Section 5 provides the applicable mitigation measures that need to be implemented.

Table 1 Factors for consideration under Section 171 of the EP&A Regulations

Environmental Factor	Impact Assessment	Rating
(a) the environmental impact on the community,	Community impacts would relate to impacts associated with traffic, access, noise and to a lesser extent, dust. In the longer term, the community would be positively affected as these works will transform the underutilised playground into a larger, multi-use space to better suit the visitors of the park. The impacts during demolition works will be temporary and will be suitable managed through the various mitigation measured outlined in Section 5.	☐ Nil ☒ Low ☐ Medium ☐ High

Environmental Factor	Impact Assessment	Rating
(b) the transformation of a locality,	The proposal will not result in the transformation of the locality but will enhance the existing playground and surrounding facilities. The impacts will be positive, providing improved multi-use spaces and facilities for the community.	☒ Nil ☒ Low ☐ Medium ☐ High
(c) the environmental impact on the ecosystems of the locality,	An arborist report has been prepared by Ha-Bra-Cul-Cha to accompany this report (see Appendix B). The proposed works require the removal of 44 trees (predominantly low-medium value vegetation). The proposed activity will not result in any significant impact on the ecosystems of the locality.	☐ Nil ☒ Low ☐ Medium ☐ High
d) reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality,	The proposal will not result in a reduction of the aesthetic, recreational, scientific value of the locality. The proposed works are part of an overall upgrade of the Newcastle Harbour Foreshore Masterplan which will provide a net improvement to the aesthetic, environmental and educational values of the locality. The removal of the underutilised playground facilities and the erection of the new play space are considered to have a positive impact on the aesthetic of the locality. Aboriginal and Torres Strait Island heritage themes and pieces have been incorporated into the design features of the play space to enhance the local character and history of the site. Mitigation measures have been recommended in this report to manage and mitigate any potential impacts on the environment that may arise.	☒ Nil ☐ Low ☐ Medium ☐ High
(e) the effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations,	The site does contain European heritage significance. The works do not affect the heritage values of the park or any heritage items in the vicinity of the proposal. The proposed play space incorporate a range of Indigenous peoples themes and items to have a positive effect on the locality in a architectural and historical way.	☒ Nil ☐ Low ☐ Medium ☐ High
(f) the impact on the habitat of protected animals (within the meaning of the ***Biodiversity Conservation Act 2016***),	The removed trees were not identified as providing any significant habitat.	☒ Nil ☐ Low ☐ Medium ☐ High
(g) the endangering of a species of animal, plant or other form of life, whether living on land, in water or in the air,	The proposal will not endanger any species of animal, plant or other form of life, whether living on land, in water or in the air.	☒ Nil ☐ Low ☐ Medium ☐ High
(h) the long-term effects on the environment,	Environmental impacts will primarily be during the construction phase and will be temporary. These effects will be minor but mitigated appropriately in accord with the mitigation measures outlined in Section 5 of this report.	☒ Nil ☐ Low ☐ Medium ☐ High

Environmental Factor	Impact Assessment	Rating
(i) degradation of the quality of the environment,	Works will result in a temporary increase in noise and potentially a minor level of air pollution, and these impacts require mitigation throughout the duration of works. Suitable mitigation measures have been included in Section 5.	☐ Nil ☒ Low ☐ Medium ☐ High
(j) risk to the safety of the environment,	No. Subject to the mitigation measures set out in Section 5 of this REF, the proposed works will not result in any risk to the safety of the environment.	☒ Nil ☐ Low ☐ Medium ☐ High
(k) reduction in the range of beneficial uses of the environment,	No. The proposed works will facilitate an improved range of connectivity throughout the site.	☒ Nil ☐ Low ☐ Medium ☐ High
(l) pollution of the environment,	Minimal. Noise, potential vibration and dust emissions on the surrounding land uses and public infrastructure during construction are considered to be negligible and distanced far enough from established vegetation and properties. In addition, the works will be undertaken in accordance with a Construction Environmental Management Plan (CEMP) as per the recommended mitigation measures. The CEMP will include additional measure to mitigate impacts during construction.	☐ Nil ☒ Low ☐ Medium ☐ High
(m) environmental problems associated with the disposal of waste,	There are a clear set of mitigation measures and legislative parameters around the management of waste. To this end, we do not consider the level of impact to be unmanageable or of any significance.	☐ Nil ☒ Low ☐ Medium ☐ High
(n) increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply,	No.	☒ Nil ☐ Low ☐ Medium ☐ High
(o) the cumulative environmental effect with other existing or likely future activities,	No, all existing and likely future activities will be related to existing activities that occur throughout the site.	☒ Nil ☐ Low ☐ Medium ☐ High
(p) the impact on coastal processes and coastal hazards, including those under projected climate change conditions.	No, the site is not located in an area that is considered to be affected by coastal hazards.	☒ Nil ☐ Low ☐ Medium ☐ High
(q) applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1,	No, the site is not the focus on any applicable local strategic planning statements, regional strategic plans or district plans.	☒ Nil ☐ Low ☐ Medium ☐ High

Environmental Factor	Impact Assessment	Rating
(r) other relevant environmental factors.	Nil.	☒ Nil ☐ Low ☐ Medium ☐ High

4.3 Infrastructure State Environment Planning Policy (Transport and Infrastructure) 2021

4.3.1 Overview

Chapter 2 is the relevant chapter of the ***State Environmental Planning Policy (Transport and Infrastructure) 2021*** (Transport and Infrastructure SEPP).

The aim of Chapter 2 Infrastructure of the Transport and Infrastructure SEPP is to facilitate the effective delivery of infrastructure across the state. The chapter includes provisions which enable certain development to attain approval by a public authority pursuant to Part 5 of the Act, following an environmental assessment. This process is known as 'development without consent'. The relevant provisions of this chapter are considered below.

4.3.2 Part 2.1 Preliminary

Clause 2.1 – Aim of Chapter

The aims of the Chapter 2 Infrastructure require consideration. According to Clause 2.1 of the policy, the aims are as follows:

The aim of this Chapter is to facilitate the effective delivery of infrastructure across the State by—

(a) improving regulatory certainty and efficiency through a consistent planning regime for infrastructure and the provision of services, and

(b) providing greater flexibility in the location of infrastructure and service facilities, and

(c) allowing for the efficient development, redevelopment or disposal of surplus government owned land, and

(d) identifying the environmental assessment category into which different types of infrastructure and services development fall (including identifying certain development of minimal environmental impact as exempt development), and

(e) identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure development, and

(f) providing for consultation with relevant public authorities about certain development during the assessment process or prior to development commencing, and

(g) providing opportunities for infrastructure to demonstrate good design outcomes.

It is considered that the proposal satisfies the relevant objectives of the policy for the following reasons including:

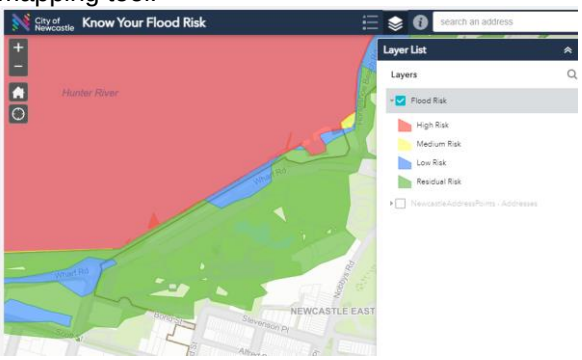
- It utilises a nominated approval mechanism.
- The nominated approval mechanism will allow for the timely delivery of important infrastructure.
- This assessment addresses the relevant matters for consideration.

4.3.3 Part 2.2 General, Division 1 Consultation

Chapter 2 – Part 2.2 General, Division 1 Consultation identifies when consultation with CN or other public authorities must occur. All matters that may trigger consultation are addressed in Table 2 below.

Table 2 Transport and Infrastructure SEPP Consultation Requirements

Relevant Provision	Comment
2.10 Consultation with councils - development with impacts on council-related infrastructure or services (1) This section applies to development carried out by or on behalf of a public authority that this Chapter provides may be carried out without consent if, in the opinion of the public authority, the development— (a) will have a substantial impact on stormwater management services provided by a council, or (b) is likely to generate traffic to an extent that will strain the capacity of the road system in a local government area, or (c) involves connection to, and a substantial impact on the capacity of, any part of a sewerage system owned by a council, or (d) involves connection to, and use of a substantial volume of water from, any part of a water supply system owned by a council, or (e) involves the installation of a temporary structure on, or the enclosing of, a public place that is under a council's management or control that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential, or (f) involves excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which a council is the roads authority under the ***Roads Act 1993*** (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath). (2) A public authority, or a person acting on behalf of a public authority, must not carry out development to which this section applies unless the authority or the person has— (a) given written notice of the intention to carry out the development (together with a scope of works) to the council for the area in which the land is located, and (b) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.	(1) The works are proposed to be carried out by a public authority. (a) Minor works are required to improve stormwater management services provided by council for the proposed upgrades (b) The proposed use is not anticipated to generate significant volumes of traffic beyond the existing traffic conditions. Council's traffic team has indicated that there is sufficient capacity to adjust timed parking in the area to cater for the needs of the proposal. (c) Not required, no works are proposed to the sewerage system. (d) The new pump room will connect to the existing water system. The water used in the coastal play area will be circulated through the pump room system and will have no substantial external impact. (e) Temporary construction fences will be installed for the duration of the works, enclosing the construction site from the general public. This will be no significant disruption to pedestrian or vehicular traffic as it is not within a pedestrian or vehicular route. The temporary structure will improve safety at the proposed work site. (f) Not required, only minor excavations are required to facilitate the proposed works. The earthworks will not impact on the road infrastructure. (2) The works are proposed to be carried out by a public authority. (a) Written notice has been given to applicable CN teams of the development. (b) Not required, no record of response to notice provided.

Relevant Provision	Comment
2.11 Consultation with councils - development with impacts on local heritage (1) This section applies to development carried out by or on behalf of a public authority if the development— (a) is likely to affect the heritage significance of a local heritage item, or of a heritage conservation area, that is not also a State heritage item, in a way that is more than minor or inconsequential, and (b) is development that this Chapter provides may be carried out without consent. (2) A public authority, or a person acting on behalf of a public authority, must not carry out development to which this section applies unless the authority or the person has— (a) had an assessment of the impact prepared, and (b) given written notice of the intention to carry out the development, with a copy of the assessment and a scope of works, to the council for the area in which the heritage item or heritage conservation area (or the relevant part of such an area) is located, and (c) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.	CN prepared an archaeological investigation for the foreshore park area. The report prepared by Umwelt (Appendix C) confirmed that the proposed works are not likely to impact on any archaeological heritage. It is considered unlikely that significant historical archaeological 'relics' will be exposed during the proposed works. Given that the scope of the works is relatively minor and are not in close proximity, it is not expected to have any impact on nearby non-aboriginal heritage items. Furthermore, the minor nature of the works are not anticipated to create an outcome that is inconsistent with the Newcastle East Heritage Conservation Area. (b) Written notice has been given to CN Council including the scope of works.
2.12 Consultation with councils—development with impacts on flood liable land (2) A public authority, or a person acting on behalf of a public authority, must not carry out, on flood liable land, development that this Chapter provides may be carried out without consent and that will change flood patterns other than to a minor extent unless the authority or person has— (a) given written notice of the intention to carry out the development (together with a scope of works) to the council for the area in which the land is located, and (b) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given	The site is identified as being impacted by Residual Flood Risk as per CN online flood mapping tool.  (2) The works are proposed to be carried out by a public authority. (a) Written notice has been given to CN Council including the scope of works. (b) On 21 March 2023 CN's engineers provided written advice identified that the site is only impacted by the Ocean 2100 inundation. PMF flash flood and PMF do not impact on the site which means it is very low risk.

Relevant Provision	Comment
2.13 Consultation with State Emergency Service—development with impacts on flood liable land (1) A public authority, or a person acting on behalf of a public authority, must not carry out development on flood liable land that may be carried out without development consent under a relevant provision unless the authority or person has— (a) given written notice of the intention to carry out the development (together with a scope of works) to the State Emergency Service, and (b) taken into consideration any response to the notice that is received from the State Emergency Service within 21 days after the notice is given.	Not applicable, the works are not relevant provisions requiring consultation under the SEPP as follows: (a) Division 1 (Air transport facilities), (b) Division 2 (Correctional centres and correctional complexes), (c) Division 6 (Emergency services facilities and bush fire hazard reduction), (d) Division 10 (Health services facilities), (e) Division 14 (Public administration buildings and buildings of the Crown), (f) Division 15 (Railways), (g) Division 16 (Research and monitoring stations), (h) Division 17 (Roads and traffic), (i) Division 20 (Stormwater management systems).
2.14 Consultation with councils—development with impacts on certain land within the coastal zone (1) This section applies to development on land that is within a coastal vulnerability area and is inconsistent with a certified coastal management program that applies to that (2) A public authority, or a person acting on behalf of a public authority, must not carry out development to which this section applies, which this Chapter provides may be carried out without development consent, unless the authority or person has— (a) given written notice of the intention to carry out the development to the council for the local government area in which the land is located, and (b) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.	Not applicable. The site is not located on land within a coastal vulnerability zone.
2.15 Consultation with public authorities other than councils	Not applicable. The proposed development is not a specified development pursuant to Clause 2.15(2).
2.16 Consideration of Planning for Bush Fire Protection	Not applicable. • The site is not mapped as bushfire prone land on the NSW Planning Portal Spatial Viewer • The proposal is not development for the purpose of health care facilities, correctional centres or residential accommodation
2.17 Exceptions	Not applicable.

4.4 Part 2.3 Development controls

The proposed activity incorporates seven types of works which are defined as development permitted without consent under the Transport and Infrastructure SEPP, those being:

- Division 12, 2.73(a)(i) – roads, pedestrian pathways, cycleways, single storey car parks, ticketing facilities, viewing platforms and pedestrian bridges,
- Division 12, 2.73(a)(ii) – recreation areas and recreation facilities (outdoor), but not including grandstands,
- Division 12, 2.73(a)(iv) – lighting, if light spill and artificial sky glow is minimised in accordance with the Lighting for Roads and Public Spaces Standard,
- Division 12, 2.73(a)(v) – landscaping, including landscape structures or features (such as art work) and irrigation systems,
- Division 12, 2.73(a)(vi) – amenities for people using the reserve, including toilets and change rooms,
- Division 12, 2.73(b) – environmental management works,
- Division 12, 2.73(c) – demolition of buildings (other than any building that is, or is part of, a State or local heritage item or is within a heritage conservation area).

The controls that apply for development permitted without consent are provided below in Table 3.

Table 3 Transport and Infrastructure SEPP Development permitted without consent

Relevant Provision	Comment
Division 12 Parks and other public reserves	
2.73 Development permitted without consent ***(3) Any of the following development may be carried out by or on behalf of a public authority without consent on land owned or controlled by the public authority—*** ***(a) development for any of the following purposes—*** ***(i) roads, pedestrian pathways, cycleways, single storey car parks, ticketing facilities, viewing platforms and pedestrian bridges,*** ***(ii) recreation areas and recreation facilities (outdoor), but not including grandstands,*** ***(iii) visitor information centres, information boards and other information facilities,*** ***(iv) lighting, if light spill and artificial sky glow is minimised in accordance with the Lighting for Roads and Public Spaces Standard,*** ***(v) landscaping, including landscape structures or features (such as art work) and irrigation systems,*** ***(vi) amenities for people using the reserve, including toilets and change rooms,*** ***(vii) food preparation and related facilities for people using the reserve,*** ***(viii) maintenance depots,*** ***(ix) portable lifeguard towers,***	(i) The proposal includes the demolition of the existing footpaths within the site area and construction of new footpaths. These pedestrian pathways have been appropriately designed to allow continuous paths of travel to and within all areas of the play space. They have been designed in accordance with the ***Design for access and mobility*** guidelines (AS1428) alongside other provisions for new building work and construction. Details are outlined in Section 5 of this report. (ii) The proposal is for the purpose of recreational use to provide improved facilities for the local and wider community. The upgraded play space and associated works will be designed in accordance with the relevant standards and guidelines. Details are outlined in Section 5 of this report. (iii) Not applicable. (iv) The proposal includes the provision of new lighting components. Lighting spill and artificial sky glow will be minimised in accordance with the ***Lighting for Roads and Public Spaces Standard.*** Details are outlined in Section 5 of this report. (v) The proposal includes various landscaping works in associated with the upgraded facilities and surrounds. This includes the construction of several lawns,

Relevant Provision	Comment
(b) environmental management works, demolition of buildings (other than any building that is, or is part of, a State or local heritage item or is within a heritage conservation area). ***(c) demolition of buildings (other than any building that is, or is part of, a State or local heritage item or is within a heritage conservation area).***	gardens bed, mulched areas, sculptural pieces and soft and hard landscaping. A suitable irrigation system will be delivered as part of the landscaping works. (vi) The proposal includes accessible drinking fountains, picnic areas and seating. (vii) Not applicable. (viii) Not applicable. (ix) Not Applicable. (b) Not applicable. (c) Not applicable. Note. The tree removal is undertaken in accordance with the definition of 'consent' and will be removed in accordance with Council's tree removal practices/requirements.

4.5 Foreshore Plan of Management

The Foreshore Plan of Management (Plan of Management) was adopted by Council in October 2015. The plan aims to document the key values of the Foreshore and guide the ongoing management, future use and development of the park. The plan addresses current recreational uses, demands and trends, anticipated future uses of the area, commercial activities and major events, and respond to demographic changes.

The Plan of Management identifies a future for Foreshore Park and the necessary actions required for any construction works. The Plan of Management recognises the foreshore as a city park and identifies the need for the provision of a city standard playground, enhancement of the parks overall scenic quality and amenity, provide a continued use for the local community and wider public and to promote heritage values of the park as being key to achieving the objectives of the Plan of Management.

The key management objectives of Foreshore Park are:

(1) Maintain the park's visual amenity and views to the harbour and the city.
(2) Encourage informal and organised recreational use of the park.
(3) Provide appropriate facilities and services and flexible spaces consistent with a city scale park to meet the current and future needs of the local community and broader public.
(4) Improve accessibility and connectivity both within the park and with surrounding areas.
(5) Improve activation through promotion and appropriate development of the park.
(6) Foster community awareness, understanding and interpretation of the heritage themes evident in the park.
(7) Manage the park in an effective, efficient and sustainable manner.

The proposed works are consistent with the above objectives by:

- The works will continue to ensure Foreshore Park is an accessible and inclusive community asset;
- Maintain and enhance a space that is of regional significance;

- Deliver new high quality play equipment;
- Deliver new high quality pedestrian pathways;
- Deliver new high quality landscaping;
- Provide appropriate facilities and services for the local community and broader public and
- Promote visitation to the Park and broader CBD by locals and tourists.

4.6 Other Legislation

Other legislation has been considered to determine whether or not it is applicable or otherwise relevant to the proposed works. An analysis has been provided below in Table 4 and Table 5.

Table 4 Commonwealth legislation considered

<table>
<tr><th>Commonwealth Legislation</th><th>Comment</th></tr>
<tr><td>Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)</td><td>This EPCB Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places.
The objectives of EPBC Act are to provide for the conservation of threatened species, populations and ecological communities of animals and plants.
Under the EPBC Act, a proponent must not take an action if that action is a controlled action, but instead must refer the proposed development to the Minister for the Environment for the Minister’s decision as to whether or not the action is a controlled action. A controlled action is one that has or will have; or is likely to have an impact on matters protected under the EPBC Act (Matters of National Environmental Significance).
An action includes a project, development, undertaking, activity, or series of activities. The EPBC Act identifies nine Matters of National Environmental Significance, which are considered below:
<table>
<tr><th>Factor</th><th>Comment</th></tr>
<tr><td>Any significant impact on a declared World Heritage Property?</td><td>No</td></tr>
<tr><td>Any significant impact on a National Heritage place?</td><td>No</td></tr>
<tr><td>Any significant impact on a National Heritage place?</td><td>No</td></tr>
<tr><td>Any significant impact on Commonwealth listed threatened species or endangered community?</td><td>No</td></tr>
<tr><td>Any significant impact on Commonwealth listed migratory species?</td><td>No</td></tr>
<tr><td>Does any part of the proposal involve nuclear actions?</td><td>No</td></tr>
<tr><td>Any significant impact on Commonwealth marine areas?</td><td>No</td></tr>
<tr><td>Any significant impact on the Great Barrier Reef Marine Park?</td><td>No</td></tr>
<tr><td>Any significant impact on Commonwealth land?</td><td>No</td></tr>
</table>
As the abovementioned states, works proposed are minor, and there is no significant flora or fauna impact. There is ground disturbance through small scale excavation associated with irrigation works, however, this is not considered to trigger any of the provisions of the Act.
The minor works also require the removal of 44 trees of medium and low significance. The tree removal does not trigger any of the provisions of the</td></tr>
</table>

Commonwealth Legislation	Comment
	Act. The works do not trigger the 0.25 hectare clearing thresholds requirement for a BDAR.
Disability Discrimination Act 1992	This Act provides a legal framework for the prohibition of discrimination against people with disabilities in employment, education, publicly available premises, provision of goods and services, accommodation, clubs and associations, and other contexts. As a mitigation strategy, all construction works are to be in accordance with the relevant provisions of the Building Code of Australia, Australian Standards, and Premises Standards.
Native Title Act 1993	This Act provides a legal framework in relation to Native title. The works are not located upon Crown land and thus the provisions of the Act are not triggered. The main objectives of the Act are: • to provide for the recognition and protection of native title; and • to establish ways in which future dealings affecting native title may proceed and to set standards for those dealings; and • to establish a mechanism for determining claims to native title; and • to provide for, or permit, the validation of past acts, and intermediate period acts, invalidated because of the existence of native title. There is no identified Native Title claim on the subject site.

Table 5 NSW Legislation Considered

NSW Legislation	Comment
Contaminated Land Management Act 1997	The object of the ***Contaminated Land Management Act 1997*** is to establish a process for investigating and remediating contaminated land. The site has a history of contamination based on historical industrial activities that have occurred across it. A contamination report (Appendix D) was prepared by Douglas Partners to support a previous REF across the park. Given the proximity of the works to this assessment and the nature of the works proposed, the proposed activities are unlikely to interact with any contaminants. A search of the NSW Environmental Protect Authority (EPA) Contaminated Land Record revealed there are no records of contamination in the project area. Despite no history of contamination, appropriate mitigation measure have been included to ensure any unexpected finds will be managed accordingly.
Crown Land Management Act 2016	The object of the ***Crown Land Management Act 2016*** is to ensure Crown Land is managed appropriately. CN are the appointed managers of the site and the proposed works will improve environmental management of the site. Gyde have been advised by CN that the land is part CN owned and part Crown Land. Gyde have been advised that CN is the Crown Land manager for Foreshore Park, including maintaining and providing general upkeep for the built form features on the site and ongoing care for the vegetation currently at Foreshore Park. As such, it is a matter for CN delegate to be satisfied under that CN have the requisite authority to approve the proposed works.

NSW Legislation	Comment
Heritage Act 1977	The object of the ***Heritage Act 1977*** is to assist with the conservation of items of State heritage significance. The site is adjacent to the listed state heritage items, being: • Coast River Precinct (Listing No. 01674). • Earp Gillam Bond Store Precinct (Listing No. 00762) Preliminary consultation was undertaken with Heritage NSW and a section 60 application has been lodged for the proposed works.
Local Government Act 1993	The purpose of the ***Local Government Act 1993*** is to provide a legal framework for local government in NSW. The subject site is located within the Newcastle local government area. The proposed development ***is 'development permitted without consent,'*** the determining authority in this case is the CN. A Plan of Management will be prepared prior to the commencement of construction. The provisions of this Act are not applicable. Refer to Section 5 of this report for consideration against the Plan of Management requirements.
Rural Fires Act 1997	The objects of the ***Rural Fires Act 1997*** are to provide for the prevention, mitigation, and suppression of bush and other fires NSW. The subject site is not identified as bushfire prone land, nor is it within a buffer area. The provisions of this Act are not applicable.
Wilderness Act 1987	The objects of the ***Wilderness Act 1987*** are to provide permanent protection and proper management of wilderness areas. Section 5.5(3) of the EP&A Act also requires that the determining authority consider the effect of an activity on any ***"wilderness area"*** as defined by the ***Wilderness Act 1987***. The subject site is not a ***"wilderness area"*** and is not in proximity to any such area. It will, therefore, not have any impact on any ***"wilderness area"***. The provisions of this section of the EP&A Act are, therefore, satisfied. In addition, the subject site and immediate locality are not identified as wilderness areas. The provisions of the ***Wilderness Act 1987*** are not applicable.
Protection of the Environment Operations Act 1997	The objects of the ***Protection of the Environment Operations Act 1997*** are to protect, restore and enhance the quality of the environment in NSW. The proposed works do not require an approval or license. Council will be the regulatory authority for the works.
Roads Act 1993	The objects of the ***Roads Act 1993*** are to set out rights of members of the public to pass along public roads. Access to the site during construction will utilise existing access points form the carpark directly north of the site. Works associated with this REF are not intended to impact upon any roads.

NSW Legislation	Comment
Biodiversity Conservation Act 2016 and the ***Biodiversity Conservation Regulation 2017***	The objects of the ***Biodiversity Conservation Act 2016*** (BC Act) are to conserve biological diversity and promote ecologically sustainable development. The ***Biodiversity Conservation Regulation 2017*** details the areas of outstanding biodiversity value to support achieving the requirements of the BC Act. The proposed activity will not be carried out in a declared area of outstanding biodiversity value and is not likely to significantly affect threatened species, populations or ecological communities, or their habitats or impact biodiversity values. In turn, Species Impact Statement (SIS) and a Biodiversity Development Assessment Report (BDAR) are not required. The works are minor, and there is no impact on native flora or fauna. There is ground disturbance through small scale excavation associated with works, however, this is not considered to trigger any of the provisions of the Act. The trees being removed do not trigger the requirements of the ***Biodiversity Conservation Act 2016*** as they are not native.
Water Management Act 2000 and the ***Water Management Regulations 2018***	The objects of the ***Water Management Act 2000*** are to provide for sustainable and integrated management of water sources of the State. In general, works that occur within 40m of a waterway may require an Activity Approval under section 91(2) of the ***Water Management Act 2000.*** The ***Water Management Regulations 2018*** include exemptions to the need to obtain an Activity Approval. Clause 41 specifies that public authorities are exempt from the need to get an Activity Approval. As such, no approval is required in this case.
Coal Mine Subsidence Compensation Act 2017	The objects of the ***Coal Mine Subsidence Compensation Act 2017*** are to provide a scheme from compensation for damage cause by subsidence resulting from coal mine operations, and the assessment and management of risks associated with subsidence resulting from coal mine operations. The site is not located within a proclaimed subsidence district. The provisions of this Act are not applicable.
National Parks and Wildlife Act 1974	The objects of the ***National Parks and Wildlife Act 1974*** include to conserve objects, places or features of cultural value within the landscape, including, those of significance to Aboriginal people. The Act provides that a person who exercises due diligence in determining that their actions will not harm Aboriginal objects has a defense against prosecution if they unknowingly harm an object without an AHIP. An Archaeological Constraints Assessment was prepared (Umwelt Environmental & Social Consultants – Appendix C) for a previous REF for works immediately adjacent to the proposals. Given the proximity of these works and the radius of the assessment undertaken the findings of the previous assessment are relevant to this proposal. The conclusions and recommendations of the Assessment has determined: • The study area has low potential. • The proposed activities can proceed with caution without requiring further Aboriginal heritage investigations

4.7 Other Environmental Planning Instruments

Additional Environmental Planning Instruments (EPIs) have been considered to determine whether or not they are applicable or relevant to the proposed works. An analysis has been provided below in Table 6. In summary, no other EPIs are relevant to the proposal.

Table 6 Other Environmental Planning Instruments

Environmental Planning Instrument	Comment
State Environmental Planning Policy (Exempt and Complying Development Codes) 2008	This SEPP aims to provide an effective assessment process for development that complies with specified development standards by providing exempt and complying development codes that have State-wide application. The provisions of this Policy are not applicable to the proposed works through the operation of Clause 1.8(2) of the Codes SEPP.
State Environmental Planning Policy (Industry and Employment) 2021	This SEPP contains the following provisions for: • Advertising and signage in NSW All signage proposed is for the purposes of wayfinding and is not for advertising. See Landscape Architectural Plans for details (Appendix A).
State Environmental Planning Policy (Biodiversity and Conservation) 2021	This SEPP contains the following provisions for: • Planning rules and controls for the clearing of native vegetation in NSW on land zoned for urban and environmental purposes that is not linked to a development application. • The land use planning and assessment framework for koala habitat. • Provisions which establish a consistent and coordinated approach to environmental planning and assessment along the River Murray. • Provisions seeking to protect and preserve bushland within public open space zones and reservations. • Provisions which prohibit canal estate development. • Provisions to support the water quality objectives for the Sydney drinking water catchment. • Provisions to protect the environment of the Hawkesbury-Nepean River system. • Provisions to manage and improve environmental outcomes for Sydney Harbour and its tributaries. • Provisions to manage and promote integrated catchment management policies along the Georges River and its tributaries. • Provisions which seek to protect, conserve and manage the World Heritage listed Willandra Lakes property The relevance of the SEPP to the development site relates primarily to the provision of tree or vegetation removal, ecological system impacts on riverbeds. **Chapter 2 Vegetation in non-rural areas** The aims of this Chapter are to: (a) To protect the biodiversity values of trees and other vegetation in non-rural areas of the State. (b) To preserve the amenity of non-rural areas of the State through the preservation of trees and other vegetation.”

Environmental Planning Instrument	Comment
	The proposal is consistent with the objectives of the SEPP.
State Environmental Planning Policy (Resilience and Hazards) 2021	This SEPP contains the following provisions for: • For land use planning within the coastal zone, in a manner consistent with the objects of the Coastal Management Act 2016 to manage hazardous and offensive development. • Which provides a state-wide planning framework for the remediation of contaminated land and to minimise the risk of harm. **Chapter 2 Coastal Management** The aim of this Chapter is to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the ***Coastal Management Act 2016***, including the management objectives for each coastal management area, by— (a) managing development in the coastal zone and protecting the environmental assets of the coast, and (b) establishing a framework for land use planning to guide decision-making in the coastal zone, and (c) mapping the 4 coastal management areas that comprise the NSW coastal zone for the purpose of the definitions in the ***Coastal Management Act 2016***. The site is located within a Coastal Environment area and a Coastal use area. Division 2.12 states that development consent must not be granted to development on land within the coastal zone unless the consent authority is satisfied that the proposed development is not likely to cause increased risk of coastal hazards on that land or other land. The works are a considerable distance from the waterway, and a mitigation measure in relation to the use of sediment control fencing during construction will mitigate any construction materials to spill towards the nominated coastal areas and waterways. See section 5 of this report for mitigation measures. **Chapter 4 Remediation of land** The objective of Chapter 4 is to provide a State-wide planning approach for the remediation of contaminated land. The site has a history of contamination based on historical industrial activities that have occurred across the site. A contamination report (Appendix D) was prepared by Douglas Partners to support a previous REF across the park. A search of the NSW Environmental Protect Authority (EPA) Contaminated Land Record revealed there is no records of contamination in the project area. Despite no history of contamination, a mitigation measure has been included to ensure any unexpected finds will be managed accordingly. Based on the known contamination parameters applying to the site, the site is suitable for this use.
State Environmental Planning Policy (Planning Systems) 2021	This SEPP contains the following provisions for: • Identifies State or regionally significant development, State significant Infrastructure, and critical State significant infrastructure. • Provides for consideration of development delivery plans by local Aboriginal land councils in planning assessment.

Environmental Planning Instrument	Comment
	• Allows the Planning Secretary to elect to be the concurrence authority for certain development that requires concurrence under nominated State environmental planning policies. The works are not classified as regional or state significant development.
Newcastle Local Environmental Plan 2012	The Newcastle Local Environmental Plan 2012 creates local environmental planning provisions for land in the Newcastle Local Government Area (LGA). The Newcastle Local Environmental Plan 2012 is a relevant consideration for the proposed development. The Foreshore Park is zoned RE1 Public Recreation pursuant to the Newcastle Local Environmental Plan (NLEP) provisions. The proposed development will achieve the objectives of the zone as it will provide a range of recreation activities that improve the environmental outcomes of the public recreation area. Additionally, the proposed works with enhance the natural environment for recreational purposes by encourage good built form and design incorporate the surrounding land uses and desired future outcome of the site.
Newcastle Development Control Plan 2012	This Policy is not a relevant matter for consideration.

4.8 Consultation

City Infrastructure at CN has consulted with a variety of government and non-government stakeholders, which is summarised below:

Table 7: Community and Stakeholder Consultation Engagement Criteria

STAKEHOLDER	CONSULTATION FORMAT	CONSULTATION OUTCOME	CITY INFRASTRUCTURE ACTION
CN	• Internal Project Working Groups (PWGs) as follows: ➢ Electrical PWG ➢ Hydraulics and Drainage PWG ➢ Playground Design and Accessibility PWG ➢ Accessible Parking PWG ➢ Soft Landscaping, Trees and Irrigation PWG ➢ Material Selections and Future Maintenance PWG ➢ Signage PWG ➢ Operation and Maintenance Plan PWG • Direct officer engagement • Formal letter	• Discussions on design of infrastructure assets to be dedicated to CN	• Continue discussions and design refinement to enable dedication of infrastructure assets.
CN Grant Funding Bodies	• Department Primary Industries and Regional Development - Newcastle Port Community	• Discussions during design of playspace	• Continue discussions and design refinement

	Contribution Fund - Round 6 and 7 Grant Funding. • Department of Planning and Environment - Everyone Can Play Grant Funding • Department Primary Industries - Resource For Regions Round 9 Grant Funding • Livi's Place Grant Funding		
General community	• Public Exhibition of the Draft Harbour Foreshore Masterplan. • Community drop in sessions • Letterbox drop. • Social media posts • Have your Say page on CN website. • Community Reference Group (CRG) stakeholder workshops. • Guraki Aboriginal Advisory	• Adoption of the masterplan including the new regional play space that required filling of the frog pond and construction of the kiosk.	• Design of new play space.

Further consultation:

- Further consultation with agencies prior to commencement of works is listed in Section 5.
- The determining authority must place all relevant information to the REF on the determining authority's website or the NSW Planning Portal prior to the commencement of works as per Cl171(4) of the EPAR.

4.8.1 City of Newcastle

CN's engineering team was consulted on the proposed works and potential flooding impacts. The team provided additional insights into flooding across the site. To support this conclusion, CN engaged Torrent Consulting to prepare a Flood Impact Assessment (Appendix G) to simulate the local catchment processes contributing to runoff. The Flood Impact Assessment included development of a TUFLOW combined hydrological and hydraulic model to simulate the rainfall-runoff process for the local catchment and establish design flood conditions within the Project area for the existing and post-development scenarios. The Flood Impact Assessment concluded that the proposed redevelopment does not significantly alter the existing flood conditions and result in adverse changes to the existing flood risk profile.

4.8.2 Government Agency or Authority

Agencies were engaged on the proposed works. Hunter Water were engaged multiple times throughout the process between March 2022 and December 2022 resulting in minor movement of assets to realign with Hunter Water's request. No further feedback was received from Agencies.

5. Environmental Impact Assessment

5.1 Introduction

This section describes and assesses the potential impacts of the proposed activity.

Section 171 of the Regulations stipulates the environmental factors that must be taken into account when consideration is being given to the likely impact of an activity on the environment. An evaluation of the proposal against those environmental factors is provided below.

5.2 Assessment Methodology

5.2.1 Overview

The environmental assessment methodology for the project involves the following:

- Identifying potential environmental risks/impacts associated with the project
- Evaluating identified risks/impacts to determine the potential for occurrence and degree of severity
- Identifying and determining suitable environmental management procedures and mitigation measures for planned works

5.3 Consideration of Key Issues

5.3.1 Landscape character and visual amenity

The proposed works involve the erection of a new large play space in an area previously occupied by a small play space facility and landscaping. The proposed works include four new themed play space areas and additional amenities and infrastructure including:

- Garden beds, trees and lawns;
- Dedicated quiet spaces;
- Three (3) Picnic areas and seating;
- Three (3) accessible drinking fountains;
- Coastal water play with tug boats, sea grass sculptures and shade sails
- Coastal waterplay area pump room;
- Indigenous themed meeting space with communal picnic table and whale bone swing
- Industrial play with elevated tree top walk, climbing towers and flying fox
- Junior play with sand pit, swing set, trampolines and logs/nature play
- Connecting pedestrian pathways;
- Signage and wayfinding; and
- Lighting.

The proposed works will deliver a consistent use to the existing built form (that being presentation of a play space area and landscaped parkland). An extensive landscaping plan has been prepared that will diffuse the built form of play space equipment that will include planting to screen much of the play space equipment from surrounding vantage points. The proposed works (including landscaping) is considered to have neutral impacts on the landscape character and visual amenity of the park as it will appear largely consistent with the existing character.

5.3.2 Social Impacts

Foreshore Park is an important community and social space for Newcastle. The park and wider foreshore provide an important connection for the city to its harbour. However, the park and facilities are underutilised and should be upgraded to accommodate the future community needs. The proposed works will transform the underutilised play equipment and surrounding space into an attractive and practical multi-use area that is better adapted to the needs of the community.

The proposed development will contribute positively to the residents of Newcastle and the wider community anticipated to visit the regional park.

CN have indicated that the play space's operation will be defined as part of the Operational Management Plan, with gates being locked before opening and after closing times. Given that the site is an outdoor facility, CN should prepare an Operational Management Plan to prior to the commencement of operations to ensure systems are in place to manage any potential complaints or anti-social behaviour.

The following mitigation measures are proposed to manage environmental impacts:

Number	Aspect	Mitigation Measure	Responsibility	Timing
1	Social Impact	Prior to operation of the facility, an Operational Management Plan is to be prepared detailing how the facility will operate, including: • Operating hours, • Safety and security provisions • Operation of the site lighting • Operation of the pumping facilities • Managing social impacts • Handling of complaints	CN	Prior to commencement of operation

5.3.3 Aboriginal heritage

An Archaeological Constraints Analysis (ACA) was prepared by Umwelt Environmental & Social Consultants to inform a previous REF for the park's infrastructure works in June 2020 (see Appendix C). The assessment involved an archaeological investment of the study area in relation to the Indigenous importance of the park. The study area of the Archaeological Constraints Analysis includes the location of the proposed works for this REF and therefore can be relied upon for the purposes of this review.



Figure 8 **Study area of the ACA (outlined in red) and AHIMS Registered sites within the locality (green and yellow dots) (Source: Umwelt Archaeological Constraints Analysis)**

The study involved an Aboriginal Heritage Information Management System (AHIMS) search of the study area and surrounding locality. This search identified that there are no Aboriginal sites within the project area as shown in **Figure 9.**

The details of nearby Aboriginal heritage sites are:

- **AHIMS # 38-4-1020**: Coutts Sailors Home PAD1 is located within the former convict lumber yard site along Scott Street, Lot 2 DP 706760. AHIMS advanced search data identifies that a permit has been issued for this PAD. It is unknown whether any further archaeological works have been undertaken as part of the permit issued for this PAD. It is noted however, that the AHIMS site 38-4-0957 (below) is located within the same Lot and DP as 38-4-1020.
- **AHIMS # 38-4-0957**: The NCL 931 site is identified as an open camp site and is located along Bond Street. It was noted that the assemblage was recovered from backfill deposits which dated from the 1987 excavations of the area. The AHIMS data indicates that a permit was issued for the site. It is unknown whether any further archaeological works have been undertaken as part of the permit issued for the site.

The ***National Parks and Wildlife Act Regulation 2019*** identifies that compliance with the ***Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*** is to constitute due diligence in determining whether a proposed activity will harm an Aboriginal object.

In accordance with Clause 80B of the National Parks and Wildlife Regulation, land is defined as disturbed if it has been the subject of human activity that has changed the earth's surface, being changes that remain clear and observable. The area of proposed works meets the description of disturbed land. Under Step 2B of the due diligence code, the area therefore does not meet the definition of a landscape feature likely to indicate the presence of Aboriginal objects.

On the basis of the information presented above, it is considered that there is a low likelihood that the proposed works will result in harm to Aboriginal objects. In accordance with the due diligence code, it is assessed that no further Aboriginal heritage investigations are required, and works can proceed with caution. As the proposals do not involve works to a registered Aboriginal Site and declared place, an Aboriginal Heritage Impact Permit (AHIP) is not required.

The following mitigation measures are proposed to manage environmental impacts:

Number	Aspect	Mitigation Measure	Responsibility	Timing
2	Aboriginal Cultural Heritage	In the event that unexpected Aboriginal objects, sites or places (or potential Aboriginal objects, site or places) are discovered during construction, all works in the vicinity should cease and the proponent should determine the subsequent course of action in consultation with a heritage professional and/or the relevant State government agency as appropriate. In accordance with the Aboriginal Due Diligence Assessment the following is recommended: • A heritage induction and an unexpected finds procedure is to be put in place for all stages of the works. It is recommended that representatives from the Aboriginal community are involved during this process. • Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity. The find should not be moved until assessed by a suitably qualified archaeologist. If the find is determined to be an Aboriginal object, the archaeologist is to provide further recommendations. This may include notifying Heritage NSW and the relevant Aboriginal stakeholders. • Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity you must: – Immediately cease all work and the find should not be moved or remains disturbed. – Notify the NSW Police and Heritage NSW Environmental Line on 131 555 as soon as practicable an provide details of remains and their location. – No work can recommence unless authorised in writing by Heritage NSW	Aboriginal Heritage Consultation, Project Manager/Contractor, CN, NSW Heritage and NSW National Parks and Wildlife Service	Prior to commencement of and during works

5.3.4 Heritage Impacts

The subject site is on reclaimed land that was developed as part of the construction of Newcastle Harbour upon settlement of the city. The site has no known history of buildings or European occupation since the

reclaimed land was constructed. Despite having no known occupation, the following mitigation measure is proposed to manage any unexpected finds.

Number	Aspect	Mitigation Measure	Responsibility	Timing
3	European Cultural Heritage	• In the event that unexpected European objects are discovered during construction, all works in the vicinity should cease and the proponent should determine the subsequent course of action in consultation with a heritage professional and/or the relevant State government agency as appropriate.	Project Manager / Contractor / CN / NSW Heritage NPWS	During works

5.3.5 Water Management

The works associated with this REF involve the installation of a pump room and associated stormwater services to support the new coastal waterplay area. Minor changes are also proposed for the existing hydraulic services at the site. Additionally, the upgrades to landscaping within the site area involve the provision of additional hard landscaped areas. These areas have been built in accordance with the relevant standards and are not anticipated to increase ground water run off or affect stormwater capacity at the site.

The subject area is flood prone. It is classified as very low risk and is outside of the 1% Annual Exceedance Probability (AEP) event. Advice from CN's engineers confirmed that the proposed works would not exacerbate the potential flooding characteristics of the area. In addition to the advice from CN's engineers, a Flood Impact Assessment was prepared by Torrent Consulting to simulate the local catchment processes contributing to runoff. The Flood Impact Assessment concluded that the proposed redevelopment does not significantly alter the existing flood conditions and result in adverse changes to the existing flood risk profile.

The following mitigation measures are proposed to manage environmental impacts:

Number	Aspect	Mitigation Measure	Responsibility	Timing
4	Hydraulic services	• If required, the project manager/contractor shall gain approval from the relevant authority for the relocation and/or construction of temporary services prior to commencement of works • All work shall be carried out in accordance with relevant authority requirements, council regulations, hydraulic specifications and Australian standards and codes	Project manager/Contractor	Prior to commencement of and during works
5	Controlling surface water	• During works, any alteration to natural surface levels on the site is to be undertaken in such a manner as to ensure that there is no increase in surface water runoff to adjoining properties or that runoff is impounded on adjoining properties, as a result of the development	Contractor	During works

5.3.6 Trees and vegetation

Where possible, existing trees are to be retained and incorporated into the new landscaping design and features. It is proposed to remove 44 trees to facilitate the construction of the play space. The trees are a mix of mature and semi-mature low and medium value trees. The trees are not naturally seeded and are

located within a managed landscape. The trees being removed will be replaced by a more holistic landscaping approach achieving a superior landscaping outcome for the side as part of the larger Foreshore Park works.

The trees contribute to the visual amenity of the park, providing high reaching landscaping. A comprehensive new landscaping scheme is proposed. The scope of works proposed will enhance planting within more functional spaces, passive recreation areas and amenity planting which will enhance the overall landscape character of the site, as well as generally increase canopy cover.

The following mitigation measures are proposed to manage impacts on trees:

Number	Aspect	Mitigation Measure	Responsibility	Timing
6	Tree Protection Measures, Arborist inspection and reporting of retained trees	Before the commencement of any works: • The arborist Impact Plan and Tree Protection Plan will form part of the documentation supplied to the contractor undertaking the proposed works. • The project arborist will identify all trees on-site using the City of Newcastle TAMS protocol. • Trees with no asset identification will be allocated an asset identification number. • The project arborist shall identify trees that have been approved for removal from the site by applying pink marking paint to the ground. • Staff are to be made aware of tree protection measures during induction to the site. • Tree protection temporary fencing will be established before bulk earthworks commence. • The temporary fence will consist of panels from anti-climb mesh, measuring 2.1 m high x 2.4 m wide; the temporary fence must comply with Australian standards, AS4687:2007 Temporary fencing and hoardings to guarantee safety and security. • The Arborist Impact Plan denotes the tree's temporary fencing location. The location of the tree protection temporary fencing has been sighted to ensure machinery will not clash with first-order branches • Tree protection temporary fencing can only be modified after discussions with the project arborist. • Tree protection temporary fencing will be denoted with appropriate signage, and signage will be consistent with AS 4970-2009, the protection of trees on development sites, and Part B of Newcastle Council's Urban Forestry Technical Manual. Tree protection zones and structural root zones will be marked on the ground prior to the	Project Manager / Contractor	Before works

Number	Aspect	Mitigation Measure	Responsibility	Timing
		commencement of bulk earthworks and will be maintained during the proposed works.		
7	Tree Protection Measures, Arborist inspection and reporting of retained trees	• Installation of mulch around the tree to remain on site as per the Arborist Impact Plan will occur immediately after tree removal has occurred. • The tree protection fence will be installed prior to bulk earthworks. • The tree protection fence will be certified by the project arborists • The tree protection temporary fencing will stay in situ for the project's duration. • No storage of equipment or materials is permitted within the TPZ, and no asphalt wasting or other pollutants must be allowed to enter the TPZ • All machinery working within the tree protection zones of heritage-listed trees will mitigate their impact on tree roots and soil structure by reducing manoeuvrability. • Footings and foundations for play equipment, steppingstones, sandstone logs, and park furniture located within the tree protection zone and the structural root zone will be hand-dug under the supervision of the project arborist. The project arborist will undertake all tree roots that require severing. • No equipment or machinery will be allowed within the tree protection fence. • All new infrastructure will not be re-routed through the tree protection zone. • No storage of equipment or materials is permitted within the Tree Protection Zone. All equipment and materials will not impede drainage from the trade protection zones • During prolonged absence of rain, additional irrigation will be supplied to tree identified by the project arborist • Damage to any part of a TPZ must be reported to the certifying project arborist for assessment	Project Manager / Contractor	During works
8	Tree Protection Measures, Arborist inspection and reporting of retained trees	• All disturbed areas within the Tree Protection Zone & and Structural Root Zone will be mulched to a depth of 200mm and adequate moisture will be supplied for the duration of the project • Post-Construction Assessment: It is essential to conduct a thorough assessment of the trees after construction to identify any damage or stress the trees might have	Project Manager	After works.

Number	Aspect	Mitigation Measure	Responsibility	Timing
		undergone		

5.3.7 Ecology

Works associated with this REF do not propose the removal or disturbance of high value native flora or fauna that may reside in Foreshore Park. Works associated with this REF will disturb the turf and existing landscaping that is currently on the park through shallow excavation of the ground for levelling, construction and landscaping works. Given that the proposed works does not seek to impact on any significant vegetation, it is not anticipated that it will result in any impact on fauna.

5.3.8 Noise and Vibration

Construction Noise

Construction works will proceed with normal construction operation times (7am – 5pm Monday to Friday and 9am – 1pm Saturday). All construction works will be undertaken in accordance with the EPA Noise guidelines.

The following mitigation measures are proposed to manage environmental impacts:

Number	Aspect	Mitigation Measure	Responsibility	Timing
9	Hours of work	Demolition and construction may only be carried out between the following hours: (a) Monday to Friday 7am – 6pm (b) Saturday 8am – 1pm (c) No work is to occur on Sundays and public holidays (d) Delivery may occur outside the hours referred to above, but not before 6:30am or after 6:30pm. Night works as required and with appropriate notification. These hours may be extended in limited circumstances, provided that high noise making machinery and activities and other impacts on neighbourhood amenity are avoided.	Project manager / Contractor	During works
10	Noise	The following mitigation measures are recommended: • Behavioural practices: No swearing or unnecessary shouting or loud stereos/ radios on site. No dropping of materials from height, throwing of metal items and slamming of doors. • Construction hours and scheduling: Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Works generating high noise and/or vibration level should be scheduled during less sensitive time periods. Comply with requirements of the EPA industrial noise policy.	Project manager/ Contractor	Prior to commencement of and during works

5.3.9 Lighting

The REF is accompanied by a lighting plan prepared by Electro Light detailing the extent of the proposed lighting across the site (Appendix E). It identifies that the lighting has been located to direct light away from any of the potential residential receivers to the south of the proposed works. Based on the lighting specifications identified within the lighting plan, it is not anticipated that the lighting will result in any amenity impacts on neighbouring properties. Operation of the lighting across the play space will be detailed as part of Mitigation Measure 1 for the preparation of an Operational Management Plan.

5.3.10 Air Quality and Dust

Whilst the proposed works are considered to be minor in nature, there are potential impacts on the air quality in the near vicinity of where the works will occur. Dust may be generated from excavation works and lifted and shifted from the movement of construction vehicles during the demolition and construction phases. There is also the potential for exhaust emission from construction vehicles to occur.

It is noted that the proposed works involve limited earthworks and will be of a limited duration and as such pacts should be minimal.

The following mitigation measures are proposed to manage environmental impacts:

Number	Aspect	Mitigation Measure	Responsibility	Timing
11	Dust control	If dust nuisance is likely to occur, suitable screens shall be erected during demolition and construction of the proposed work. If necessary, water sprays shall be used on the site to reduce the emission of dust.	Project manager/contractor	During works

5.3.11 Traffic and Access

Foreshore Park has several vehicular access points with Wharf Road to the north and Bond Street to the south. It is anticipated that medium and heavy rigid vehicles will use these roads.

Due to the nature of the proposed works – being located across a wide area of the park and involving the construction of new infrastructure (occurring under a separate REF) the access points may change over the project duration depending on the location of the subject works. As per the civil engineering drawings prepared by Northrop found in Appendix F, the temporary vehicular access will be located at the northern portion of the site area to join the existing carpark.

The most recent CN traffic study determined a 50% vacancy rate within the Foreshore carpark that CN considers sufficient to fulfill the demand for the proposed play space. The existing car park is currently an 8 hour zone with this to be retained.

Pedestrian and public access will be restricted at the site. Pedestrian access in some areas of the park will be restricted due to the size of the site area and location.

The following mitigation measures are proposed to manage environmental impacts:

Number	Aspect	Mitigation Measure	Responsibility	Timing
12	Pedestrian safety (before and during construction)	• Installation of temporary barriers between any currently publicly accessible areas and the relevant construction zone to avoid pedestrians entering the construction zone. The temporary barrier shall be a minimum height of 1.6 m.	Project manager/contractor	Prior to commencement of and during works

Number	Aspect	Mitigation Measure	Responsibility	Timing
		• Inclusion of pedestrian awareness in any induction program for all staff associated with the onsite works. • During both the construction and operational phase, suitable materials shall be used to avoid pedestrian trips, slips and the like. Materials in accordance with the relevant Australian Standards shall be used. Such materials shall be maintained in accordance with the relevant standards and/or the manufacturer's requirements. • A public communications protocol shall also be established before and for the duration of the construction phase. The protocol should outline at least the following: – Purpose of the project. – When construction works are anticipated to commence, daily construction hours, and the approximate duration of the construction works. – Any particular construction related processes which may generate amenity impacts which could be reasonably regarded as out of the ordinary. – The means of communication, which should include at least onsite signage, notifications within local newspapers or other publications with local circulation, as well as social media, a project liaison officer from CN for local business owners, and a contact phone number. – Establishment of construction zone lighting in accordance with relevant Australian Standards.		
13	Access	• Construction will be managed to ensure that vehicular and pedestrian access is continuously available to the surrounding public areas of the park. Access management requires shall be detailed in the CEMP and a site specific PTMP to manage site movements access and deliveries.	Project manager and CN	During works

5.3.12 Services and Utilities

Previous work has been recently competed to upgrade the water infrastructure and electrical services infrastructure servicing the park. As part of the previous REF for the kiosk and frog pond area, service connections were also proposed. Proposed connections are compliant with the relevant Australian standards.

The following mitigation measures are proposed to manage environmental impacts:

Number	Aspect	Mitigation Measure	Responsibility	Timing
14	Services and Infrastructure	All services and utilities in the area of construction must be appropriately disconnected and reconnected as required. The contractor is required (if necessary) to consult with the various service authorities regarding their requirements for the disconnection of services.	CN / Contractor	During Works
15	Utilities and Services	• Prior to commencement of any demolition or construction activities, any services near the building site which may be impacted by the works are to be accurately located. • Dial Before You Dig should be contacted prior to the commencement of any works. • Prior to commencement of works, an application for a compliance certificate is to be made to Hunter Water or other evidence of CN non-objection to the commencement of work on the basis of service availability is to be provided, if deemed to be required.	CN / Contractor	During Works

5.3.13 Excavation, earthworks and contamination

The proposed works will require the undertaking of shallow excavation including the removal of several pedestrian pathways for the new equipment and associated landscaping. The exact volume of excavated material will not be known until works occur but is generally expected to be minor in nature.

The site is identified as having Class 3 acid sulfate soils. As per City of Newcastle's environmental health regulations for this class, any works more than 1m below the natural ground surface may require a management plan. The excavation works are not anticipated to exceed 1 metres, and as such, acid sulfate soils management plan is not required for this proposal.

The preliminary geotechnical investigation prepared by Douglas Partners dated February 2021 and contamination assessment prepared by CESL dated June 2022, indicated the presence of several potentially contaminating activities, including fill placement, former industrial land use (e.g. rail yards) and demolition of structures. Laboratory testing considered the fill materials to be suitable to remain on site provided that remediation and management is implemented to manage the observed and potential contamination risks.

The following mitigation measures are proposed to manage environmental impacts:

Number	Aspect	Mitigation Measure	Responsibility	Timing
16	General	• During works all excavation is to be executed safely and properly protected to prevent any harm to life and assets	Project manager / Contractor	During works

Number	Aspect	Mitigation Measure	Responsibility	Timing
17	Acid sulfate soil	• If excavation works exceed 1 metre below the natural ground surface the Contractor shall implement an Acid Sulfate Management Plan to mitigate impacts	Project manager / Contractor	During works
18	Erosion and Sediment	• Ongoing management of soils and sediment is in accordance with Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) Guidelines for Fresh and Marine Water Quality. • Ongoing management of soils and sediment in accordance with Landcom's (2004) Managing Urban Stormwater: Soils and Construction. • Ongoing management of soils and sediment in accordance with Volume 2D of Managing Urban Stormwater: Soils and Construction (DECC 2008). • Construction to be undertaken in accordance with the ***Protection of the Environment Operations Act 1997***. • Stockpiles are to be placed more than 2m, preferably 5m from existing vegetation, concentrated water flow, roads and hazard areas. • Sediment fences should be constructed in accordance with the relevant standards and civil engineering drawings	Project manager/contractor	Prior to commencement and during works
19	Unexpected Finds Protocol – Historic Heritage	• If any unexpected archaeological relics are uncovered during the work, then all works must cease immediately in that area and the NSW Heritage Division is to be contacted. Depending on the possible significance of the relics, an archaeological assessment and management strategy may be required before further works can continue in that area. Works may only recommence with the written approval of the NSW Heritage Division.	Contractor / Project Manager	During Works
20	Unexpected Finds Protocol – Contamination	• If any unexpected contaminated material is encountered during the works, all work shall cease, the site will be secured and a safe work method statement(s) and appropriate documented practices would be implemented to ensure the site it suitable for its use in accordance with the approved Demolition Management Plan	Contractor / Project Manager	During Works

Number	Aspect	Mitigation Measure	Responsibility	Timing
21	Contamination (before and during construction)	• All requirements and recommendations, including foundations and structural footings, contained in the Civil Plans (Appendix F) should be complied with. • Construction to be undertaken in accordance with the Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia (Western Australia Department of Health 2009). • Certification from appropriately qualified person that contamination remediation as required has been completed to the requisite standard.	Project Manager / Contractor	Prior to Commencement of and during works
22	Site remediation and management	• Removal and off-site disposal of impacted fill and soils is to be delivered to an appropriately licensed facility to remove the identified and potential human health and ecological impacts	Project Manager / Contractor	During and post works

5.3.14 Site Suitability

A new Foreshore Plan of Management (PoM) was released in 2015 by the Infrastructure Group, City of Newcastle with the aim of guiding the ongoing management, future use and development of the park. The PoM replaced the former PoM published in 2000 but retains the key strategic direction which informed the Newcastle Harbour Foreshore Park Masterplan (HFMP) which was adopted by CN in December 2022.

The PoM addresses the current uses of the site, demands and trends, the anticipated future uses, commercial activities and major events whilst responding to demographic changes.

The proposed works will provide a more usable space and pedestrian connections for the broader community to gather, socialise and enjoy the harbour location. The site is considered suitable for the proposed use as it enhances the existing use by delivering high quality play equipment, pedestrian pathways and accessible facilities.

5.3.15 Other potential environmental impacts

This REF considered the likelihood of the following environmental impacts being:

- Water quality
- Natural hazards
- Sea level rise
- Visual amenity and lighting
- Bushfire
- Socio economic
- Climate change and cumulative impacts

It is considered that the above environmental impacts are not likely to result from the proposed development, however the following mitigation measures are proposed to ensure the any unexpected impacts are appropriately managed.

Number	Aspect	Mitigation Measure	Responsibility	Timing
23	Building Code of Australia	All works must be carried out in accordance with the requirements of the Building Code of Australia (BCA).	Project manager/contractors	During works
24	Water Quality and Water Sensitive Urban Design	• All care and due diligence are to be taken to minimise or prevent pollutant material entering drain inlets or waterways. • All water collected shall be directed through a water quality management system prior to discharge • Water sensitive urban design measures achieve the water quality standards	CN / Contractor	During Works
25	Details of the Activity	The activity must be carried out substantially in accordance with the plans identified within the appendices to this REF.	CN / Contractor	At all times
26	Site attendance and works period	A Construction Environmental Management Plan (CEMP) is to be prepared in consultation with relevant stakeholders and in accordance with CN and / or NSW Government Environmental management guidelines for construction (Edition 4). The plan would provide information on traffic flow, vehicle moments, site access and parking arrangements during construction, and the measures to minimise the impacts on the relevant road network. The proposed works will be undertaken in accordance the environmental construction management plan. The CEMP must address/include (as a minimum): • Legislative requirements and relevant non-statutory policies • Specific environmental construction mitigation measures described in this REF • Requirements outlined in any relevant approvals, permits or licences • Details of: – Hours of work; – 24-hour contact details of site manager; and – Community consultation and complaints handling. • Construction traffic and pedestrian management and construction access. • Construction noise and vibration • Erosion and sediment control in accordance with Landcom's Management Urban Stormwater: Soils and Construction.	CN / project manager / contractor	Prior to commencement of any work

Number	Aspect	Mitigation Measure	Responsibility	Timing
		• Tree management and protection. • Air quality/dust suppression • Management of hazardous materials • Unexpected finds protocols for Aboriginal cultural heritage, European heritage and contamination.		
27	Approvals	All necessary consultation and approvals required by State and Commonwealth legislation and relevant CN policies are to be obtained. A copy of all approvals is to be kept on-site and include the following: • Approval / Notice to Crown Lands in accordance with Land Manager Requirements under Crown Lands Act • Obtain referral response from Heritage Council of NSW. • Consult relevant utility providers (Water, Sewer, Electricity, Gas, Telecommunications etc) with regard to the installation or impact of any utilities • The proposed works be approved by CN's Local Pedestrian, Cycling and Traffic Calming Committee (Traffic Committee). • City of Newcastle with regard to flooding, heritage items, heritage conservation areas, coastal vulnerability area matters		
28	Neighbour notification	Neighbouring properties shall be notified 5-7 days prior to the commencement of works. The determining authority must place all relevant information to the REF on the determining authority's website or the NSW Planning Portal prior to the commencement of works as per Cl171(4) of the Environmental Planning & Assessment regulations. Consider any submissions.	CN	Prior to commencement of any works
29	Deliveries	Disruption to road users is to be kept to a minimum by scheduling any delivery activities outside of peak network hours	Project Manager / Contractor	During Works
30	Demolition waste	• A Demolition Waste Management Plan shall be prepared by an appropriately qualified contractor prior to the commencement of works. The plan should be prepared in accordance with the NSW Environment Planning Authority "Waste Classification Guidelines" and the ***Protection of the Environment Operations Act 1997***.	CN/ / Contractor	Prior to commencement of any works

Number	Aspect	Mitigation Measure	Responsibility	Timing
		• Any waste or materials that are not suitable for recycling are to be disposed of at CN's Summerhill Waste Management Facility or equivalently licences site. • Any demolition work must comply with the demolition work plans required by Australian Standard AS 2601-2001 The demolition of structures (Standards Australia, 2001) and endorsed by a suitably qualified person.		
31	Waste generally	• The contractors shall remove rubbish resulting from the works from site. Rubbish shall be handled in a manner so as to confine the material completely and to minimise dust emissions and disposed of in accordance with Contractor's DMP. • Any asbestos removal is to be undertaken by a Licensed Asbestos Removalist (once appointed). All works are to be conducted in accordance with NSW Government's legislative requirements and following the requirements of the document "How to Safely Remove Asbestos: Code of Practice" (SafeWork NSW, 2022). • All waste generated by the project, is to be beneficially reused, recycled or directed to a waste facility lawfully permitted to accept the materials in accordance with the NSW Environment Planning Authority "Waste Classification Guidelines" and the ***Protection of the Environment Operations Act 1997***. • No burning or burying of wastes is permitted on site. • Portable toilet facilities are to be provided on site and maintained until the works are completed at a ratio of 1 toilet plus 1 additional toilet for every 20 persons employed at site (the adjoining amenities blocks can be taken into consideration when calculating the ratio). • Non-recyclable waste and containers are to be regularly collected and disposed of at a licensed landfill or other licensed disposal sites in the area. • Any bulk garbage bins delivered by authorised waste contractors are to be placed and kept within the property boundary.	Contractor	During and after works

Number	Aspect	Mitigation Measure	Responsibility	Timing
		• A waste container of at least one cubic metre capacity is to be provided, maintained and regularly serviced from the commencement of operations until the completion of the works, for the reception and storage of waste generated by the construction of the building and associated waste. • Any waste containers used in association with the proposed demolition are to be located on the site where possible • Waste management practices for the proposal are to follow the resource management hierarchy principles embodied in the ***Waste Avoidance and Resource Recovery Act 2001***. These includes avoiding unnecessary resource consumption, recover of resources (including reuse, reprocessing, recycling and energy recovery) and disposal		
32	Asbestos Removal	• Asbestos removal and management in NSW is regulated under the ***Work Health Safety Regulations 2017***. If Asbestos has been identified on the site, therefore the handling of asbestos and asbestos work must be carried out in accordance with Work Health Safety Regulations 2017, and the following documents: a. Code of Practice: Construction Work; b. Code of Practice: Demolition Work: c. Code of Practice: How to Manage and Control Asbestos in the Workplace d. Code of Practice: How to Safely Remove Asbestos. • Only suitably certified contractors who hold a current SafeWork Class A asbestos removal licence can demolish, handle and transport asbestos. The contractor is required to follow appropriate notification and guidelines issued by SafeWork NSW as well as those listed above. • Notification to residents and SafeWork NSW will be provided if required under the relevant Code of Practice.	Contractor	During any demolition works
33	At the completed of works	• At the completion of the project, documentation and certification must be submitted to Council which demonstrates that the work as undertaken complies with the terms of this REF, BCA standard, Plumbing Engineering Codes / Australian	Relevant Accredited Person and / or certifier	Prior to completion of the works

Number	Aspect	Mitigation Measure	Responsibility	Timing
		Standards and any other relevant requirements		

5.4 Section 5.5 – Environmental Planning and Assessment Act 1979

Pursuant to Section 5.5 of the Act, the Determining Authority is to consider the effect of an activity on the environment. An analysis of the activity is provided below in Table 8. The analysis has considered the environmental impact assessment functions. In summary, due to the minor nature of the proposal, is not considered to negatively affect the environment and is considered satisfactory in this regard.

Table 8 Section 5.5 of the EP&A Act Compliance Table

Matters to be addressed	Comment
(1) For the purpose of attaining the objects of this Act relating to the protection and enhancement of the environment, a determining authority in its consideration of an activity shall, notwithstanding any other provisions of this Act or the provisions of any other Act or of any instrument made under this or any other Act, examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity.	Addressed in the REF.
(2) (Repealed)	N/A
(3) Without limiting subsection (1), a determining authority shall consider the effect of an activity on any wilderness area (within the meaning of the Wilderness Act 1987) in the locality in which the activity is intended to be carried on.	N/A. The site is not located within a wilderness area, not the vicinity of a wilderness area.
(4) (Repealed)	N/A

6. Conclusion

This Review of Environmental Factors (REF) has been prepared for City of Newcastle and assesses the potential environmental impacts that could arise from the proposed works at Foreshore Park in Newcastle East.

This report has been prepared in accordance with the relevant provisions of:

- Part 5 of the Act;
- Part 8 of the EP&A Regulations; and
- State Environmental Planning Policy (Transport and Infrastructure) 2021.

This REF identifies and assesses the likely impacts of the proposal on the environment and details the mitigation measures to be implemented to minimise the potential impact to the environment.

In accordance with Part 5 of Act and Part 8 of the EP&A Regulations this REF has determined that the proposed works as described in Section 3 of this REF, including any proposed management measures and safeguards will not likely affect the environment and does not cause any unacceptable environmental risk to the site or locality.

The proposed activity will not be carried out in a declared area of outstanding biodiversity value and is not likely to significantly affect threatened species, populations or ecological communities, or their habitats or impact biodiversity values. As such, a Species Impact Statement (SIS) and a Biodiversity Development Assessment Report (BDAR) are not required.

Following the above assessment, it is concluded that the proposed activity is not likely to have a significant impact on the environment, and an Environmental Impact Statement (EIS) is not required to be prepared.

It is recommended that the proposed activity proceed for the following reasons:

- The proposed development will not result in adverse impacts on the natural and built environments.
- The proposed development will not result in adverse impacts on the social and economics aspects of the environments.
- The proposed development will not result in adverse impacts on the amenity of adjoining residents and businesses.
- The proposed development will not result in adverse impacts upon the surrounding heritage items.
- The project is in the public interest.

7. SUMMARY OF MITIGATION MEASURES

Number	Aspect	Mitigation Measure	Responsibility	Timing
1	Social Impact	Prior to operation of the facility, an Operational Management Plan is to be prepared detailing how the facility will operate, including: • Operating hours, • Safety and security provisions • Operation of the site lighting • Operation of the pumping facilities • Managing social impacts • Handling of complaints	CN	Prior to commencement of operation
2	Aboriginal Cultural Heritage	In the event that unexpected Aboriginal objects, sites or places (or potential Aboriginal objects, site or places) are discovered during construction, all works in the vicinity should cease and the proponent should determine the subsequent course of action in consultation with a heritage professional and/or the relevant State government agency as appropriate. In accordance with the Aboriginal Due Diligence Assessment the following is recommended: • A heritage induction and an unexpected finds procedure is to be put in place for all stages of the works. It is recommended that representatives from the Aboriginal community are involved during this process. • Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity. The find should not be moved until assessed by a suitably qualified archaeologist. If the find is determined to be an Aboriginal object, the archaeologist is to provide further recommendations. This may include notifying Heritage NSW and the relevant Aboriginal stakeholders. • Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity you must:	Aboriginal Heritage Consultation, Project Manager/Contractor, CN, NSW Heritage and NSW National Parks and Wildlife Service	Prior to commencement of and during works

Number	Aspect	Mitigation Measure	Responsibility	Timing
		– Immediately cease all work and the find should not be moved or remains disturbed. – Notify the NSW Police and Heritage NSW Environmental Line on 131 555 as soon as practicable an provide details of remains and their location. No work can recommence unless authorised in writing by Heritage NSW		
3	European Cultural Heritage	In the event that unexpected European objects are discovered during construction, all works in the vicinity should cease and the proponent should determine the subsequent course of action in consultation with a heritage professional and/or the relevant State government agency as appropriate.	Project Manager / Contractor / CN / NSW Heritage NPWS	During works
4	Hydraulic services	• If required, the project manager/contractor shall gain approval from the relevant authority for the relocation and/or construction of temporary services prior to commencement of works All work shall be carried out in accordance with relevant authority requirements, council regulations, hydraulic specifications and Australian standards and codes	Project manager/Contractor	Prior to commencement of and during works
5	Controlling surface water	During works, any alteration to natural surface levels on the site is to be undertaken in such a manner as to ensure that there is no increase in surface water runoff to adjoining properties or that runoff is impounded on adjoining properties, as a result of the development	Contractor	During works
6	Tree Protection Measures, Arborist inspection and reporting of retained trees	Before the commencement of any works: • The arborist Impact Plan and Tree Protection Plan will form part of the documentation supplied to the contractor undertaking the proposed works. • The project arborist will identify all trees on-site using the City of Newcastle TAMS protocol. • Trees with no asset identification will be allocated an asset identification number. • The project arborist shall identify trees that have been approved for removal from the site by applying pink marking paint to the ground. • Staff are to be made aware of tree protection measures during induction to the site. • Tree protection temporary fencing will be established before bulk earthworks commence.	Project Manager / Contractor	Before works

Number	Aspect	Mitigation Measure	Responsibility	Timing
		• The temporary fence will consist of panels from anti-climb mesh, measuring 2.1 m high x 2.4 m wide; the temporary fence must comply with Australian standards, AS4687:2007 Temporary fencing and hoardings to guarantee safety and security. • The Arborist Impact Plan denotes the tree's temporary fencing location. The location of the tree protection temporary fencing has been sighted to ensure machinery will not clash with first-order branches • Tree protection temporary fencing can only be modified after discussions with the project arborist. • Tree protection temporary fencing will be denoted with appropriate signage, and signage will be consistent with AS 4970-2009, the protection of trees on development sites, and Part B of Newcastle Council's Urban Forestry Technical Manual. Tree protection zones and structural root zones will be marked on the ground prior to the commencement of bulk earthworks and will be maintained during the proposed works.		
7	Tree Protection Measures, Arborist inspection and reporting of retained trees	• Installation of mulch around the tree to remain on site as per the Arborist Impact Plan will occur immediately after tree removal has occurred. • The tree protection fence will be installed prior to bulk earthworks. • The tree protection fence will be certified by the project arborists • The tree protection temporary fencing will stay in situ for the project's duration. • No storage of equipment or materials is permitted within the TPZ, and no asphalt wasting or other pollutants must be allowed to enter the TPZ • All machinery working within the tree protection zones of heritage-listed trees will mitigate their impact on tree roots and soil structure by reducing manoeuvrability. • Footings and foundations for play equipment, steppingstones, sandstone logs, and park furniture located within the tree protection zone and the structural root zone will be hand-dug under the supervision of the project arborist. The project arborist will undertake all tree roots that require severing. • No equipment or machinery will be allowed	Project Manager / Contractor	During works

Number	Aspect	Mitigation Measure	Responsibility	Timing
		within the tree protection fence. • All new infrastructure will not be re-routed through the tree protection zone. • No storage of equipment or materials is permitted within the Tree Protection Zone. All equipment and materials will not impede drainage from the trade protection zones • During prolonged absence of rain, additional irrigation will be supplied to tree identified by the project arborist Damage to any part of a TPZ must be reported to the certifying project arborist for assessment		
8	Tree Protection Measures, Arborist inspection and reporting of retained trees	• All disturbed areas within the Tree Protection Zone & and Structural Root Zone will be mulched to a depth of 200mm and adequate moisture will be supplied for the duration of the project Post-Construction Assessment: It is essential to conduct a thorough assessment of the trees after construction to identify any damage or stress the trees might have undergone	Project Manager	After works.
9	Hours of work	Demolition and construction may only be carried out between the following hours: (e) Monday to Friday 7am – 6pm (f) Saturday 8am – 1pm (g) No work is to occur on Sundays and public holidays (h) Delivery may occur outside the hours referred to above, but not before 6:30am or after 6:30pm. Night works as required and with appropriate notification. These hours may be extended in limited circumstances, provided that high noise making machinery and activities and other impacts on neighbourhood amenity are avoided.	Project manager / Contractor	During works
10	Noise	The following mitigation measures are recommended: • Behavioural practices: No swearing or unnecessary shouting or loud stereos/ radios on site. No dropping of materials from height, throwing of metal items and slamming of doors. • Construction hours and scheduling: Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Works generating high noise and/or vibration level should be	Project manager/ Contractor	Prior to commencement of and during works

Number	Aspect	Mitigation Measure	Responsibility	Timing
		scheduled during less sensitive time periods. Comply with requirements of the EPA industrial noise policy.		
11	Dust control	If dust nuisance is likely to occur, suitable screens shall be erected during demolition and construction of the proposed work. If necessary, water sprays shall be used on the site to reduce the emission of dust.	Project manager/contractor	During works
12	Pedestrian safety (before and during construction)	• Installation of temporary barriers between any currently publicly accessible areas and the relevant construction zone to avoid pedestrians entering the construction zone. The temporary barrier shall be a minimum height of 1.6 m. • Inclusion of pedestrian awareness in any induction program for all staff associated with the onsite works. • During both the construction and operational phase, suitable materials shall be used to avoid pedestrian trips, slips and the like. Materials in accordance with the relevant Australian Standards shall be used. Such materials shall be maintained in accordance with the relevant standards and/or the manufacturer's requirements. • A public communications protocol shall also be established before and for the duration of the construction phase. The protocol should outline at least the following: – Purpose of the project. – When construction works are anticipated to commence, daily construction hours, and the approximate duration of the construction works. – Any particular construction related processes which may generate amenity impacts which could be reasonably regarded as out of the ordinary. – The means of communication, which should include at least onsite signage, notifications within local newspapers or other publications with local circulation, as well as social media, a project liaison officer from CN for local	Project manager/contractor	Prior to commencement of and during works

Number	Aspect	Mitigation Measure	Responsibility	Timing
		business owners, and a contact phone number. Establishment of construction zone lighting in accordance with relevant Australian Standards.		
13	Access	Construction will be managed to ensure that vehicular and pedestrian access is continuously available to the surrounding public areas of the park. Access management requires shall be detailed in the CEMP and a site specific PTMP to manage site movements access and deliveries.	Project manager and CN	During works
14	Services and Infrastructure	All services and utilities in the area of construction must be appropriately disconnected and reconnected as required. The contractor is required (if necessary) to consult with the various service authorities regarding their requirements for the disconnection of services.	CN / Contractor	During Works
15	Utilities and Services	• Prior to commencement of any demolition or construction activities, any services near the building site which may be impacted by the works are to be accurately located. • Dial Before You Dig should be contacted prior to the commencement of any works. Prior to commencement of works, an application for a compliance certificate is to be made to Hunter Water or other evidence of CN non-objection to the commencement of work on the basis of service availability is to be provided, if deemed to be required.	CN / Contractor	During Works
16	General	During works all excavation is to be executed safely and properly protected to prevent any harm to life and assets	Project manager / Contractor	During works
17	Acid sulfate soil	If excavation works exceed 1 metre below the natural ground surface the Contractor shall implement an Acid Sulfate Management Plan to mitigate impacts	Project manager / Contractor	During works
18	Erosion and Sediment	• Ongoing management of soils and sediment is in accordance with Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) Guidelines for Fresh and Marine Water Quality. • Ongoing management of soils and sediment in accordance with Landcom's (2004) Managing Urban Stormwater: Soils and Construction.	Project manager/contractor	Prior to commencement and during works

Number	Aspect	Mitigation Measure	Responsibility	Timing
		• Ongoing management of soils and sediment in accordance with Volume 2D of Managing Urban Stormwater: Soils and Construction (DECC 2008). • Construction to be undertaken in accordance with the ***Protection of the Environment Operations Act 1997***. • Stockpiles are to be placed more than 2m, preferably 5m from existing vegetation, concentrated water flow, roads and hazard areas. Sediment fences should be constructed in accordance with the relevant standards and civil engineering drawings		
19	Unexpected Finds Protocol – Historic Heritage	If any unexpected archaeological relics are uncovered during the work, then all works must cease immediately in that area and the NSW Heritage Division is to be contacted. Depending on the possible significance of the relics, an archaeological assessment and management strategy may be required before further works can continue in that area. Works may only recommence with the written approval of the NSW Heritage Division.	Contractor / Project Manager	During Works
20	Unexpected Finds Protocol – Contamination	If any unexpected contaminated material is encountered during the works, all work shall cease, the site will be secured and a safe work method statement(s) and appropriate documented practices would be implemented to ensure the site it suitable for its use in accordance with the approved Demolition Management Plan	Contractor / Project Manager	During Works
21	Contamination (before and during construction)	• All requirements and recommendations, including foundations and structural footings, contained in the Civil Plans (Appendix F) should be complied with. • Construction to be undertaken in accordance with the Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia (Western Australia Department of Health 2009). Certification from appropriately qualified person that contamination remediation as required has been completed to the requisite standard.	Project Manager / Contractor	Prior to Commencement of and during works
22	Site remediation and management	Removal and off-site disposal of impacted fill and soils is to be delivered to an appropriately licensed facility to remove the identified and potential human health and ecological impacts	Project Manager / Contractor	During and post works

Number	Aspect	Mitigation Measure	Responsibility	Timing
23	Building Code of Australia	All works must be carried out in accordance with the requirements of the Building Code of Australia (BCA).	Project manager/contractors	During works
24	Water Quality and Water Sensitive Urban Design	• All care and due diligence are to be taken to minimise or prevent pollutant material entering drain inlets or waterways. • All water collected shall be directed through a water quality management system prior to discharge Water sensitive urban design measures achieve the water quality standards	CN / Contractor	During Works
25	Details of the Activity	The activity must be carried out substantially in accordance with the plans identified within the appendices to this REF.	CN / Contractor	At all times
26	Site attendance and works period	A Construction Environmental Management Plan (CEMP) is to be prepared in consultation with relevant stakeholders and in accordance with CN and / or NSW Government Environmental management guidelines for construction (Edition 4). The plan would provide information on traffic flow, vehicle moments, site access and parking arrangements during construction, and the measures to minimise the impacts on the relevant road network. The proposed works will be undertaken in accordance the environmental construction management plan. The CEMP must address/include (as a minimum): • Legislative requirements and relevant non-statutory policies • Specific environmental construction mitigation measures described in this REF • Requirements outlined in any relevant approvals, permits or licences • Details of: – Hours of work; – 24-hour contact details of site manager; and – Community consultation and complaints handling. • Construction traffic and pedestrian management and construction access. • Construction noise and vibration • Erosion and sediment control in accordance with Landcom's Management Urban Stormwater: Soils and Construction.	CN / project manager / contractor	Prior to commencement of any work

Number	Aspect	Mitigation Measure	Responsibility	Timing
		• Tree management and protection. • Air quality/dust suppression • Management of hazardous materials • Unexpected finds protocols for Aboriginal cultural heritage, European heritage and contamination.		
27	Approvals	All necessary consultation and approvals required by State and Commonwealth legislation and relevant CN policies are to be obtained. A copy of all approvals is to be kept on-site and include the following: • Approval / Notice to Crown Lands in accordance with Land Manager Requirements under Crown Lands Act • Obtain referral response from Heritage Council of NSW. • Consult relevant utility providers (Water, Sewer, Electricity, Gas, Telecommunications etc) with regard to the installation or impact of any utilities • The proposed works be approved by CN's Local Pedestrian, Cycling and Traffic Calming Committee (Traffic Committee). City of Newcastle with regard to flooding, heritage items, heritage conservation areas, coastal vulnerability area matters		
28	Neighbour notification	Neighbouring properties shall be notified 5-7 days prior to the commencement of works. The determining authority must place all relevant information to the REF on the determining authority's website or the NSW Planning Portal prior to the commencement of works as per Cl171(4) of the Environmental Planning & Assessment regulations. Consider any submissions.	CN	Prior to commencement of any works
29	Deliveries	Disruption to road users is to be kept to a minimum by scheduling any delivery activities outside of peak network hours	Project Manager / Contractor	During Works
30	Demolition waste	• A Demolition Waste Management Plan shall be prepared by an appropriately qualified contractor prior to the commencement of works. The plan should be prepared in accordance with the NSW Environment Planning Authority "Waste Classification Guidelines" and the ***Protection of the Environment Operations Act 1997***.	CN/ / Contractor	Prior to commencement of any works

Number	Aspect	Mitigation Measure	Responsibility	Timing
		• Any waste or materials that are not suitable for recycling are to be disposed of at CN's Summerhill Waste Management Facility or equivalently licences site. Any demolition work must comply with the demolition work plans required by Australian Standard AS 2601-2001 The demolition of structures (Standards Australia, 2001) and endorsed by a suitably qualified person.		
31	Waste generally	• The contractors shall remove rubbish resulting from the works from site. Rubbish shall be handled in a manner so as to confine the material completely and to minimise dust emissions and disposed of in accordance with Contractor's DMP. • Any asbestos removal is to be undertaken by a Licensed Asbestos Removalist (once appointed). All works are to be conducted in accordance with NSW Government's legislative requirements and following the requirements of the document "How to Safely Remove Asbestos: Code of Practice" (SafeWork NSW, 2022). • All waste generated by the project, is to be beneficially reused, recycled or directed to a waste facility lawfully permitted to accept the materials in accordance with the NSW Environment Planning Authority "Waste Classification Guidelines" and the ***Protection of the Environment Operations Act 1997***. • No burning or burying of wastes is permitted on site. • Portable toilet facilities are to be provided on site and maintained until the works are completed at a ratio of 1 toilet plus 1 additional toilet for every 20 persons employed at site (the adjoining amenities blocks can be taken into consideration when calculating the ratio). • Non-recyclable waste and containers are to be regularly collected and disposed of at a licensed landfill or other licensed disposal sites in the area. • Any bulk garbage bins delivered by authorised waste contractors are to be placed and kept within the property boundary.	Contractor	During and after works

Number	Aspect	Mitigation Measure	Responsibility	Timing
		• A waste container of at least one cubic metre capacity is to be provided, maintained and regularly serviced from the commencement of operations until the completion of the works, for the reception and storage of waste generated by the construction of the building and associated waste. • Any waste containers used in association with the proposed demolition are to be located on the site where possible Waste management practices for the proposal are to follow the resource management hierarchy principles embodied in the ***Waste Avoidance and Resource Recovery Act 2001***. These includes avoiding unnecessary resource consumption, recover of resources (including reuse, reprocessing, recycling and energy recovery) and disposal		
32	Asbestos Removal	• Asbestos removal and management in NSW is regulated under the ***Work Health Safety Regulations 2017***. If Asbestos has been identified on the site, therefore the handling of asbestos and asbestos work must be carried out in accordance with Work Health Safety Regulations 2017, and the following documents: a. Code of Practice: Construction Work; b. Code of Practice: Demolition Work: c. Code of Practice: How to Manage and Control Asbestos in the Workplace d. Code of Practice: How to Safely Remove Asbestos. • Only suitably certified contractors who hold a current SafeWork Class A asbestos removal licence can demolish, handle and transport asbestos. The contractor is required to follow appropriate notification and guidelines issued by SafeWork NSW as well as those listed above. Notification to residents and SafeWork NSW will be provided if required under the relevant Code of Practice.	Contractor	During any demolition works
33	At the completed of works	At the completion of the project, documentation and certification must be submitted to Council which demonstrates that the work as undertaken complies with the terms of this REF, BCA standard, Plumbing Engineering Codes / Australian Standards and any other relevant requirements	Relevant Accredited Person and / or certifier	Prior to completion of the works

Appendix A

Architectural Plans

TCL

M2202_LIVVI'S PLACE PLAYSPACE

LANDSCAPE WORKS

NEWCASTLE EAST, NSW, 2300

ISSUED: 16.12.2022 75% DESIGN DEVELOPMENT REV: 02

GENERAL NOTES

THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE TECHINICAL SPECIFICATION AND THE FINISHES AND FURNITURE SCHEDULED PROVIDED AS PART OF THIS DRAWING SET.

THE CONTRACTOR AND SUB-CONTRACTORS SHALL VERIFY ALL DIMENSIONS, LINES, LEVELS, AND EXISTING SERVICE LOCATIONS PRIOR TO COMMENCEMENT ON SITE, PREPARATION OF DETAIL/SHOP DRAWINGS, AND FABRICATION OF CONSTRUCTION/BUILDING COMPONENTS.

CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS PRIOR TO FABRICATION AND INSTALLATION. IF ANY ANOMALIES ARISE THE CONTRACTOR IS TO ADVISE THE ENGINEER IMMEDIATELY.
ALL DIMENSIONS ARE IN MM. DO NOT SCALE OFF DRAWINGS.

CONTRACTOR IS TO PROVIDE SHOP DRAWINGS (CAD DRAFTED TO SCALE WITH ADEQUATE NOTES AND DIMENSIONS FOR REVIEW AND FABRICATION) TO THE ENGINEER. FIXING COMPONENTS AND DETAIL TO BE CONFIRMED THROUGH THE SHOP DRAWING PROCESS.

ALL WELDS TO BE 4MM CFW ELECTRODE TO AS/NZ 1554, PART 1 AND 2 AS APPROPRIATE. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS/NZ 4100 STEEL STRUCTURES.
SHOP WELD WITH CFW ALL JOINS. ALL BUTT WELDS SHALL BE FULL PENETRATION. UNLESS SPECIFIED OTHERWISE ALL FABRICATION TOLERANCES SHALL BE WITHIN +/- 1.0MM AND ALL.

ANGULAR TOLERANCES SHALL BE +/- 1.0MM.
GRIND SMOOTH ALL EDGES TO MAKE NEAT JOINS. REMOVE GLOBULES OF WELD METAL, WELD SLAG AND ALL FOREIGN MATTER.

FINISH VISIBLE JOINTS MADE BY WELDING USING METHODS, APPROPRIATE TO THE CLASS OF WORK, INCLUDING GRINDING OR BUFFING BEFORE FURTHER TREATMENT.

CONTRACTOR SHALL SUPPLY AND INSTALL ALL STAINLESS STEEL SCREWS, BOLTS, NUTS , WASHERS, HINGES, LOCKS, RIVETS AND FIXINGS.

WHERE FIXING TYPES OR STRUCTURAL SPACINGS HAVE NOT BEEN NOMINATED, CONTRACTOR TO ENSURE THAT ENGINEER HAS APPROVED ANY SIZINGS AND SPACINGS INSTALLED.

ALL HARDWOOD TIMBER TO BE SUPPLIED AND INSTALLED AS DURABLE CLASS 1 UNLESS OTHERWISE STATED IN THE TECHNICAL SPECIFICATION.

ALL PRECAST CONCRETE SURFACES TO BE 'CLASS 2' FINISH. REFER TO ENGINEER'S DRAWINGS FOR CONCRETE STRENGTH AND REINFORCING.

PRECAST CONCRETE UNITS WILL REQUIRE STEEL REINFORCEMENT - DESIGN TO BE PROVIDED BY THE FABRICATOR FOR THE ENGINEER'S APPROVAL. CONTRACTOR TO ALLOW FOR DH10 REINFORCEMENT AT 150C/C ON EACH FACE.

DRAWING LIST

DRAWING	Drawing Title	Scale	Rev
L001	Title Sheet	N/A	02
L002	Landscape Schedules	N/A	02
L003	Play Elements Schedule	N/A	01
L050	Key Plan	1:400	02
L051	Overall Surfaces Plan	1:400	02
L300	Surfaces Plan Sheet 1 of 5	1:100	02
L301	Surfaces Plan Sheet 2 of 5	1:100	02
L302	Surfaces Plan Sheet 3 of 5	1:100	02
L303	Surfaces Plan Sheet 4 of 5	1:100	02
L304	Surfaces Plan Sheet 5 of 5	1:100	02
L400	Grading Plan Sheet 1 of 5	1:100	02
L401	Grading Plan Sheet 2 of 5	1:100	02
L402	Grading Plan Sheet 3 of 5	1:100	02
L403	Grading Plan Sheet 4 of 5	1:100	02
L404	Grading Plan Sheet 5 of 5	1:100	02
L500	Planting Plan Sheet 1 of 5	1:100	01
L501	Planting Plan Sheet 2 of 5	1:100	01
L502	Planting Plan Sheet 3 of 5	1:100	01
L503	Planting Plan Sheet 4 of 5	1:100	01
L504	Planting Plan Sheet 5 of 5	1:100	01
L601	Junior Play Sections	As Shown	02
L602	Sunken Lawn Section	As Shown	01
L603	Industrial Play Sections	As Shown	02
L700	General Paving Details	As Shown	02
L705	Soft Landscape Details	As Shown	02
L706	Soft Landscape Details - Planting	As Shown	02
L707	Edges and Wall Details	As Shown	01
L710	Timber Decking Details	As Shown	01
L715	Fencing	As Shown	02
L716	Shade Structure Details	As Shown	01
L720	Junior Play Elements Details	As Shown	01
L721	Junior Play Elements Details	As Shown	01
L722	Junior Play Elements Details	As Shown	01
L723	Junior Play Elements Details	As Shown	01
L724	Junior Play Elements Details	As Shown	01
L724	Junior Play Elements Details	As Shown	01
L725	Junior Play Elements Details	As Shown	01
L800	Industrial Play - Detail Plan Sheet	1:50	01
L801	Industrial Play - Render Sheet	N/A	01
L802	Industrial Play - Render Sheet	N/A	01
L803	Industrial Play - Render Sheet	1:25	01
L804	Industrial Play - Cog Frames Sheet 1 of 3	N/A	01
L805	Industrial Play - Cog Frames Sheet 2 of 3	1:25	01
L807	Industrial Play - Cog Frames Sheet 3 of 3	1:50	01
L808	Industrial Play - Tree Top Walk Sheet 1 of 3	1:10	01
L808	Industrial Play - Tree Top Walk Sheet 2 of 3	1:50	01
L809	Industrial Play - Tree Top Walk Sheet 3 of 3	1:50	01
L850	Waterplay - Detail Plan	1:100	01
L851	Waterplay - Sections	As Shown	01
L852	Waterplay - Tessellated Edge	As Shown	01
L852	Waterplay - Sea Grass Sculpture	As Shown	01
L900	Awabakal & Worimi - Table	As Shown	01
L901	Awabakal & Worimi - Swing Sheet 1 of 2	1:50	01
L902	Awabakal & Worimi - Swing Sheet 2 of 2	1:25	01

CODES & ABBREVIATIONS LEGEND

Code	Description
AT#	Astroturf Paving Type #
B#	Bench Type #
CFW	Continuous Fillet Weld
CHS	Circular Hollow Section
CSK	Countersunk (Surface Finish)
Cts.	Centres
DC1	Dried Class 1
EA	Equal Angle
ED##	Edge Type #
FN#	Proprietary Furniture Type #
FX#	Proprietary Fixture Type #
FSBW	Full Strength Butt Weld
FSL	Finished Surface Level
G	Gauge
GB#	Garden Bed Type #
PV##	Paving Arrangement Type #
HDG	Hot Dip Galvanised
HWD	Hardwood
LU#	Landscape Light #
MS	Mild Steel
ML#	Mulch Type #
Nom	Nominal
PFC	Parallel Flange Channel
RSB	Roof Slab Below
SD	Slot Drain
SE#	Steel Edge Type #
SHS	Square Hollow Section
SS	Stainless Steel
TG#	Timber Grate Lid Type #
TP	Tangent Point
TP#	Tree Pit Type #
TT#	TGSI Unit Type #
Typ	Typical
UA	Unequal Angle
	ALL CODES AND ABBREVIATIONS ARE TO BE READ IN CONJUNCTION WITH THE SCHEDULES AND DRAWING SET.

Rev	Date	Revision Details	By	Chk	App
02	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status: 75% DESIGN DEVELOPMENT

NOT FOR TENDER

Drawing: TITLESHEET

Sheet: Sheet 1 of 1

Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22

Scale: N/A

Drawing No. L001

Rev. 02

FURNITURE AND FIXTURES SCHEDULE

NOTE:

This sheet is to be referred to when reading the TCL documentation drawings. Furniture and fixture codes have been used throughout the drawing to ensure that furniture and fixture types are uniform throughout the set.

Key Code	Item	Item Description / Supplier Code	Size	Material/ Colour	Finish	Supplier	Notes
PROPRIETARY FURNITURE							
FN01	Drinking Fountain	Apollo 880 Drinking Fountain (Disabled Access) Model A880	915mm H x 301mm W x 702mm L (Clearance height 846mm)	316 SS	Powder Coated SS with Anti-Graffiti coating and Bottle Filler	Urban FF	
FN02	General waste bin	Draffin 240Ltr 888 Series Infinity	L 800 x W 700L 800 x W 700 x H 1320 mm x H 1320 mm	316 SS	Powder Coated SS with Anti-Graffiti coating	Draffin	As per City of Newcastle Standards
FN03	Recycling bin	Draffin 240Ltr 888 Series Infinity	L 800 x W 700L 800 x W 700 x H 1320 mm x H 1320 mm	316 SS	Powder Coated SS with Anti-Graffiti coating	Draffin	As per City of Newcastle Standards
FN04	Picnic Setting	Hobsons Setting TM4117-14	1800 L x 965 W x 755mm H table, 1800 L x 420 W x 450mm H bench	Australian Hardwood Timber Batten (Class 1)	Powdercoated frames and bolt down fixing.	Commercial Systtems Australia (CSA)	1No Bench required
FN05	Picnic Setting (DDA)	Hobsons Setting TM4117-14	1800 L x 965 W x 755mm H table 800 L x 420 W x 450mm H bench	Australian Hardwood Timber Batten (Class 1)	Powdercoated frames and bolt down fixing.	Commercial Systtems Australia (CSA)	1No Bench required, shorter length for DDA access seating
PROPRIETARY FIXTURE							
FX01	Trench Grate	TBC	TBC	steel	TBC	TBC	
FX02	Infill Pit Lid 1	PV01 pathway	TBC	concrete	TBC	TBC	
FX04	Infill Pit Lid 2	softfall play area	TBC	Rubberised softfall	TBC	TBC	
FX05	Infill Pit Lid 3	in lawn	TBC	Astroturf	TBC	TBC	
FENCES							
FE01	Standard Fence	Custom design fence	1350mm H x 2150mm W	steel	TBC	TBC	Custom Fence
FE02	Moveable Fence	Custom design fence	1350mm H x 2150mm W	steel/ timber	TBC	TBC	Custom Fence
FE03	Bespoke Fence (Play)	Custom play fence panels	1350mm H x 1200mm W	steel	TBC	TBC	Custom Fence
FE04	Entry Fence	Custom design fence		steel	TBC	TBC	Custom Fence
FE05	Entry Gate	Custom design fence		steel	TBC	TBC	Custom Gate
PROPRIETARY FIXTURE - INDUSTRIAL PLAY							
FX801	Cog tower panel type 01	TBC	1800mm x 2600mm typical	TBC	TBC	Custom Metal Imagery NSW	To comply with Australian standards
FX802	Cog tower panel type 02	TBC	1800mm x 2600mm typical	TBC	TBC	Custom Metal Imagery NSW	To comply with Australian standards
FX803	Cog tower panel type 03	TBC	1800mm x 2600mm typical	TBC	TBC	Custom Metal Imagery NSW	To comply with Australian standards
FX804	Cog tower panel type 04	TBC	1800mm x 2600mm typical	TBC	TBC	Custom Metal Imagery NSW	To comply with Australian standards
FX805	Cog tower panel type 05	TBC	1800mm x 2600mm typical	TBC	TBC	Custom Metal Imagery NSW	To comply with Australian standards
FX806	Cog tower panel type 06	TBC	1800mm x 2600mm typical	TBC	TBC	Custom Metal Imagery NSW	To comply with Australian standards
FX807	Ronstan mesh	CXL MICRO 2,0	2mm x 40mm aperture	Grade 316 SS	TBC	Ronstan Systems Australia	To comply with Australian standards
FX808	Treetop walk balustrade	TBC	10mmthk x 100mm wide. Refer detail 03/L806	Grade 316 SS	TBC	TBC	To comply with Australian standards
FX809	enzie Uni Standard 1300/12 Spiral Stair	TBC	TBC	Grade 316 SS	TBC	Enzie	To comply with Australian standards
PROPRIETARY FIXTURE - WATERPLAY							
FX851	Water Jet Type 01	Arch Jet BRONZE AT-ARCH	66 x 66 x 80mm	316 SS tri-base footing	Machined Brass main body	Atlantis Liquid Dynamics	10No. Qty Install as per Suppliers Specification
FX852	Water Jet Type 02	Crown Jet BRONZE AT-CROW	66 x 66 x 80mm	316 SS tri-base footing	Machined Brass main body	Atlantis Liquid Dynamics	3No. Qty Install as per Suppliers Specification
FX853	Water Bubbler Type 01	Bubble Gum AT-BGUM	TBC	316 SS Plate	TBC	Atlantis Liquid Dynamics	2No. Qty Install as per Suppliers Specification
FX854	Water Bubbler Type 02	Double Bubble AT-DBUB	TBC	317 SS Plate	TBC	Atlantis Liquid Dynamics	2No. Qty Install as per Suppliers Specification
FX855	Water Bubbler Type 03	Floor Flood - Bubbler AT-FLFL	TBC	318 SS Plate	TBC	Atlantis Liquid Dynamics	2No. Qty Install as per Suppliers Specification
FX856	Water Jet Mister Type 01	Misting Jets AT-MIST	TBC	TBC	TBC	Atlantis Liquid Dynamics	23No. Qty Install as per Suppliers Specification
CUSTOM FURNITURE							
FN06	Shade Structure - general		TBC	TBC	TBC		
CUSTOM FIXTURE							
FX06	Sandstone Boulder		Type 01: 1000 L x 500 H x 500mm W Type 02: 350-600 H x 350-600W x 550-1800mmL	TBC	Rock face on all exposed faces		Refer detail 03/L722
CUSTOM FURNITURE & FIXTURES WATERPLAY							
FX851	Awabakal shade sail	Custom design woven shade sail	7000 W x 17000mm L	Canvas, Stainless stell	TBC		
CUSTOM FURNITURE & FIXTURES AWABAKAL							
FN901	Awabakal & Woorimai community table	Custom design			TBC		
FN902	Awabakal & Woorimai tables and seats	Custom design			TBC		

LANDSCAPE DETAIL TYPE SCHEDULE

This schedule is to be referred to when reading the TCL documentation drawings.

Ensure all off the shelf items are supplied with a certificat of compliance to AS4685:2021 signed by an engineer. Custom elements will be assessed and certified by CCEP during design phase.

Detail Types directly reference the drawing details.

To be read in conjunction with the Technical Landscape Specification.

Contractor to advise any discrepancies between information provided in this Schedule with Referenced details, prior to ordering of materials.

Detail Type	Description	Location	Detail Reference No.	Size	Finish	Top Edges	Supplier	Notes
PV01	Concrete Paving 01 - Light Trafficable	Primary Pathways	01/L700		Exposed Aggregate Mix Type A		Boral	
PV02	Concrete Paving 02 - Light Trafficable	Awabakal & Worimi Area, Kiosk Seating	02/L700		Exposed Aggregate Mix Type B		Boral	
PV03	Concrete Paving - Water Play	Water Play	03/L700		Exposed Aggregate Mix Type C, Sandblast finish (varies)		Boral	Refer Water Play Hydraulic Specialist Details
PV04	Tessallated Edge	Water Play	04/L700		Formed Concrete with Exposed Aggregate, Sandblast finish (varies). Refer PV85-PV87 for mix types and finishes			
PV05	Granitic Gravel Paving	Quiet Spaces	05/L700					
PV06	Granitic Gravel Paving - Low Impact	Junior Play	06/L700	200mm THK			Geofabrics	Presto Geoweb® Cellular Confinement System Geocell
PV07	Treetop Walk	Senior Play	01/L806	TBC	Coloured Minimesh		TBC	
PV85	Tessallated Edge Type 01	Water Play - in ground edge		1000mm depth x length varies	Formed Concrete with heavy exposed aggregate finish Mix Type D			
PV86	Tessallated Edge Type 02	Water Play - raised edge		1000mm depth x length varies	Formed Concrete with heavy exposed aggregate finish Mix Type E	Side edges to be off-form concrete with rock inserts		Refer Specifcation
PV87	Tessallated Edge Type 03	Water Play - raised edge		1000mm depth x length varies	Formed Concrete with rock salt sculpted finish Mix Type F	Side edges to be off-form concrete with rock inserts		Refer Specifcation
SF01	Rubberised Softfall	Play Spaces	07/L700					
SF02	Rubberised Softfall - Fall Zones	Play Spaces	08/L700					
SF03	Rubberised Softfall - Insert	Lunchroom interps	XX/LXXX					
ED01	Seat Edge	Playground Seating Edge	01-02/L707	500mm (H) x 500mm (W) x max 2000mm (L)	Cut Sandstone Block Face Type A		Gosford Quarries	Blocks to be custom cut by quarry as required for seat edge radius
ED02	Seat Edge - Feature	Amenities/Kiosk Plaza	03/L707	450mm (H) x 500mm (W)	Integrally coloured concrete.		Boral	
ED03	Kiosk Upstand	Kiosk	XX/LXXX	TBC	Integrally coloured concrete to match Architecture palette		Boral	
ED05	Brick Edge with Timber Seat	Lunchroom interps	XX/LXXX					Reclaimed brick from Demolished Amenities building
ED06	Interps Feature Insert	Lunchroom interps	XX/LXXX		Single Width Brick Insert			Reclaimed brick from Demolished Amenities building
WT01	Retaining Wall	Perimeter of Primary Pathways and Garden Beds	04/L707	max 950mm (H) x 500mm (W)	Twp tier cut sandstone block Face Type A		Gosford Quarries	
WT02	Wall	Perimeter of Primary Pathways and Garden Beds	XX/LXXX	max 950mm (H) x 500mm (W)	TBC		Gosford Quarries	
TD01	Timber Deck	Coastal Play/Awabakal and Worimi area	02/L710	300mm (H)			Boral	
SE01	Steel Edge	GB edging			ZAM		Formboss	
SL01	Lawn	Picnic Areas	01/L705					
GB01	Garden Bed Type 01	Garden Beds	02/L705				Menai Sand & Soil	
GB02	Organic Mulch	Nature Play	03/L705	150mm Deep			Menai Sand & Soil	

Rev	Date	Revision Details	By	Chk	App
02	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status: 75% DESIGN DEVELOPMENT

NOT FOR TENDER

Drawing: SCHEDULES
Sheet: Sheet 1 of 2
Purpose: LANDSCAPE ARCHITECTURE
Date: 25.11.22
Scale: 1:200@A1
Drawing No.: L002
Rev.: 02

PLAY ELEMENTS SCHEDULE

NOTE:

This sheet is to be referred to when reading the TCL documentation drawings. Furniture and fixture Codes have been used throughout the drawing to ensure that furniture and fixture types are uniform throughout the set.

Ensure all off the shelf items are suppplied with a certificat of Compliance to AS4685:2021 signed by an engineer. Custom elements will be assessed and certified by CCEP during design phase.

Key Code	Item	Item Description / Supplier CPde	Drawing No.	Size	Material/ colour	Finish	Supplier	Notes
PROPRIETARY play ELEMENT								
Junior Play								
PP01	Tread chimes	PN136		240 x 600mm	Stainless steel, galvabond mesh.		Play Works	
PP02	Timber and Net play	The Lair - Midi. Item No:		8189 x 7043mm	Timber, SS fixtures		Playground Centre	Fall zones 8189 x 7043mm
PP03	Tunnel							
PP04	Accessible Wide Slide							
PP05	Voice Tube	Talk Tube 1No Large 1No Small		0.26m W x 0.59m D x 1.10-1.41m H	Stainless Steel		Proludic	12m to max 60m distance
PP06	Climbing Logs and Netting	Vinici Play ROBINIA RB1281 and Vinici Play ROBINIA RB1219	01/L725	8.9mL x 3mW x 1.9mH	Timber, SS fixtures		Vinici Play	
Industrial Play								
PP801	Double Flying Fox	Double Flying Fox Flyway25 Double F2025N with Inclusive Harness seat.		25m	Powdercoated Steel		Adventure PPus	1No. Pommel Seat and 1No. Inclusive Harness Seat
PP802	Trampoline - Accesible	Wheelchair-accessible Square Trampoline, WHEELY		1500x1050x300	black jump mat	Frame finish, pre-galvanised	All in play	maximum weight, 200 kgs. Suitable for adult assistant and manual wheelchair user. can so custom shapes, hexagon?
PP803	Combined Climbing Net	Climbing net up from ground level to level 1 of Tower 1. Half loose net, half taut net. Handrails at top of net		2600mm wide at top				
PP805	Inclusive Slide				Stainless Steel, silver			
PP806	Spiral Tunnel Slide	Tunnel slide with handrail(s) at entrance to slide for access		Min 3.458m H	Stainless Steel			
PP807	Periscope	Tower 2, CPg 3. To extend upwards into roof cavity. 10.27000-Periscope		2.10m H	Stainless steel		Richter Spielgeraete	Handles made of black Plastic Upper part pivoted, rotatable by 360 °, deflection of entering light through integrated mirror sheets
PP808	Playground telephone	SO.1.01		0.7 x 0.4m	Stainless steel		Duncan and Grove	Industrial play
PP809	Trampoline	Hexagonal Trampoline, JUM 301		108x108x108	black jump mat		Kompan	Fall space: 408x412
PP810	Double Helix	10.192 Ground PPane industral play zone		6m			Richte Spielgeraete	
PP811	Inclusive Seesaw	Springers - Inclusive Seesaw - J987 with custom		4.04m W x 1.14m x D, 1.19m H x 0.60m FFH (Free Fall Height)	colour/graphic customised to match industrial theme		Proludic	
PP812	Wheelchair Carousel	Kompan #KPP123-0202 with HPP floor, GXY916		60cm high			Kompan	fall space: 6060 x 6060
PP813	Fireman's Pole				Stainless Steel			
Water Play								
CUSTOM PLAY ELEMENT								
Junior Play								
CP01	Log Table and Chair		01/L720	Overall Dim 2100W x 2100D	Class 1 Hardwood	Dressed top and debarked sides.	TBC	confirm with arborist for opportunity of reclaimed timber stumps locally
CP02	Feature Log across Path		01/L722	Min 3000L, 800-1500mm DIA	Class 1 Hardwood	Dressed cross sectional face, debarked sides.	TBC	confirm with arborist for opportunity of reclaimed timber stumps locally
CP03	General Logs		01/L721	Max 900H, Length varies.	Class 1 Hardwood		TBC	confirm with arborist for opportunity of reclaimed timber stumps locally
CP04	Log steppers		03/L720		Class 1 Hardwood		TBC	confirm with arborist for opportunity of reclaimed timber stumps locally
CP05	Animal Sculpture		04/L720	350 H x 580L x 370W	Class 1 Hardwood	Dressed	TBC	confirm with arborist for opportunity of reclaimed timber stumps locally
CP06	Log Poles		01/L723	1500-2400H x 200-300DIA	Class 1 Hardwood	Dressed cross sectional face, debarked sides.	TBC	confirm with arborist for opportunity of reclaimed timber stumps locally
CP07	Balance Beam		01/L723		Class 1 Hardwood	Dressed cross sectional face, debarked sides.	TBC	confirm with arborist for opportunity of reclaimed timber stumps locally
CP08	You and Me swing				timber, SS fixings		TBC	
CP09	Balance net	CN-1051 Inclined Tri Net			timber, SS fixings		Kabelleisure	
CP10	Log Stack		03/L721	Max 900H, Length varies.	Class 1 Hardwood		TBC	confirm with arborist for opportunity of reclaimed timber stumps locally

Industrial Play								
CP801	Rope Tunnel - Rigid	3 x 750mm dia					Kabelleisure	
	Rope Tunnel - play	750mm dia					Kabelleisure	
CP802	Rope Tunnel - Tube	min 750mm dia					Kabelleisure	
CP803	Rope Ladder	Rope ladder with Ronstan Mesh surrounding vertical tunnel					Kabelleisure	
CP804	Rope net						Kabelleisure	
CP805	Rope maze						Kabelleisure	
CP806	Interactive panel 1						TBC	
CP807	Interactive panel 2						TBC	
Coastal Water Play								
CP851	Tug Boat - Elevated	By Playspace			TBC		By Playspace	
CP852	Tug Boat - On Ground	By Playspace			TBC		By Playspace	
CP853	Sea Grass Sculpture	By Playspace			TBC		By Playspace	
CP854	Bark Canoes	TBC			TBC		By Playspace	
Awabakal & Worimi Area								
CP901	Carved Creature	By others					TBC	
CP902	Ganya	By others					TBC	
CP903	Whale Bone Swingset							

Rev	Date	Revision Details	By	Chk	App
02	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status: 75% DESIGN DEVELOPMENT

NOT FOR TENDER

Drawing: L003_SCHEDULES

Sheet: Sheet 2 of 2

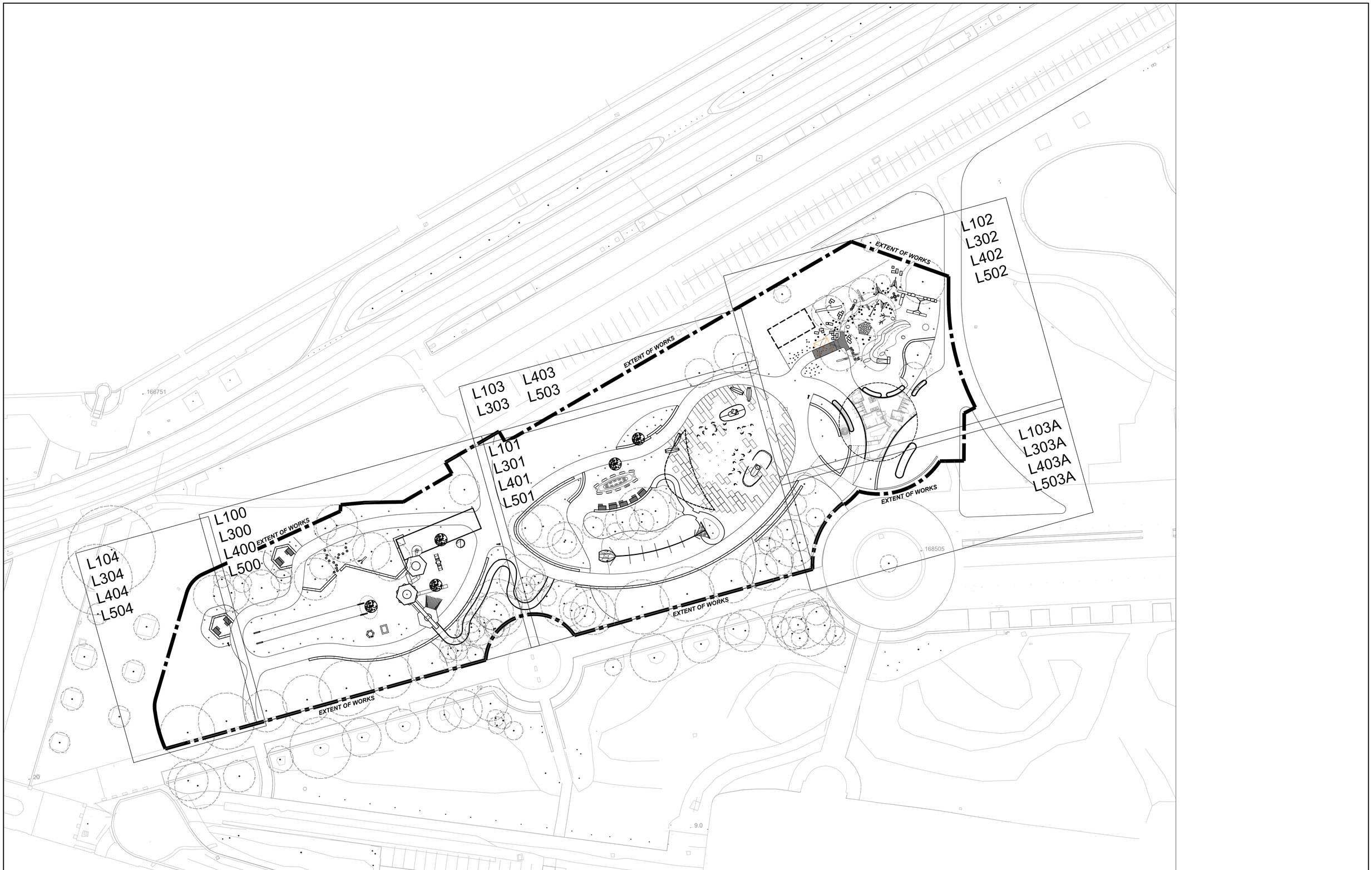
Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22

Scale: N/A

Drawing No. L003

Rev. 02



Rev	Date	Revision Details	By	Chk	App
02	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing:
KEY PLANS

Sheet:
Sheet 1 of 2

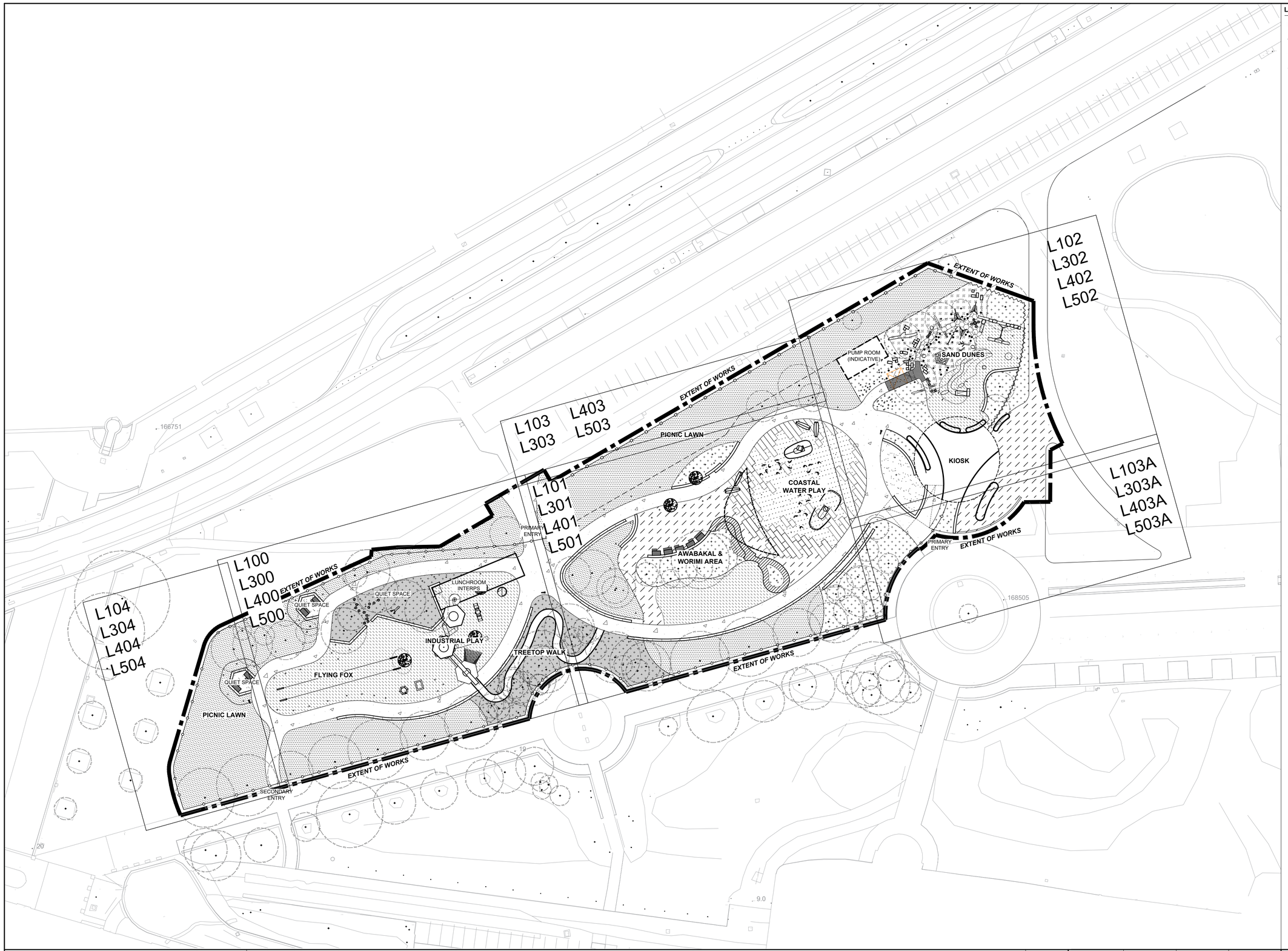
Purpose:
LANDSCAPE ARCHITECTURE

Date:
25.11.22

Scale:
1:400@A1

Drawing No.
L050

Rev.
02



LEGEND

- Extent of Works
- Building Line
- Roof (Above)
- Shade Structure (Above)
- Existing Tree with Tree Protection Zone to be Protected and Retained Refer Arborist report
- Proposed Tree Refer Planting Plans
- PV01 Concrete Paving 01 - Light Trafficable Refer detail 01/L700
- PV02 Concrete Paving 02 - Light Trafficable Refer detail 02/L700
- PV03 Concrete Paving 03 - Water Play Refer detail 03/L700
- PV04 Tessallated Edge Refer detail 04/L700
- PV05 Granitic Gravel Paving Refer detail 05/L700
- PV06 Granitic Gravel Paving - Low Impact Refer detail 06/L700
- PV07 Treetop Walk Refer detail 02/L808
- SF01 Rubberised Softfall Refer detail 07/L700
- SF02 Rubberised Softfall - Fall Zones Refer detail 08/L700
- ED01 Interps Feature Insert Refer detail 02/L707
- ED02 Seat Edge Refer detail 03/L707
- ED05 Brick edge timber seat Refer detail XX/LXXX
- WT01 Retaining Wall Edge Refer detail 04/L707
- TD01 Timber Deck Refer detail 02/L710
- TD02 Timber Boardwalk Refer detail XX/LXXX
- SL01 Lawn Refer detail 01/L705
- GB01 Garden Bed Type 01 Refer detail 02/L705
- GB02 Organic Mulch Refer detail 03/L705
- FE01 Standard Fence. Refer Detail 01/L715
- FE02 Moveable Fence. Refer Detail XX/LXXX
- FE02 Moveable Fence Extents. Refer Detail XX/LXXX
- FE03 Bespoke Play Fence. Refer Detail 02/L715

Rev	Date	Revision Details	By	Chk	App
##	##	##	##	##	##
##	##	##	##	##	##
				##	##
				##	##
02	16.11.22	75% DESIGN DEVELOPMENT	KG	AO	~~PL~~
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

File #: M2202

T.C.L
TAYLOR.CULLITY.LETHLEAN

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing:
OVERALL SURFACES

Sheet:
Sheet 2 of 2

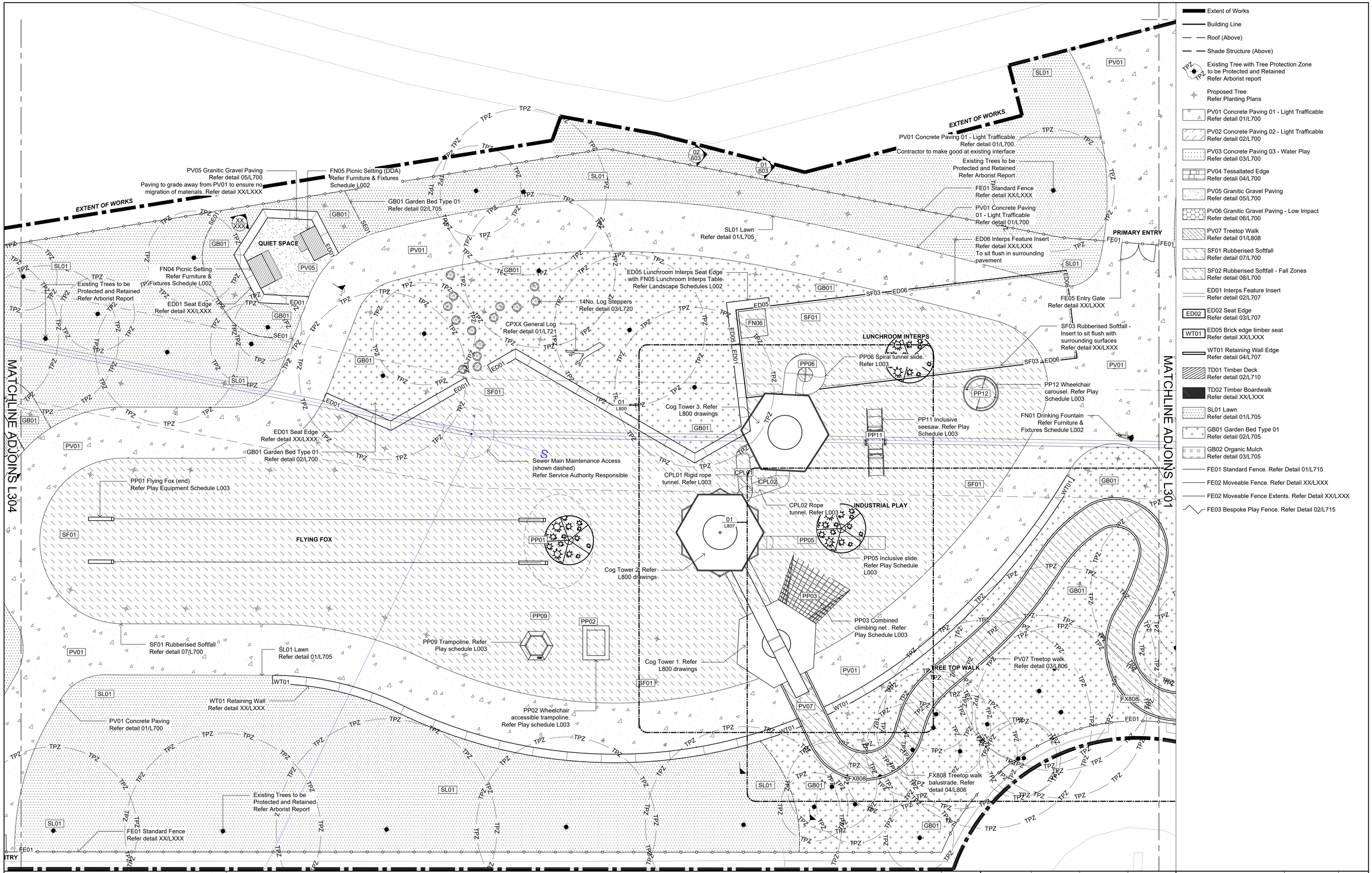
Purpose:
LANDSCAPE ARCHITECTURE

Date:
25.11.22

Scale:
1:400@A1

Drawing No.
L051

Rev.
02



- Extent of Works
- Building Line
- Roof (Above)
- Shade Structure (Above)
- Existing Tree with Tree Protection Zone to be Protected and Retained Refer Arborist report
- Proposed Tree Refer Planting Plans
- PV01 Concrete Paving 01 - Light Trafficable Refer detail 01/L700
- PV02 Concrete Paving 02 - Light Trafficable Refer detail 02/L700
- PV03 Concrete Paving 03 - Water Play Refer detail 03/L700
- PV04 Tessallated Edge Refer detail 04/L700
- PV05 Granitic Gravel Paving Refer detail 05/L700
- PV06 Granitic Gravel Paving - Low Impact Refer detail 06/L700
- PV07 Treetop Walk Refer detail 01/L808
- SF01 Rubberised Softfall Refer detail 07/L700
- SF02 Rubberised Softfall - Fall Zones Refer detail 08/L700
- ED01 Interps Feature Insert Refer detail 02/L707
- ED02 ED02 Seat Edge Refer detail 03/L707
- WT01 ED05 Brick edge timber seat Refer detail XX/LXXX
- WT01 Retaining Wall Edge Refer detail 04/L707
- TD01 Timber Deck Refer detail 02/L710
- TD02 Timber Boardwalk Refer detail XX/LXXX
- SL01 Lawn Refer detail 01/L705
- GB01 Garden Bed Type 01 Refer detail 02/L705
- GB02 Organic Mulch Refer detail 03/L705
- FE01 Standard Fence. Refer Detail 01/L715
- FE02 Moveable Fence. Refer Detail XX/LXXX
- FE02 Moveable Fence Extents. Refer Detail XX/LXXX
- FE03 Bespoke Play Fence. Refer Detail 02/L715

Rev	Date	Revision Details	By	Chk	App
02	16.12.22	75% DESIGN DEVELOPMENT	AO	KG	PL
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing: SURFACES
Sheet: Sheet 1 of 5
Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22
Scale: 1:100@A1
Drawing No. L300
Rev. 02

MATCHLINE ADJOINS L303

MATCHLINE ADJOINS L300

MATCHLINE ADJOINS L302

ENTRY

THE MEETING PLACE

SUNKEN LAWN

TREE TOP WALK

WHALEBONE SWING

COASTAL PLAY

FE02 Moveable Fence
Refer detail XX/LXXX

GB01 Garden Bed Type 01
Refer detail 02/L705
To meet into existing levels at
SL01 interface

Dashed line indicates extent of
FE02 Moveable fence location

PV01 Concrete Paving 01 -
Light Trafficable
Refer detail 01/L700

PV02 Concrete Paving 02 -
Light Trafficable
Refer detail 02/L700

ED01 Seat Edge
Refer detail 01/L707

Gap in ED01 for
wheelchair access
Refer detail XX/LXXX

SL01 Lawn
Refer detail 01/L705

PV05 Granitic Gravel Refer detail 05/L700
with steel edge to SL01 interface
Refer detail XX/LXXX

Existing Trees to be
Protected and Retained
Refer Arborist Report

Sewer main below offsets
(shown dashed)
Refer Service Authority
responsible.

Sewer Main Maintenance
Access (shown dashed)
Refer Service Authority
Responsible

3No. FN05 Picnic Setting (DDA)
Refer Furniture & Fixtures
Schedule L002

2No. FN04 Picnic Setting
Refer Furniture & Fixtures
Schedule L002

GB01 Garden Bed Type 01
Refer detail 02/L705

SE01 Steel Edge
Refer detail XX/LXXX

SL01 Lawn
Refer detail 01/L705

GB01 Garden Bed Type 01
Refer detail 02/L705
TD01 Timber Decking
Refer detail 01/L710

SE01 Steel Edge
Refer detail XX/LXXX

2No. ED01 Seat
Edge terraces
Refer detail 02/L707

GB01 Garden Bed Type
01. Refer detail 02/L705

SE01 Steel Edge
Refer detail XX/LXXX
ED01 Seat Edge
Refer detail 01/L707

SL01 Lawn
Refer detail 01/L705

GB01 Garden Bed Type 01
in Timber Decking
Refer detail 02/L705

SE01 Steel Edge
Refer detail XX/LXXX

GB01 Garden Bed Type 01
Refer detail 02/L705

Existing Trees to be
Protected and Retained
Refer Arborist Report

FE01 Standard Fence
Refer detail XX/LXXX

- Extent of Works
- Building Line
- Roof (Above)
- Shade Structure (Above)
- Existing Tree with Tree Protection Zone to be Protected and Retained Refer Arborist report
- Proposed Tree Refer Planting Plans
- PV01 Concrete Paving 01 - Light Trafficable Refer detail 01/L700
- PV02 Concrete Paving 02 - Light Trafficable Refer detail 02/L700
- PV03 Concrete Paving 03 - Water Play Refer detail 03/L700
- PV04 Tessallated Edge Refer detail 04/L700
- PV05 Granitic Gravel Paving Refer detail 05/L700
- PV06 Granitic Gravel Paving - Low Impact Refer detail 06/L700
- PV07 Treetop Walk Refer detail 01/L808
- SF01 Rubberised Softfall Refer detail 07/L700
- SF02 Rubberised Softfall - Fall Zones Refer detail 08/L700
- ED01 Interps Feature Insert Refer detail 02/L707
- ED02 ED02 Seat Edge Refer detail 03/L707
- WT01 ED05 Brick edge timber seat Refer detail XX/LXXX
- WT01 Retaining Wall Edge Refer detail 04/L707
- TD01 Timber Deck Refer detail 02/L710
- TD02 Timber Boardwalk Refer detail XX/LXXX
- SL01 Lawn Refer detail 01/L705
- GB01 Garden Bed Type 01 Refer detail 02/L705
- GB02 Organic Mulch Refer detail 03/L705
- FE01 Standard Fence. Refer Detail 01/L715
- FE02 Moveable Fence. Refer Detail XX/LXXX
- FE02 Moveable Fence Extents. Refer Detail XX/LXXX
- FE03 Bespoke Play Fence. Refer Detail 02/L715

Rev	Date	Revision Details	By	Chk	App
02	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

File #: M2202

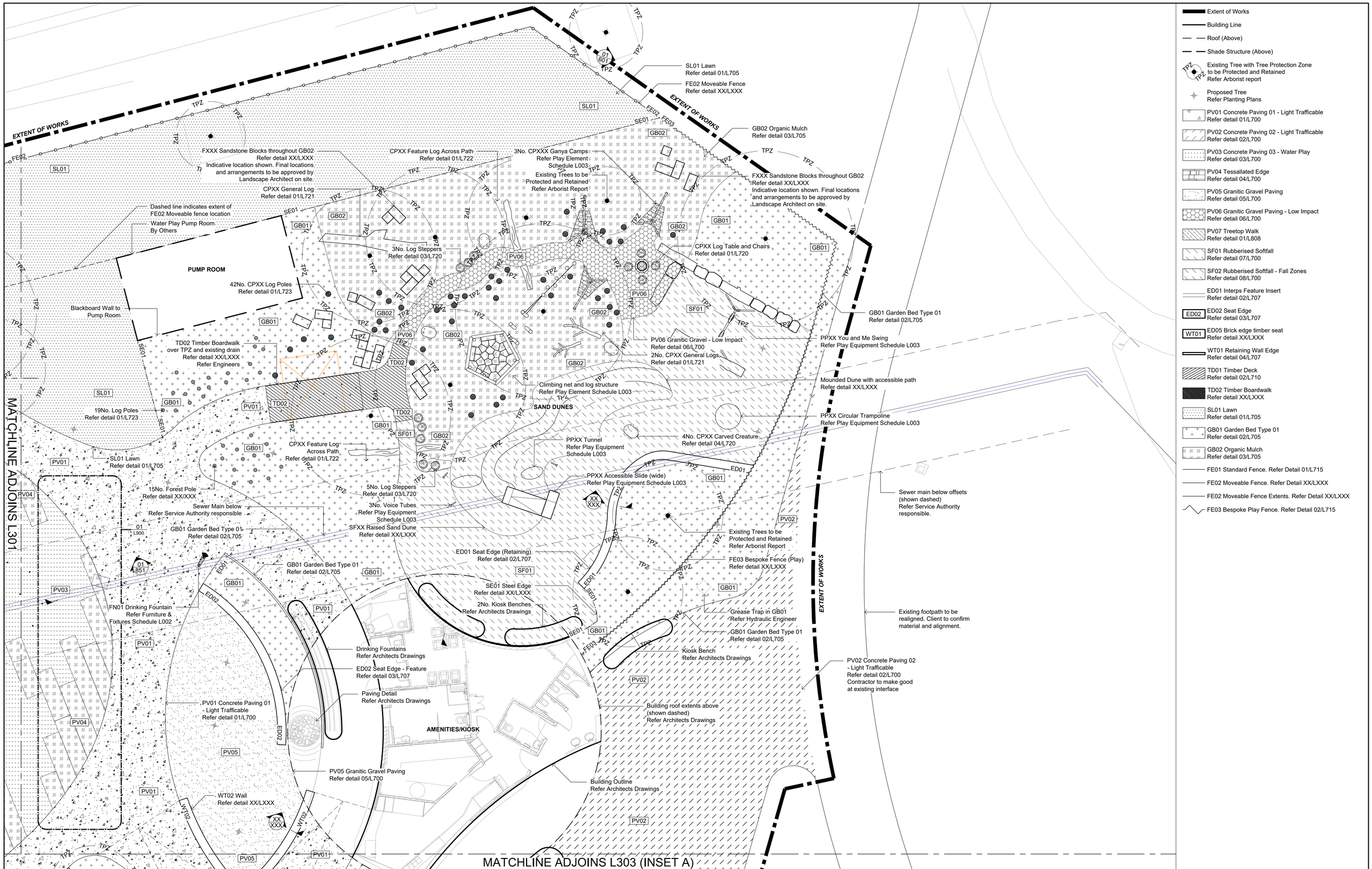
T.C.L
TAYLOR.CULLITY.LETHLEAN

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing: SURFACES
Sheet: Sheet 2 of 5
Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22
Scale: 1:100@A1
Drawing No. L301
Rev. 02



- Extent of Works
- Building Line
- Roof (Above)
- Shade Structure (Above)
- Existing Tree with Tree Protection Zone to be Protected and Retained. Refer Arborist report
- Proposed Tree. Refer Planting Plans
- PV01 Concrete Paving 01 - Light Trafficable. Refer detail 01/L700
- PV02 Concrete Paving 02 - Light Trafficable. Refer detail 02/L700
- PV03 Concrete Paving 03 - Water Play. Refer detail 03/L700
- PV04 Tessallated Edge. Refer detail 04/L700
- PV05 Granitic Gravel Paving. Refer detail 05/L700
- PV06 Granitic Gravel Paving - Low Impact. Refer detail 06/L700
- PV07 Treetop Walk. Refer detail 01/L808
- SF01 Rubberised Softfall. Refer detail 07/L700
- SF02 Rubberised Softfall - Fall Zones. Refer detail 08/L700
- ED01 Interps Feature Insert. Refer detail 02/L707
- ED02 ED02 Seat Edge. Refer detail 03/L707
- WT01 ED05 Brick edge timber seat. Refer detail XX/LXXX
- WT01 Retaining Wall Edge. Refer detail 04/L707
- TD01 Timber Deck. Refer detail 02/L710
- TD02 Timber Boardwalk. Refer detail XX/LXXX
- SL01 Lawn. Refer detail 01/L705
- GB01 Garden Bed Type 01. Refer detail 02/L705
- GB02 Organic Mulch. Refer detail 03/L705
- FE01 Standard Fence. Refer Detail 01/L715
- FE02 Moveable Fence. Refer Detail XX/LXXX
- FE02 Moveable Fence Extents. Refer Detail XX/LXXX
- FE03 Bespoke Play Fence. Refer Detail 02/L715

Rev	Date	Revision Details	By	Chk	App
02	16.12.22	75% DESIGN DEVELOPMENT	AO	KG	PL
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

File #: M2202

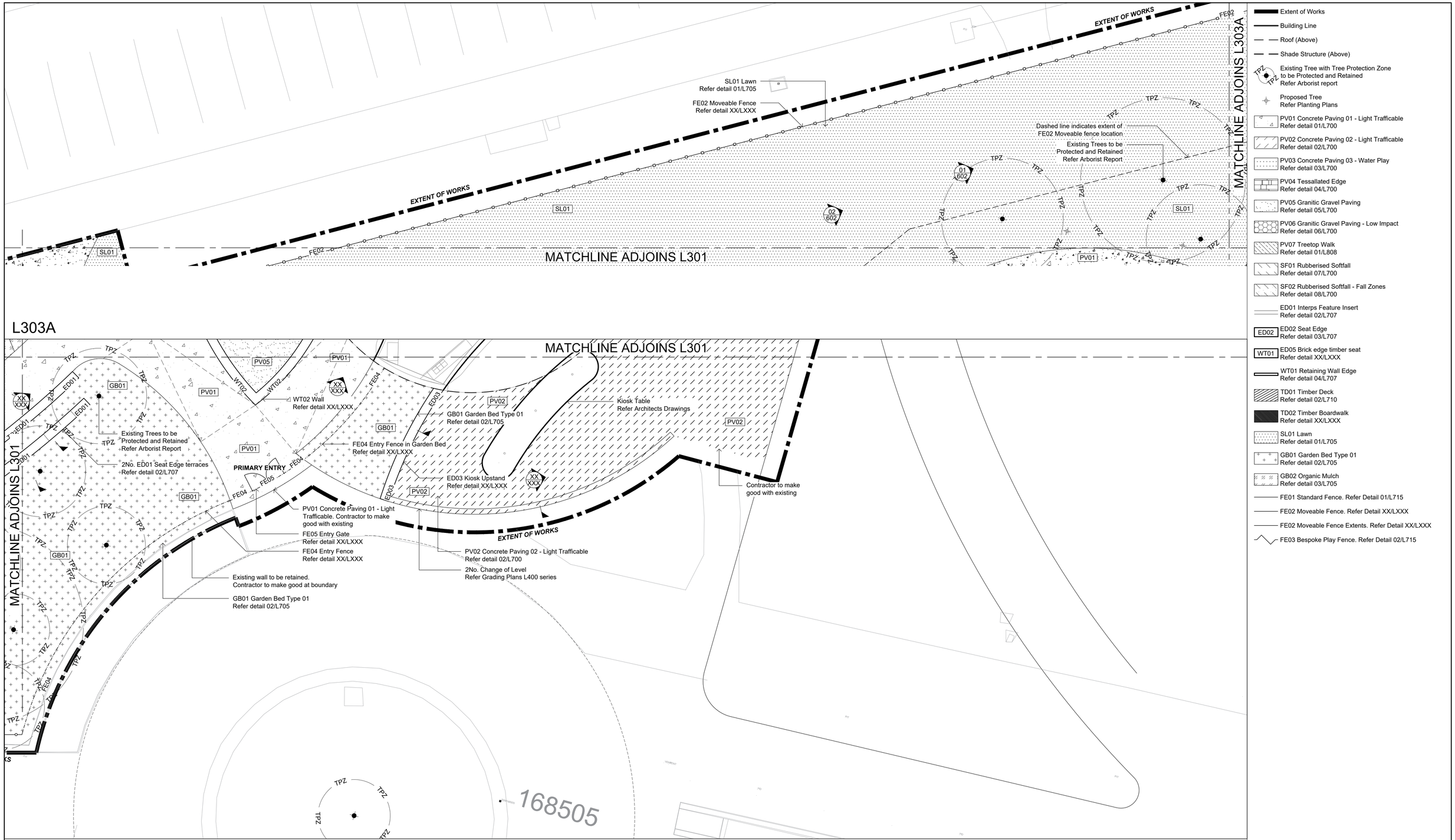
T.C.L
TAYLOR.CULLITY.LETHLEAN

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing: SURFACES
Sheet: Sheet 3 of 5
Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22
Scale: 1:100@A1
Drawing No. L302
Rev. 02



Rev	Date	Revision Details	By	Chk	App
02	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing:
SURFACES

Sheet:
Sheet 4 of 5

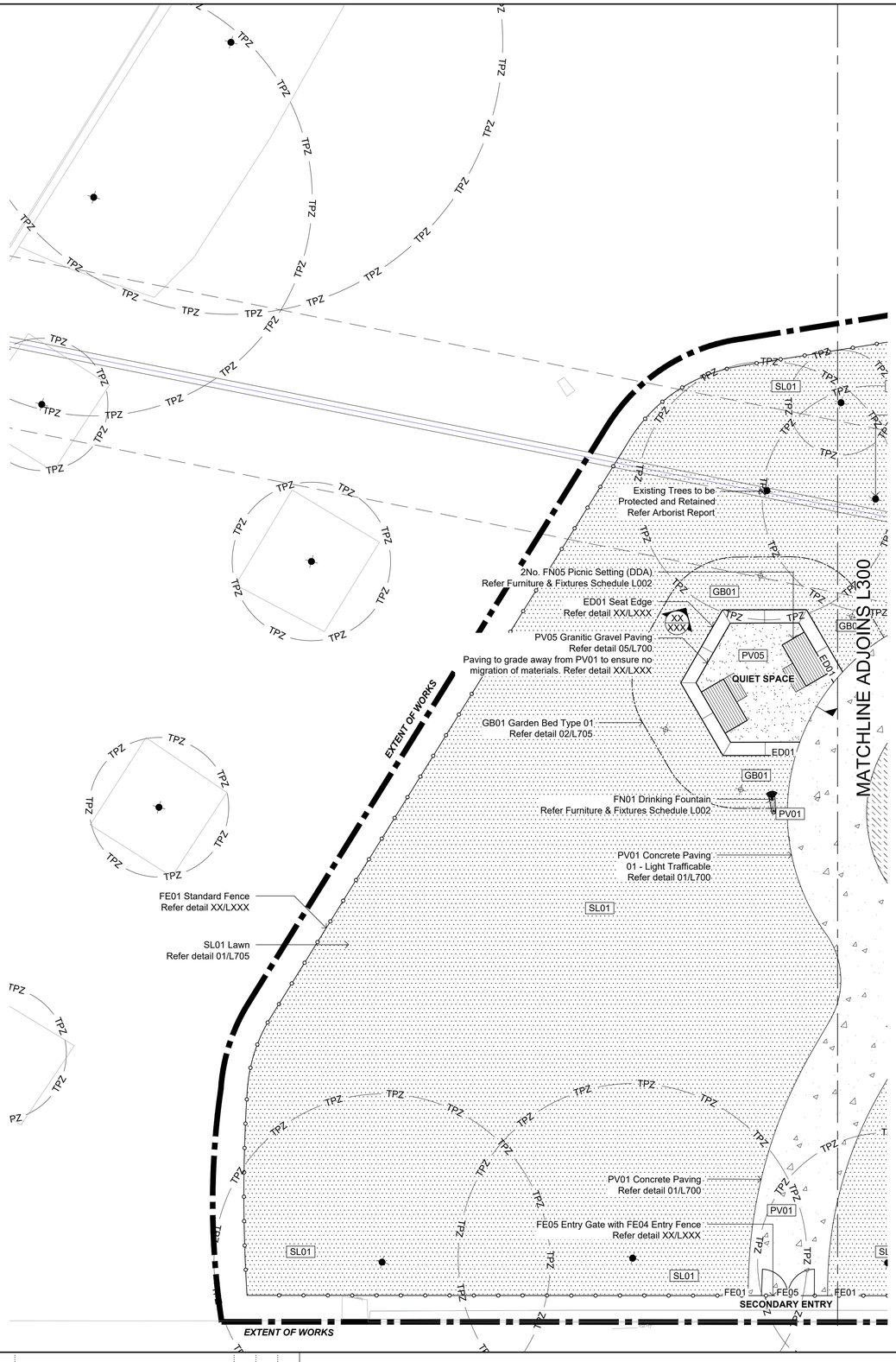
Purpose:
LANDSCAPE ARCHITECTURE

Date:
25.11.22

Scale:
1:100@A1

Drawing No.
L303

Rev.
02



- Extent of Works
- Building Line
- Roof (Above)
- Shade Structure (Above)
- Existing Tree with Tree Protection Zone to be Protected and Retained Refer Arborist report
- Proposed Tree Refer Planting Plans
- PV01 Concrete Paving 01 - Light Trafficable Refer detail 01/L700
- PV02 Concrete Paving 02 - Light Trafficable Refer detail 02/L700
- PV03 Concrete Paving 03 - Water Play Refer detail 03/L700
- PV04 Tessallated Edge Refer detail 04/L700
- PV05 Granitic Gravel Paving Refer detail 05/L700
- PV06 Granitic Gravel Paving - Low Impact Refer detail 06/L700
- PV07 Treetop Walk Refer detail 01/L808
- SF01 Rubberised Softfall Refer detail 07/L700
- SF02 Rubberised Softfall - Fall Zones Refer detail 08/L700
- ED01 Interps Feature Insert Refer detail 02/L707
- ED02 ED02 Seat Edge Refer detail 03/L707
- WT01 ED05 Brick edge timber seat Refer detail XX/LXXX
- WT01 Retaining Wall Edge Refer detail 04/L707
- TD01 Timber Deck Refer detail 02/L710
- TD02 Timber Boardwalk Refer detail XX/LXXX
- SL01 Lawn Refer detail 01/L705
- GB01 Garden Bed Type 01 Refer detail 02/L705
- GB02 Organic Mulch Refer detail 03/L705
- FE01 Standard Fence. Refer Detail 01/L715
- FE02 Moveable Fence. Refer Detail XX/LXXX
- FE02 Moveable Fence Extents. Refer Detail XX/LXXX
- FE03 Bespoke Play Fence. Refer Detail 02/L715

Rev	Date	Revision Details	By	Chk	App
02	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

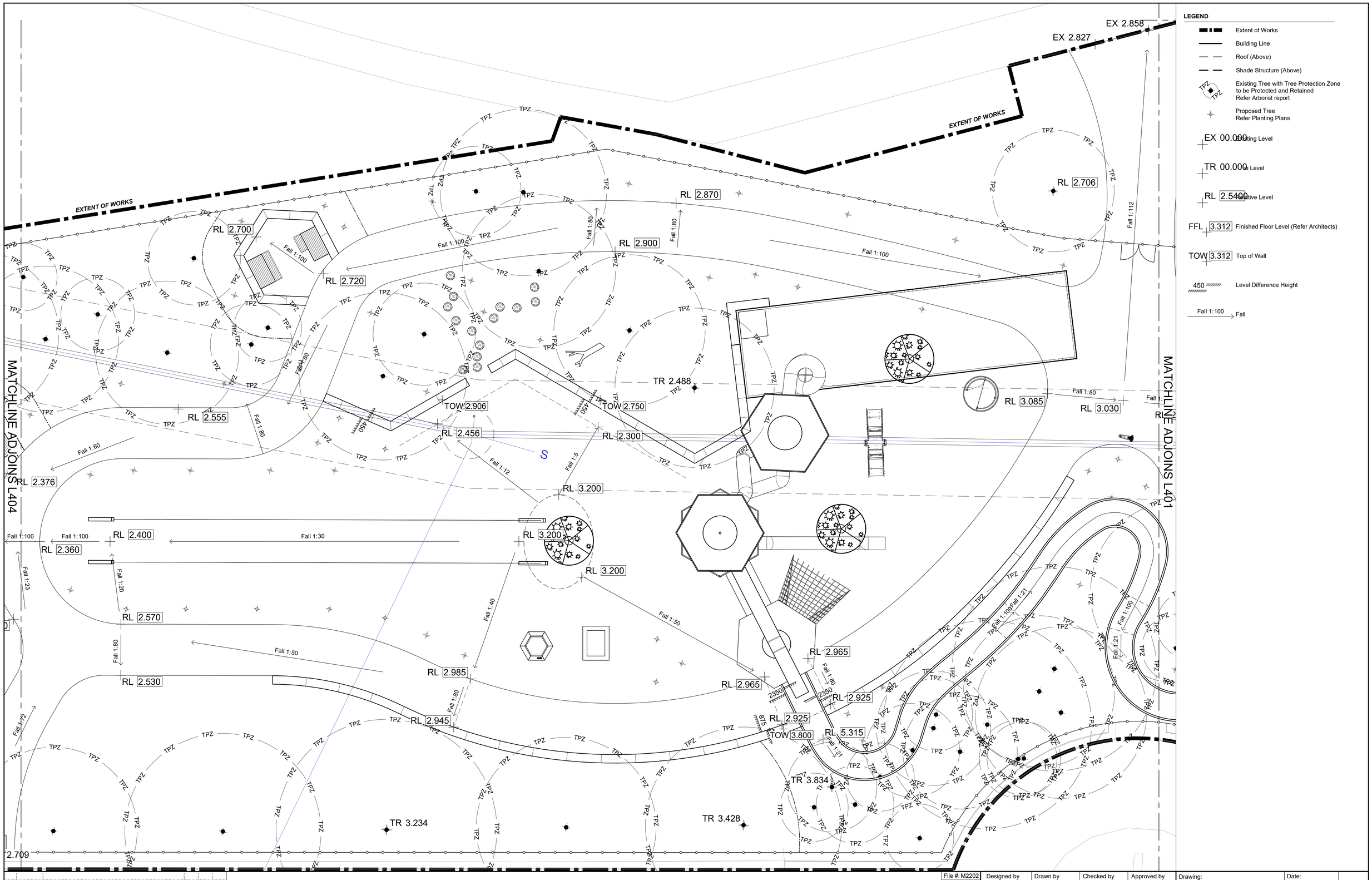
File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing: SURFACES
Sheet: Sheet 5 of 5
Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22
Scale: 1:100@A1
Drawing No. L304
Rev. 02



LEGEND

- Extent of Works
- Building Line
- Roof (Above)
- Shade Structure (Above)
- Existing Tree with Tree Protection Zone to be Protected and Retained Refer Arborist report
- Proposed Tree Refer Planting Plans
- EX 00.000 Existing Level
- TR 00.000 Trim Level
- RL 2.5400 Relative Level
- FFL 3.312 Finished Floor Level (Refer Architects)
- TOW 3.312 Top of Wall
- 450 Level Difference Height
- Fall 1:100 Fall

Rev	Date	Revision Details	By	Chk	App
02	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status: 75% DESIGN DEVELOPMENT

NOT FOR TENDER

Drawing: GRADING

Sheet: Sheet 1 of 5

Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22

Scale: 1:100@A1

Drawing No. L400

Rev. 02

MATCHLINE ADJOINS L403

MATCHLINE ADJOINS L400

MATCHLINE ADJOINS L402

EX 2.812

EX 2.646

EX 2.671

EX 2.790

RL 2.500 Fall 1:80 TOW 2.990 RL 2.500 Fall 1:80 RL 2.535 RL 2.535 RL 2.540

RL 2.560 RL 2.540 TOW 2.990 450 450 Fall 1:80 RL 2.580

RL 2.645 RL 2.600 Fall 1:60 Fall 1:88 Fall 1:91 RL 2.710 TOW 3.160

RL 2.560 Fall 1:64 Fall 1:80 Fall 1:100 225 225 RL 2.260 Fall RL 2.710

Fall 1:75 TOW 3.120 RL 2.670 TR 2.529 RL 2.970 RL 2.670 Fall 1:67 450 150

450 610 RL 2.750 TR 2.590 TR 2.653 TR 2.722 TR 2.616 TR 2.435 TR 2.502

RL 2.790 TR 2.489 TR 2.478 Fall 1:26 Fall 1:112 Fall 1:82 Fall 1:31 Fall 1:41

RL 2.510 RL 2.535 Fall 1:80 RL 2.500 Fall 1:71 Fall 1:60 RL 2.665 Fall 1:80 RL 2.630

RL 3.135 TR 2.850 RL 3.175 RL 3.175 Fall 1:80 RL 3.060 RL 3.022 Fall 1:80 450

TR 3.482 RL 3.060 Fall 1:80 RL 2.700 TR 3.737 TR 3.729 TR 3.693

LEGEND

- Extent of Works
- Building Line
- Roof (Above)
- Shade Structure (Above)
- Existing Tree with Tree Protection Zone to be Protected and Retained Refer Arborist report
- Proposed Tree Refer Planting Plans
- EX 00.000 Existing Level
- TR 00.000 Proposed Level
- RL 2.5400 Relative Level
- FFL 3.312 Finished Floor Level (Refer Architects)
- TOW 3.312 Top of Wall
- 450 Level Difference Height
- Fall 1:100 Fall

Rev	Date	Revision Details	By	Chk	App
02	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	~~PL~~
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

File #: M2202

T.C.L TAYLOR.CULLITY.LETHLEAN

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status: 75% DESIGN DEVELOPMENT

NOT FOR TENDER

Drawing: GRADING

Sheet: Sheet 2 of 5

Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22

Scale: 1:100@A1

Drawing No. L401

Rev. 02



LEGEND

- Extent of Works
- Building Line
- Roof (Above)
- Shade Structure (Above)
- Existing Tree with Tree Protection Zone to be Protected and Retained Refer Arborist report
- Proposed Tree Refer Planting Plans
- EX 00.000 Existing Level
- TR 00.000 Tree Level
- RL 2.5400 Relative Level
- FFL 3.312 Finished Floor Level (Refer Architects)
- TOW 3.312 Top of Wall
- 450 Level Difference Height
- Fall 1:100 Fall

Rev	Date	Revision Details	By	Chk	App
02	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status: 75% DESIGN DEVELOPMENT

NOT FOR TENDER

Drawing: GRADING

Sheet: Sheet 3 of 5

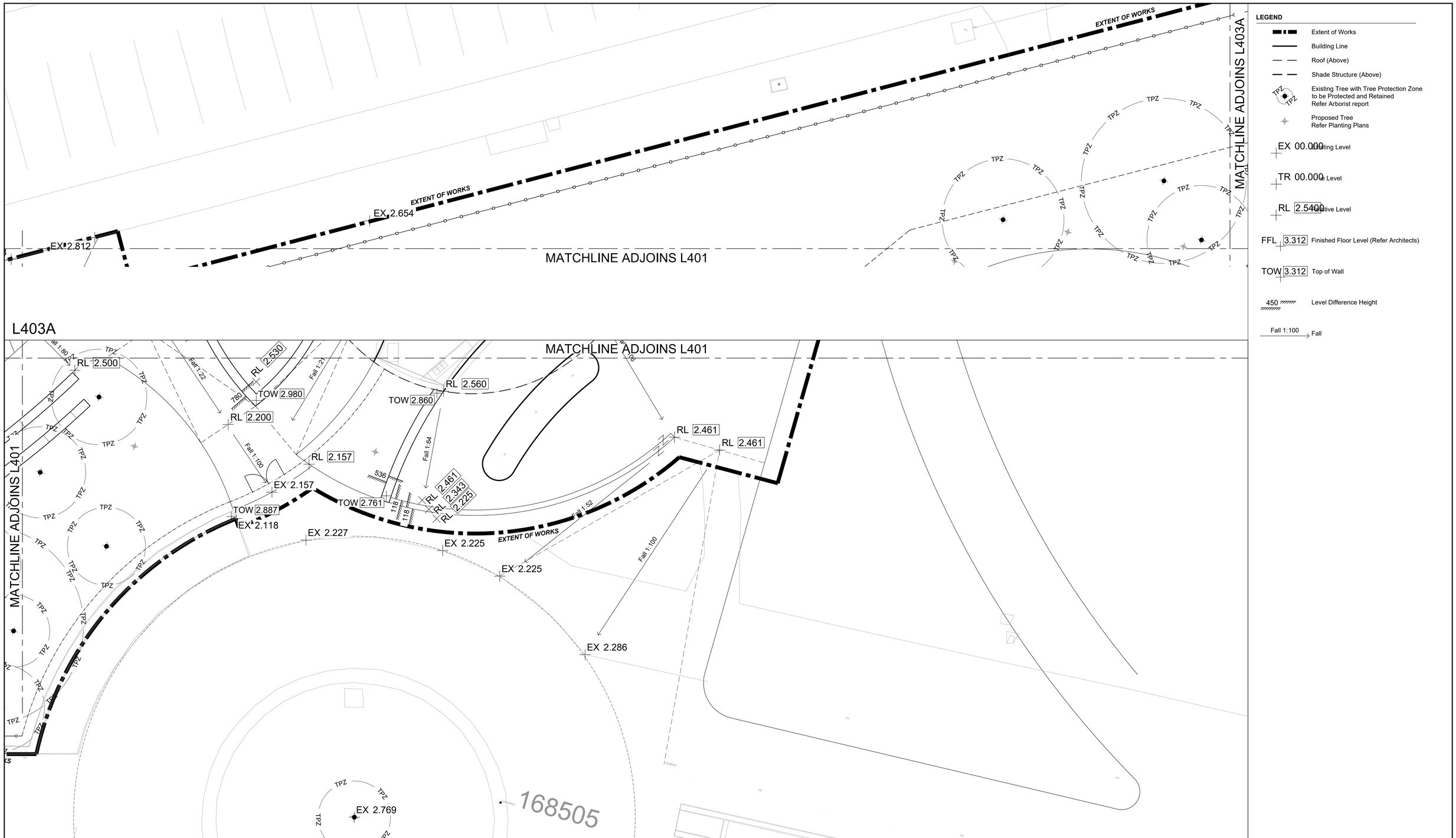
Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22

Scale: 1:100@A1

Drawing No. L402

Rev. 02



LEGEND

- Extent of Works
- Building Line
- Roof (Above)
- Shade Structure (Above)
- Existing Tree with Tree Protection Zone to be Protected and Retained Refer Arborist report
- Proposed Tree Refer Planting Plans
- EX 00.000 Existing Level
- TR 00.000 Tree Level
- RL 2.5400 Relative Level
- FFL 3.312 Finished Floor Level (Refer Architects)
- TOW 3.312 Top of Wall
- 450 Level Difference Height
- Fall 1:100 Fall

Rev	Date	Revision Details	By	Chk	App
02	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status: 75% DESIGN DEVELOPMENT

NOT FOR TENDER

Drawing: GRADING

Sheet: Sheet 4 of 5

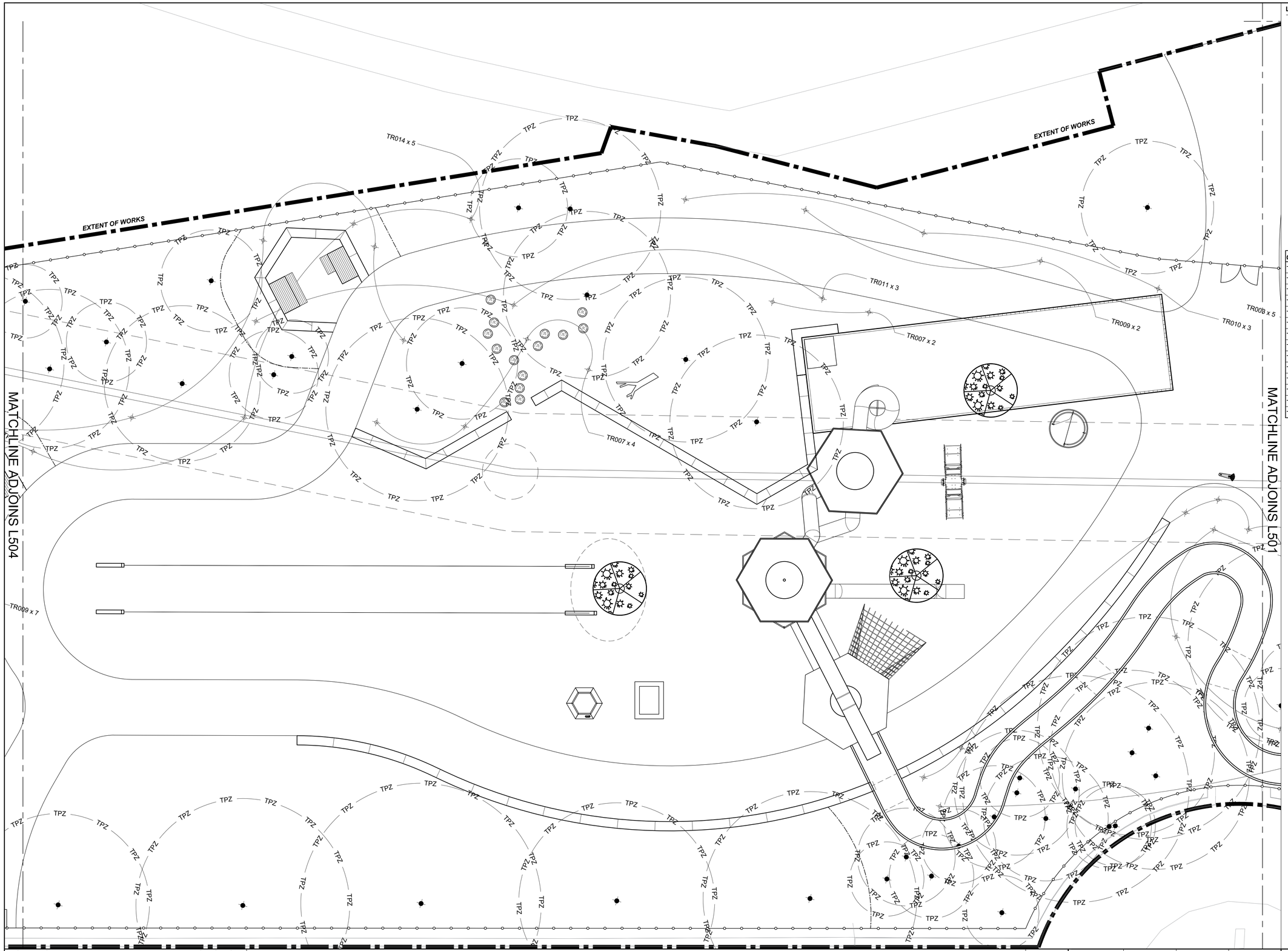
Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22

Scale: 1:100@A1

Drawing No. L403

Rev. 02



LEGEND

- Extent of Works
- Building Line
- Roof (Above)
- Shade Structure (Above)
- Existing Tree with Tree Protection Zone to be Protected and Retained Refer Arborist report
- Proposed Tree Refer Planting Plans

Code	Species	Common Name
TR001	*Angophora costata*	Apple gum
TR002	*Corymbia maculata*	Spotted gum
TR003	*Corymbia ficifolia 'Wildfire'*	Flowering gum - Red
TR004	*Eucalyptus deglupta*	Rainbow gum
TR005	*Toona ciliata*	Red cedar
TR006	*Hymenosporum flavum*	Native frangipani
TR007	*Pulmeria rubra*	Red fragipani
TR008	*Caesalpinia ferrea*	Leopard tree
TR009	*Casuarina cunninghamiana*	River sheoak
TR010	*Leptospermum laevigatum*	Costal tee tree
TR011	*Corymbia citriodora*	Lemon scented gum
TR012	*Corymbia ficifolia 'Summer beauty'*	Flowering gum - pink
TR013	*Callistemon citrinus*	Bottle brush
TR014	*Eucalyptus curtisii*	Plunkett mallee

Rev	Date	Revision Details	By	Chk	App
01	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status: 75% DESIGN DEVELOPMENT

NOT FOR TENDER

Drawing: PLANTING

Sheet: Sheet 1 of 5

Purpose: PLANTING

Date: 25.11.22

Scale: 1:100@A1

Drawing No. L500

Rev. 01

MATCHLINE ADJOINS L503

MATCHLINE ADJOINS L500

MATCHLINE ADJOINS L502

TR014 x 3

TR002 x 17

TR002 x 5

TR008 x 5

TR013 x 5

TR002 x 5

TR005 x 5

TR008 x 5

TR013 x 3

TR006 x 6

TPZ

LEGEND

- Extent of Works
- Building Line
- Roof (Above)
- Shade Structure (Above)
- Existing Tree with Tree Protection Zone to be Protected and Retained Refer Arborist report
- Proposed Tree Refer Planting Plans

Code	Species	Common Name
TR001	*Angophora costata*	Apple gum
TR002	*Corymbia maculata*	Spotted gum
TR003	*Corymbia ficifolia 'Wildfire'*	Flowering gum - Red
TR004	*Eucalyptus deglupta*	Rainbow gum
TR005	*Toona ciliata*	Red cedar
TR006	*Hymenosporum flavum*	Native frangipani
TR007	*Pulmeria rubra*	Red fragipani
TR008	*Caesalpinia ferrea*	Leopard tree
TR009	*Casuarina cunninghamiana*	River sheoak
TR010	*Leptospermum laevigatum*	Costal tee tree
TR011	*Corymbia citriodora*	Lemon scented gum
TR012	*Corymbia ficifolia 'Summer beauty'*	Flowering gum - pink
TR013	*Callistemon citrinus*	Bottle brush
TR014	*Eucalyptus curtisii*	Plunkett mallee

Rev	Date	Revision Details	By	Chk	App
01	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing: PLANTING
Sheet: Sheet 2 of 5
Purpose: PLANTING

Date: 25.11.22
Scale: 1:100@A1
Drawing No. L501
Rev. 01

EXTENT OF WORKS

EXTENT OF WORKS

EXTENT OF WORKS

TR009 x 3

TR012 x3

TR001 x 7

TR001 x 5

MATCHLINE ADJOINS L501

MATCHLINE ADJOINS L503 (INSET A)

LEGEND

- Extent of Works
- Building Line
- Roof (Above)
- Shade Structure (Above)
- Existing Tree with Tree Protection Zone to be Protected and Retained Refer Arborist report
- Proposed Tree Refer Planting Plans

Code	Species	Common Name
TR001	*Angophora costata*	Apple gum
TR002	*Corymbia maculata*	Spotted gum
TR003	*Corymbia ficifolia 'Wildfire'*	Flowering gum - Red
TR004	*Eucalyptus deglupta*	Rainbow gum
TR005	*Toona ciliata*	Red cedar
TR006	*Hymenosporum flavum*	Native frangipani
TR007	*Pulmeria rubra*	Red fragipani
TR008	*Caesalpinia ferrea*	Leopard tree
TR009	*Casuarina cunninghamiana*	River sheoak
TR010	*Leptospermum laevigatum*	Costal tee tree
TR011	*Corymbia citriodora*	Lemon scented gum
TR012	*Corymbia ficifolia 'Summer beauty'*	Flowering gum - pink
TR013	*Callistemon citrinus*	Bottle brush
TR014	*Eucalyptus curtisii*	Plunkett mallee

Rev	Date	Revision Details	By	Chk	App
01	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	LH

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

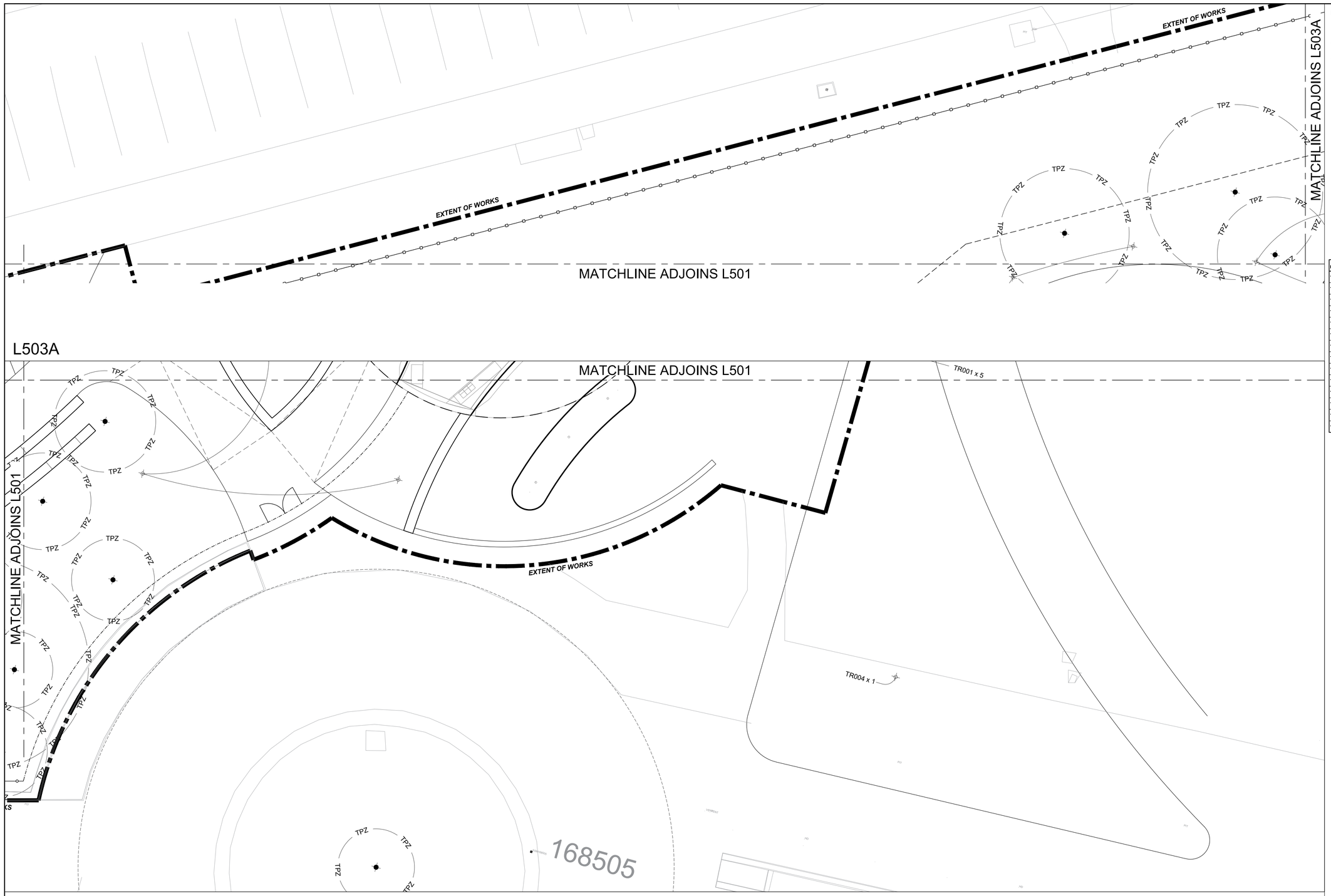
File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing: PLANTING
Sheet: Sheet 3 of 5
Purpose: PLANTING

Date: 25.11.22
Scale: 1:100@A1
Drawing No. L502
Rev. 01



Extent of Works

Building Line

Roof (Above)

Shade Structure (Above)

Existing Tree with Tree Protection Zone to be Protected and Retained
Refer Arborist report

Proposed Tree
Refer Planting Plans

Code	Species	Common Name
TR001	*Angophora costata*	Apple gum
TR002	*Corymbia maculata*	Spotted gum
TR003	*Corymbia ficifolia 'Wildfire'*	Flowering gum - Red
TR004	*Eucalyptus deglupta*	Rainbow gum
TR005	*Toona ciliata*	Red cedar
TR006	*Hymenosporum flavum*	Native frangipani
TR007	*Pulmeria rubra*	Red fragipani
TR008	*Caesalpinia ferrea*	Leopard tree
TR009	*Casuarina cunninghamiana*	River sheoak
TR010	*Leptospermum laevigatum*	Costal tee tree
TR011	*Corymbia citriodora*	Lemon scented gum
TR012	*Corymbia ficifolia 'Summer beauty'*	Flowering gum - pink
TR013	*Callistemon citrinus*	Bottle brush
TR014	*Eucalyptus curtisii*	Plunkett mallee

Rev	Date	Revision Details	By	Chk	App
01	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	LH

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing:
PLANTING

Sheet:
Sheet 4 of 5

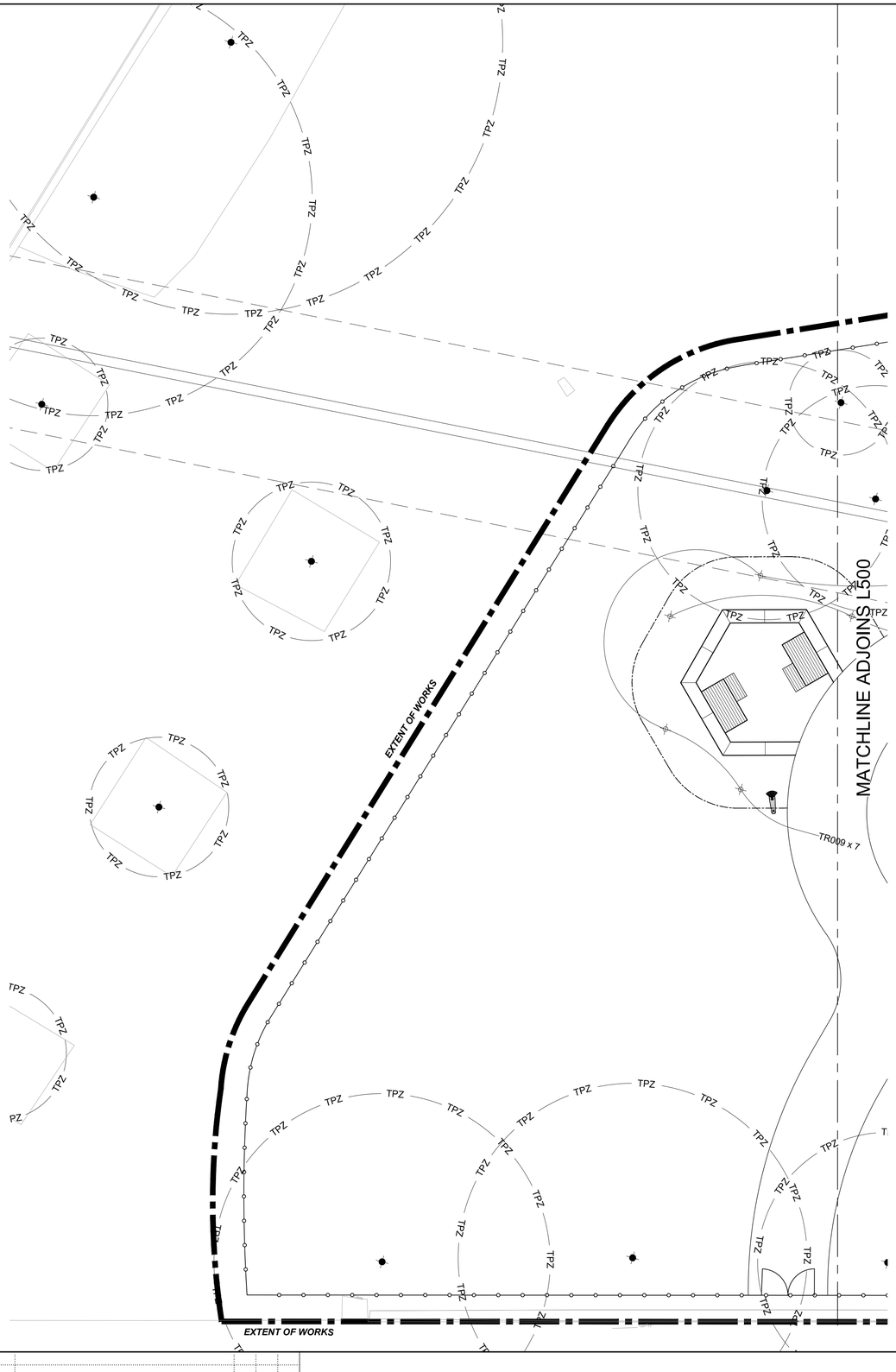
Purpose:
PLANTING

Date:
25.11.22

Scale:
1:100@A1

Drawing No.
L503

Rev.
01



Extent of Works

Building Line

Roof (Above)

Shade Structure (Above)

Existing Tree with Tree Protection Zone to be Protected and Retained
Refer Arborist report

Proposed Tree
Refer Planting Plans

Code	Species	Common Name
TR001	*Angophora costata*	Apple gum
TR002	*Corymbia maculata*	Spotted gum
TR003	*Corymbia ficifolia 'Wildfire'*	Flowering gum - Red
TR004	*Eucalyptus deglupta*	Rainbow gum
TR005	*Toona ciliata*	Red cedar
TR006	*Hymenosporum flavum*	Native frangipani
TR007	*Pulmeria rubra*	Red fragipani
TR008	*Caesalpinia ferrea*	Leopard tree
TR009	*Casuarina cunninghamiana*	River sheoak
TR010	*Leptospermum laevigatum*	Costal tee tree
TR011	*Corymbia citriodora*	Lemon scented gum
TR012	*Corymbia ficifolia 'Summer beauty'*	Flowering gum - pink
TR013	*Callistemon citrinus*	Bottle brush
TR014	*Eucalyptus curtisii*	Plunkett mallee

Rev	Date	Revision Details	By	Chk	App
01	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	LH

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

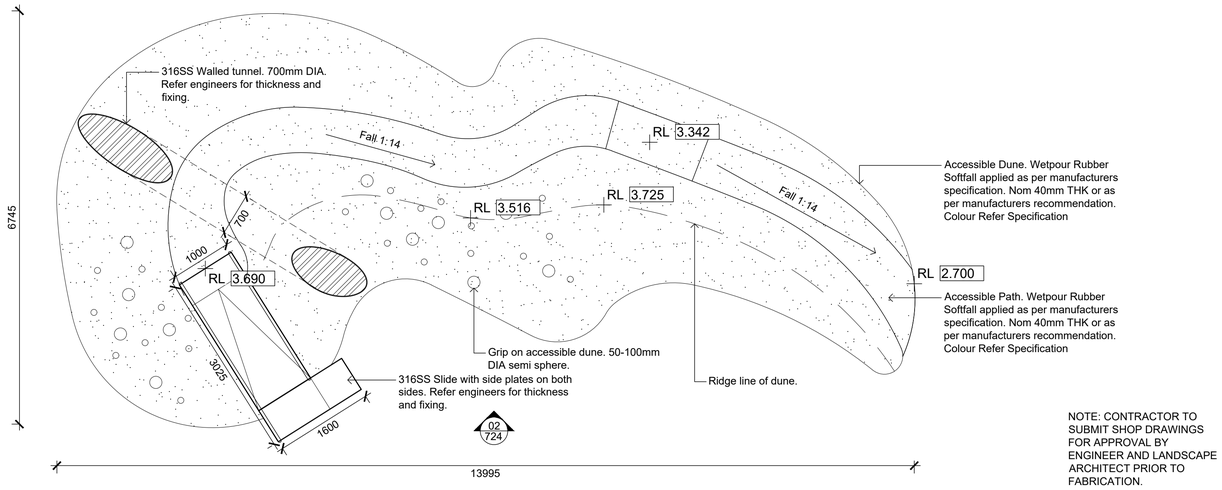
File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing: PLANTING
Sheet: Sheet 5 of 5
Purpose: PLANTING

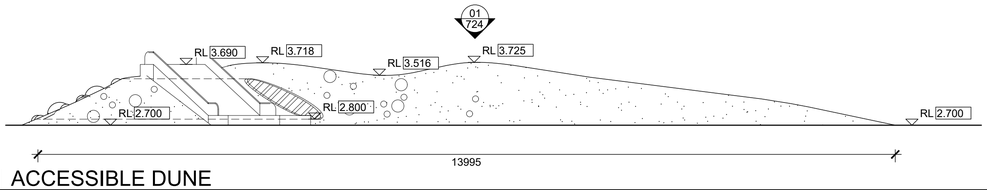
Date: 25.11.22
Scale: 1:100@A1
Drawing No. L504
Rev. 01



NOTE: CONTRACTOR TO SUBMIT SHOP DRAWINGS FOR APPROVAL BY ENGINEER AND LANDSCAPE ARCHITECT PRIOR TO FABRICATION.

01 ACCESSIBLE DUNE
Detailed Plan

Scale 1:50



NOTE: CONTRACTOR TO SUBMIT SHOP DRAWINGS FOR APPROVAL BY ENGINEER AND LANDSCAPE ARCHITECT PRIOR TO FABRICATION.

02 ACCESSIBLE DUNE
Detailed Elevation

Scale 1:50

Rev	Date	Revision Details	By	Chk	App
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing:
JUNIOR PLAY DETAILS

Sheet:
Sheet 5 of 6

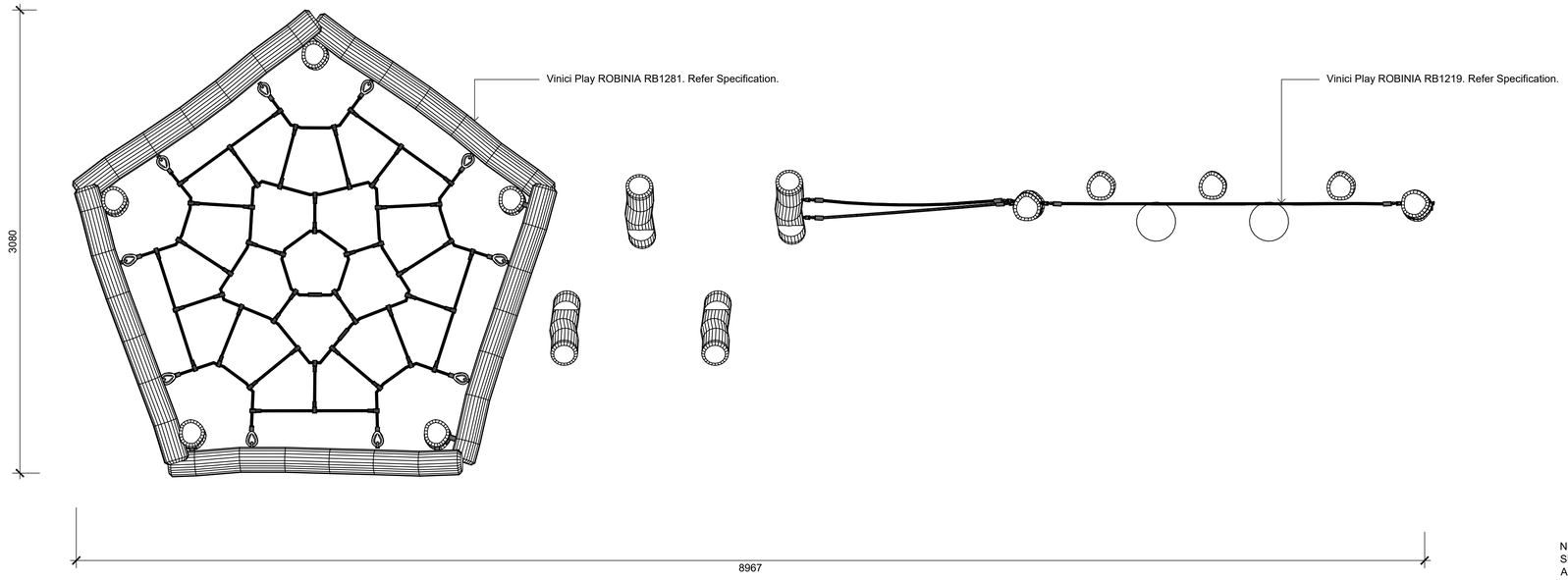
Purpose:
LANDSCAPE ARCHITECTURE

Date:
25.11.22

Scale:
AS SHOWN

Drawing No.
L724

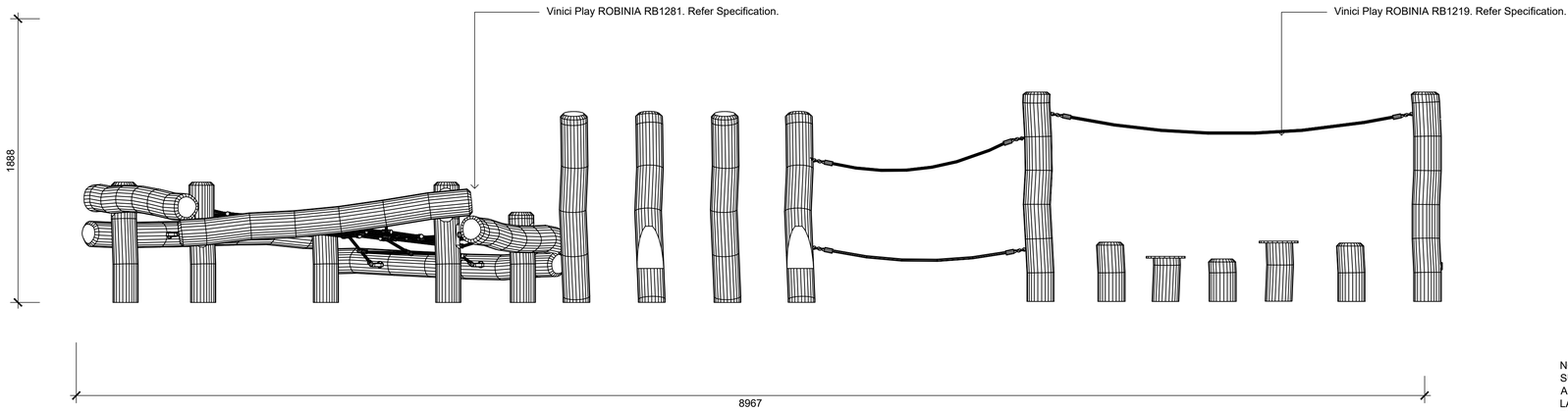
Rev.
01



NOTE: CONTRACTOR TO SUBMIT SHOP DRAWINGS FOR APPROVAL BY ENGINEER AND LANDSCAPE ARCHITECT PRIOR TO FABRICATION.

01 PP06 CLIMBING LOGS AND NETTING
Detailed Plan

Scale 1:20



NOTE: CONTRACTOR TO SUBMIT SHOP DRAWINGS FOR APPROVAL BY ENGINEER AND LANDSCAPE ARCHITECT PRIOR TO FABRICATION.

02 PP06 CLIMBING LOGS AND NETTING
Detailed Elevation

Scale 1:20

Rev	Date	Revision Details	By	Chk	App
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status: 75% DESIGN DEVELOPMENT

NOT FOR TENDER

Drawing: JUNIOR PLAY DETAILS

Sheet: Sheet 6 of 6

Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22

Scale: AS SHOWN

Drawing No. L725

Rev. 01



NOTE: Contractor to submit shop drawings for approval by landscape architect and engineer prior to fabrication.

Rev	Date	Revision Details	By	Chk	App
	16.12.12	75% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing:
INDUSTRIAL PLAY

Sheet:
Sheet 1 of 8

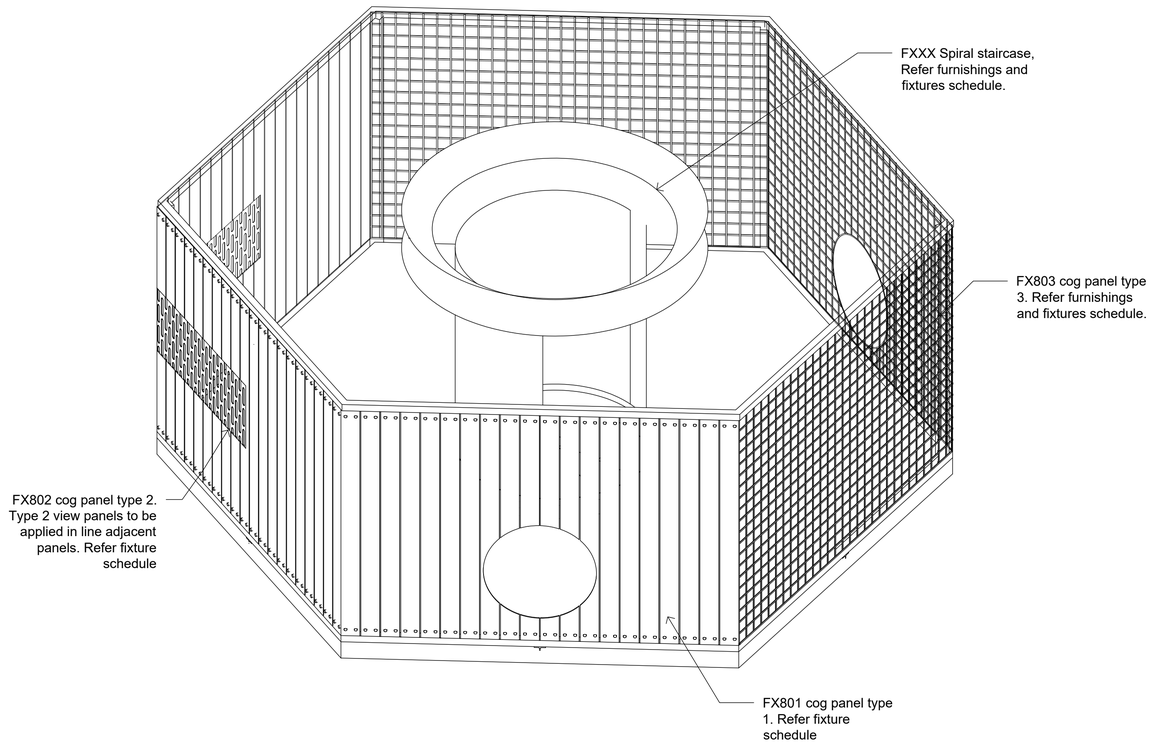
Purpose:
LANDSCAPE ARCHITECTURE

Date:
25.11.22

Scale:
1:100@A1

Drawing No.
L803

Rev.



LEGEND

- FX801 Steel panel type 1 Refer image 01/8XX
- FX802Steel panel type 2 Refer image 02/8XX
- FX803 Steel panel type 3 Refer image 04/8XX
- FX804 Steel panel type 4 Refer image 04/8XX
- FX805 Steel panel type 5 Refer image 04/8XX
- FX806 Steel panel type 6 Refer image 04/8XX
- FX807 Ronstan mesh Refer image 03/8XX

NOTE: Contractor to submit shop drawings for approval by landscape architect and engineer prior to fabrication.

Rev	Date	Revision Details	By	Chk	App
01	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

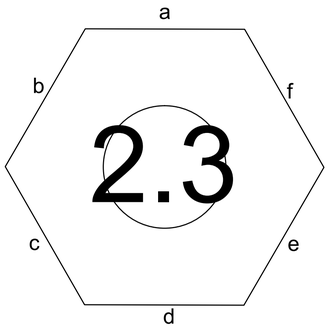
File #: M2202

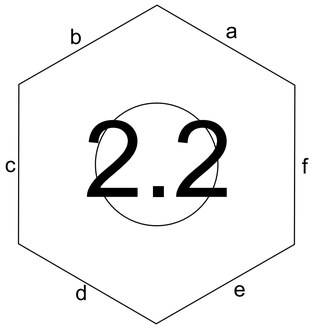
Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

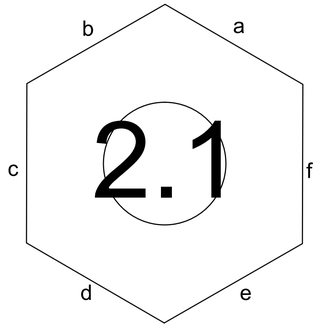
Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

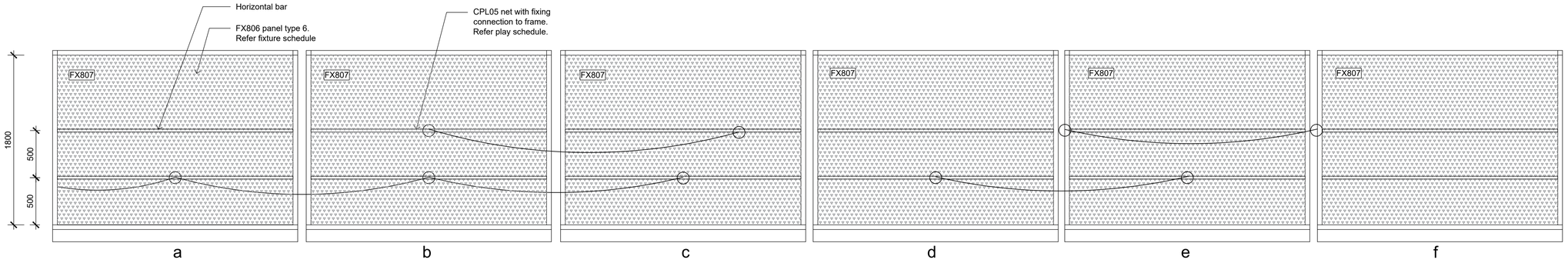
Drawing: INDUSTRIAL PLAY
Sheet: Sheet 1 of 8
Purpose: LANDSCAPE ARCHITECTURE

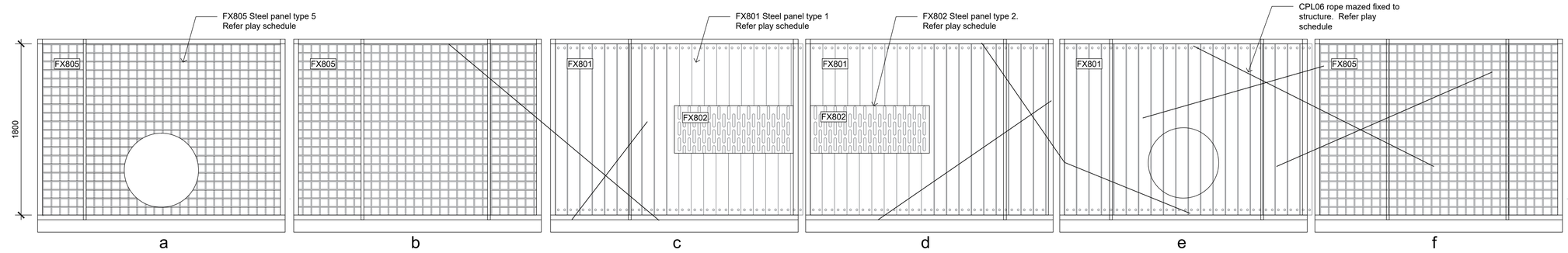
Date: 25.11.22
Scale: 1:50@A1
Drawing No. L804
Rev. 01

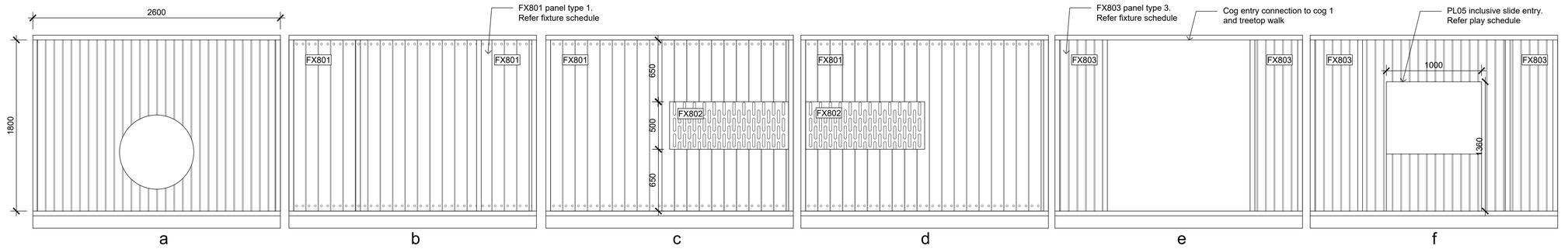












LEGEND

- FX801 Steel panel type 1 — Refer image 01/8XX
- FX802Steel panel type 2 — Refer image 02/8XX
- FX803 Steel panel type 3 — Refer image 04/8XX
- FX804 Steel panel type 4 — Refer image 04/8XX
- FX805 Steel panel type 5 — Refer image 04/8XX
- FX806 Steel panel type 6 — Refer image 04/8XX
- FX807 Ronstan mesh — Refer image 03/8XX

01 COG TOWER 2
Elevation

Scale 1:25

NOTE: Contractor to submit shop drawings for approval by landscape architect and engineer prior to fabrication.

Rev	Date	Revision Details	By	Chk	App
01	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status: 75% DESIGN DEVELOPMENT

NOT FOR TENDER

Drawing: INDUSTRIAL PLAY

Sheet: Sheet 1 of 8

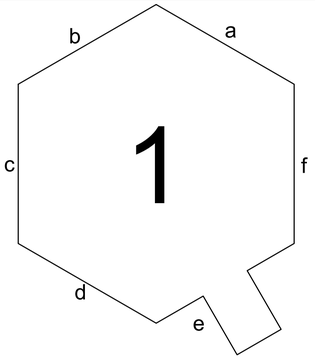
Purpose: LANDSCAPE ARCHITECTURE

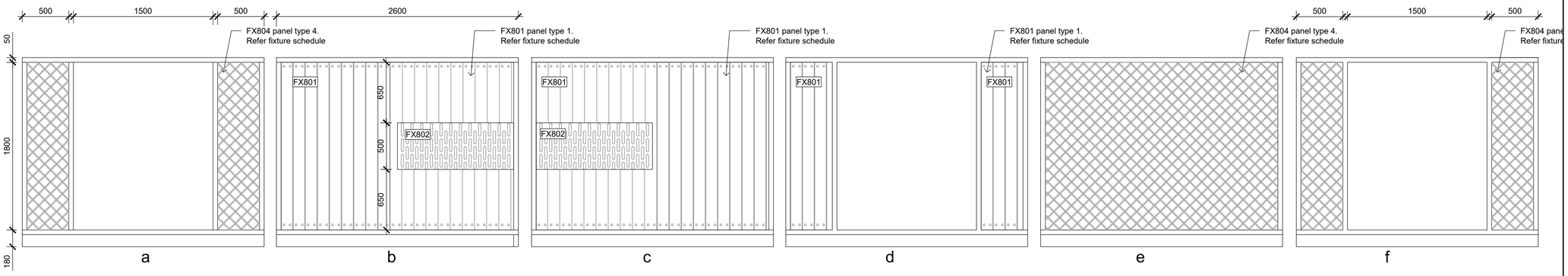
Date: 25.11.22

Scale: 1:50@A1

Drawing No. L805

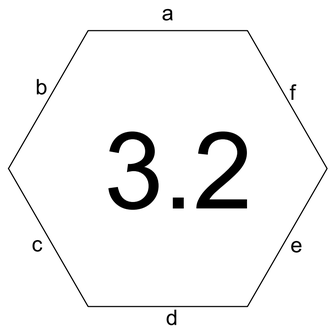
Rev. 01

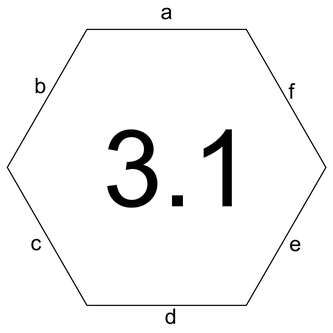


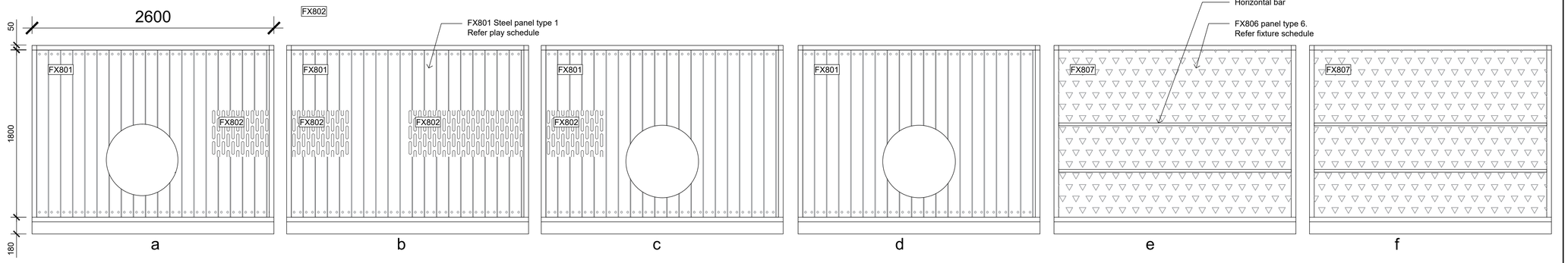


01 COG TOWER 1
Elevation

Scale 1:25

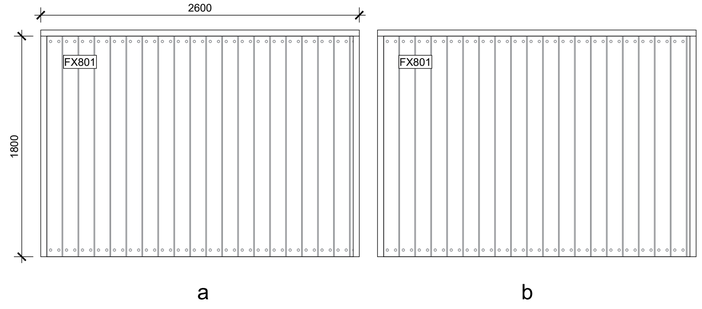


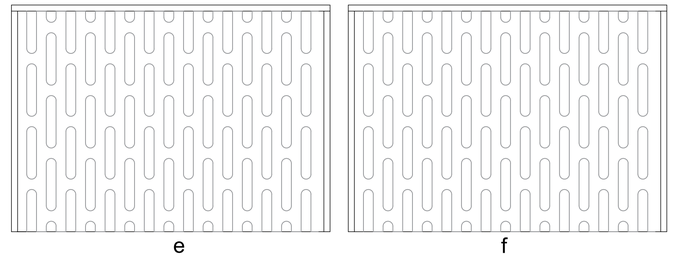




LEGEND

- FX801 Steel panel type 1 Refer image 01/8XX
- FX802Steel panel type 2 Refer image 02/8XX
- FX803 Steel panel type 3 Refer image 04/8XX
- FX804 Steel panel type 4 Refer image 04/8XX
- FX805 Steel panel type 5 Refer image 04/8XX
- FX806 Steel panel type 6 Refer image 04/8XX
- FX807 Ronstan mesh Refer image 03/8XX





02 COG TOWER 3
Elevation

Scale 1:25

Rev	Date	Revision Details	By	Chk	App
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

NOTE: Contractor to submit shop drawings for approval by landscape architect and engineer prior to fabrication.

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing: INDUSTRIAL PLAY
Sheet: Sheet 1 of 8
Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22
Scale: 1:50@A1
Drawing No. L806
Rev. ----

CPL02

CPL02 Rope tunnel. Refer L003

INDUSTRIAL PLAY

PL05

PL05 Inclusive slide. Refer Play Schedule L003

PL03

PL03 Combined climbing net . Refer Play Schedule L003

PV01

PV07

PV07 Treetop walk. Refer detail 03/L806

GB01

FX808

TREE TOP WALK

FX808 Treetop walk balustrade. Refer detail 04/L806

EXTENT OF WORKS

TPZ

LEGEND

- Extent of Works
- Building Line
- Existing Tree with Tree Protection Zone to be Protected and Retained Refer Arborist report
- Proposed Tree Refer Planting Plans
- PV07 Treetop Walk Refer detail 02/L806
- WT01 ED01 Sandstone wall Refer detail 04/L707
- FE01 Standard Fence. Refer Detail 01/L715

NOTE: Contractor to submit shop drawings for approval by landscape architect and engineer prior to fabrication.

Rev	Date	Revision Details	By	Chk	App
01	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status: 75% DESIGN DEVELOPMENT

NOT FOR TENDER

Drawing: INDUSTRIAL PLAY

Sheet: Sheet 1 of 8

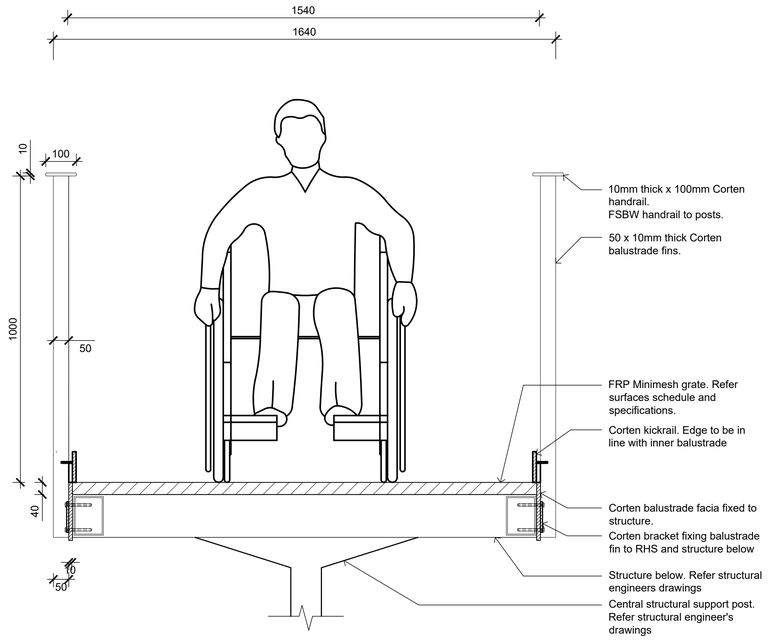
Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22

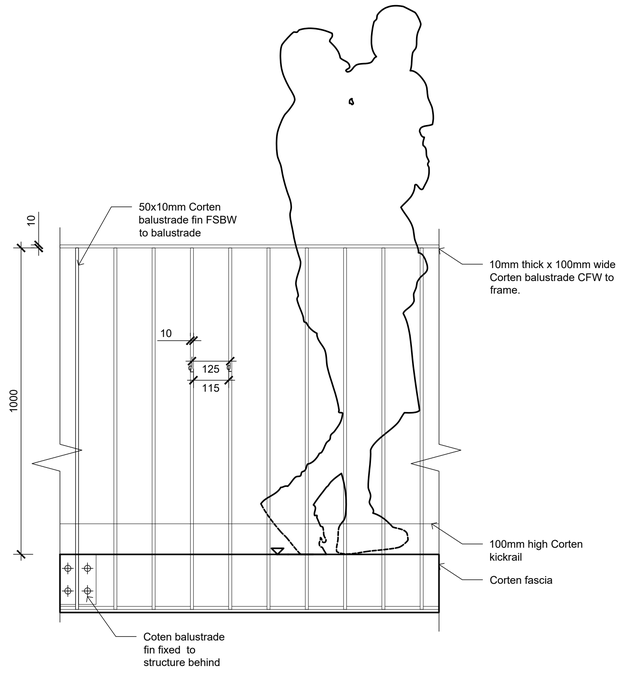
Scale: 1:100@A1

Drawing No. L807

Rev. 01



02 TREETOP WALKWAY
Section Detail
Scale 1:10



03 TREETOP WALKWAY
Elevation
Scale 1:10

NOTE: Contractor to submit shop drawings for approval by landscape architect and engineer prior to fabrication.

Rev	Date	Revision Details	By	Chk	App
01	25.11.22	50% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing:
INDUSTRIAL PLAY

Sheet:
Sheet 1 of 8

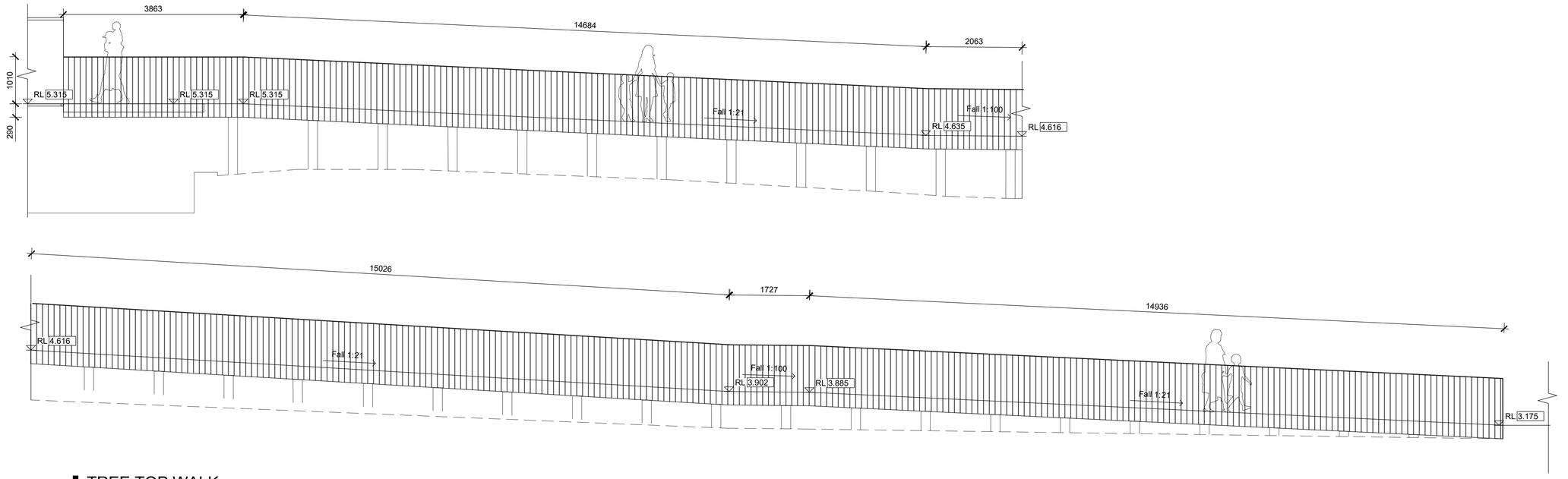
Purpose:
LANDSCAPE ARCHITECTURE

Date:
25.11.22

Scale:
1:100@A1

Drawing No.
L808

Rev.



01 TREE TOP WALK
Elevation

Scale 1:50

NOTE: Contractor to submit shop drawings for approval by landscape architect and engineer prior to fabrication.

Rev	Date	Revision Details	By	Chk	App
01	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing:
L809 INDUSTRIAL PLAY

Sheet:
Sheet 1 of 8

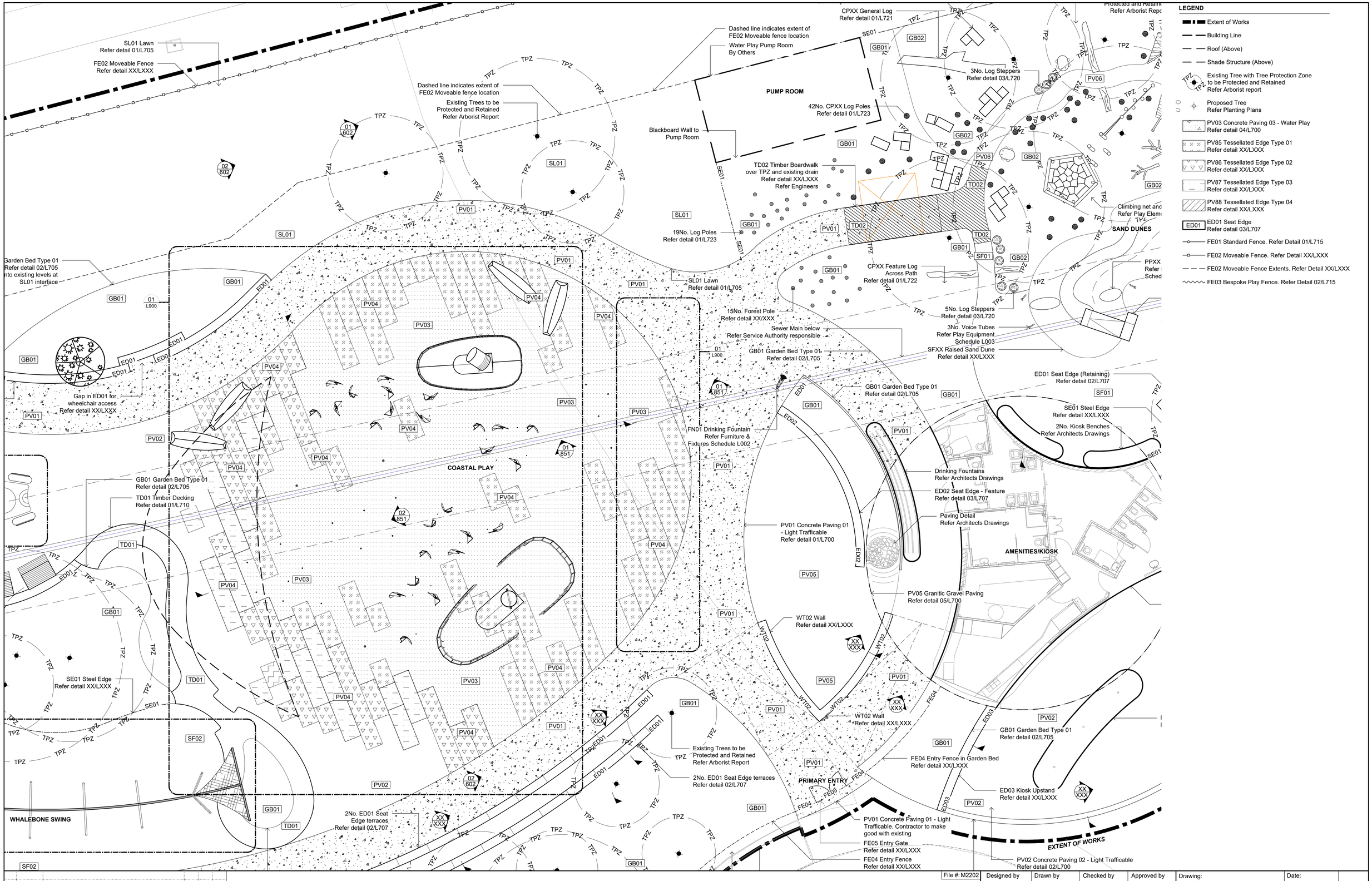
Purpose:
LANDSCAPE ARCHITECTURE

Date:
25.11.22

Scale:
1:100@A1

Drawing No.
L809

Rev.
01



LEGEND

- Extent of Works
- Building Line
- Roof (Above)
- Shade Structure (Above)
- Existing Tree with Tree Protection Zone to be Protected and Retained Refer Arborist report
- Proposed Tree Refer Planting Plans
- PV03 Concrete Paving 03 - Water Play Refer detail 04/L700
- PV85 Tessellated Edge Type 01 Refer detail XX/LXXX
- PV86 Tessellated Edge Type 02 Refer detail XX/LXXX
- PV87 Tessellated Edge Type 03 Refer detail XX/LXXX
- PV88 Tessellated Edge Type 04 Refer detail XX/LXXX
- ED01 Seat Edge Refer detail 03/L707
- FE01 Standard Fence. Refer Detail 01/L715
- FE02 Moveable Fence. Refer Detail XX/LXXX
- FE02 Moveable Fence Extents. Refer Detail XX/LXXX
- FE03 Bespoke Play Fence. Refer Detail 02/L715

Rev	Date	Revision Details	By	Chk	App
01	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing:
WATER PLAY - DETAIL PLAN

Sheet:
Sheet 1 of X

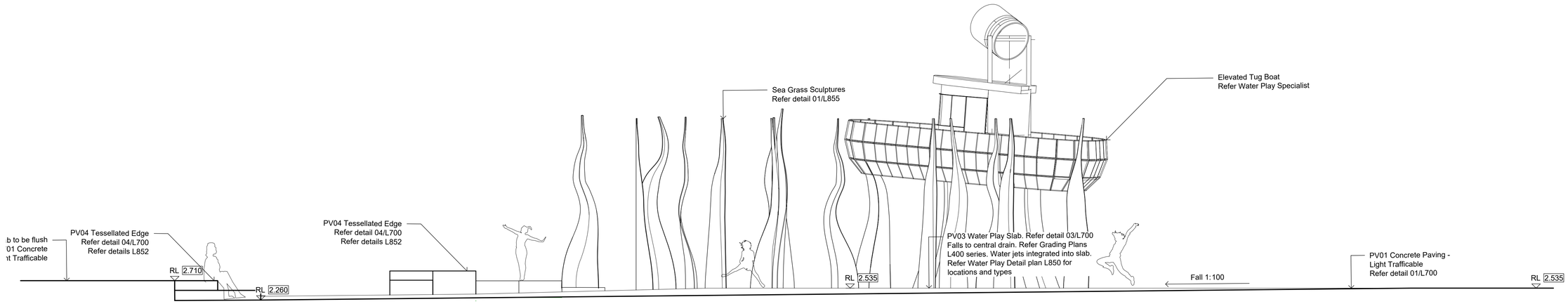
Purpose:
LANDSCAPE ARCHITECTURE

Date:
25.11.22

Scale:
1:100@A1

Drawing No.
L850

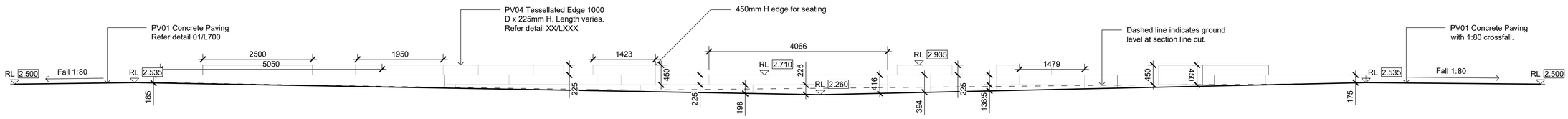
Rev.
01



01 WATERPLAY SECTION 1

Section

Scale 1:50



02 TESSELLATED EDGE

Elevation

Scale 1:50

Rev	Date	Revision Details	By	Chk	App
01	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing:
WATER PLAY - SECTIONS

Sheet:
Sheet 1 of X

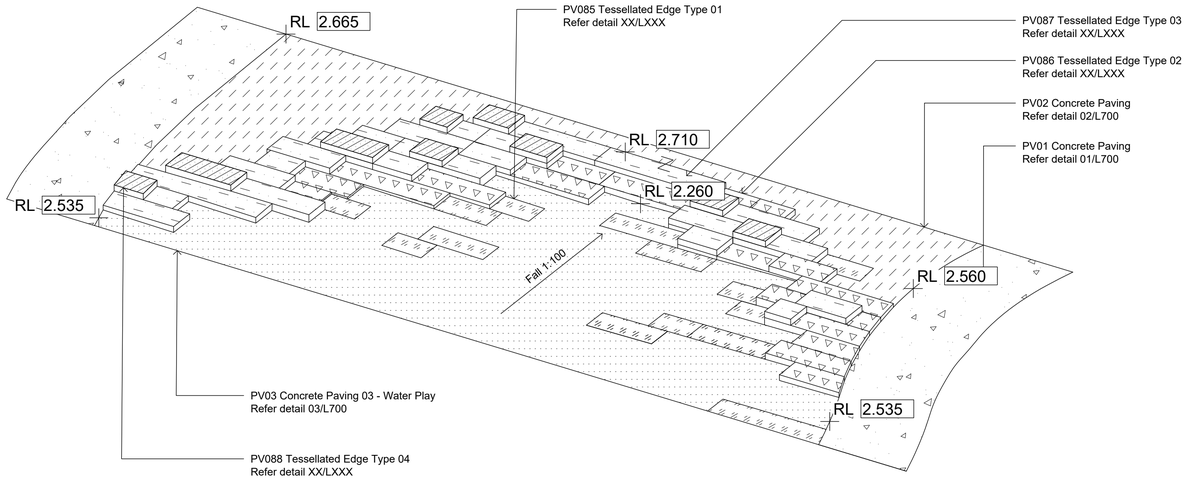
Purpose:
LANDSCAPE ARCHITECTURE

Date:
25.11.22

Scale:
AS SHOWN

Drawing No.
L851

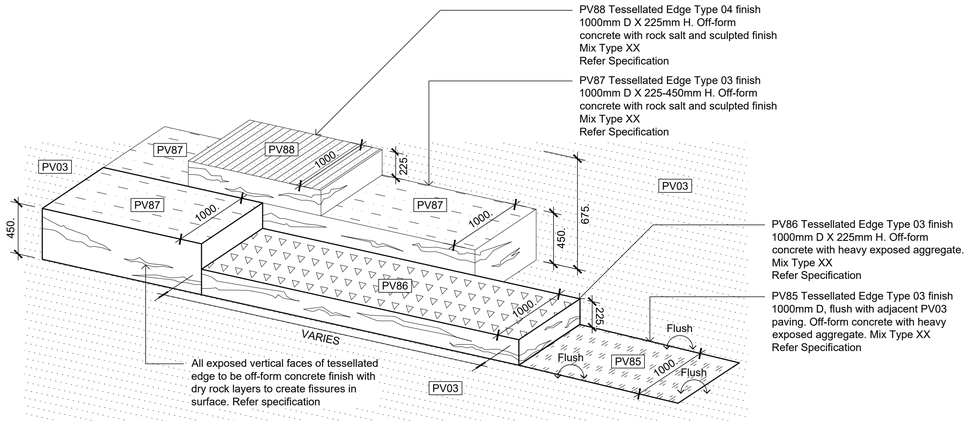
Rev.
01



01 NORTH EAST AXONOMETRIC

Axonometric

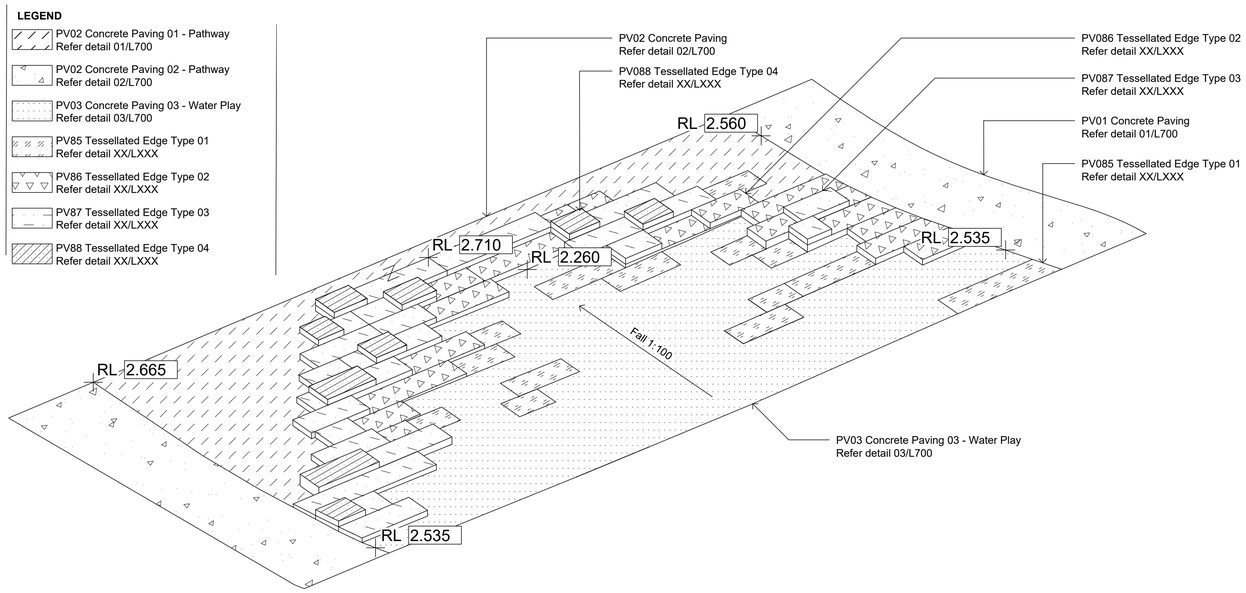
NTS



03 PV04 TESSELLATED EDGE

Axonometric Detail

NTS



02 SOUTH AXONOMETRIC

Axonometric

NTS

Rev	Date	Revision Details	By	Chk	App
01	16.11.22	75% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status:
75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing:
WATER PLAY - TESSELLATED EDGE

Sheet:
Sheet 1 of X

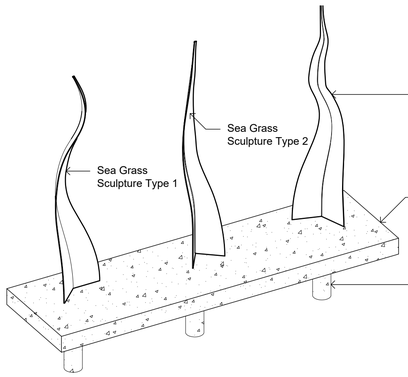
Purpose:
LANDSCAPE ARCHITECTURE

Date:
25.11.22

Scale:
AS SHOWN

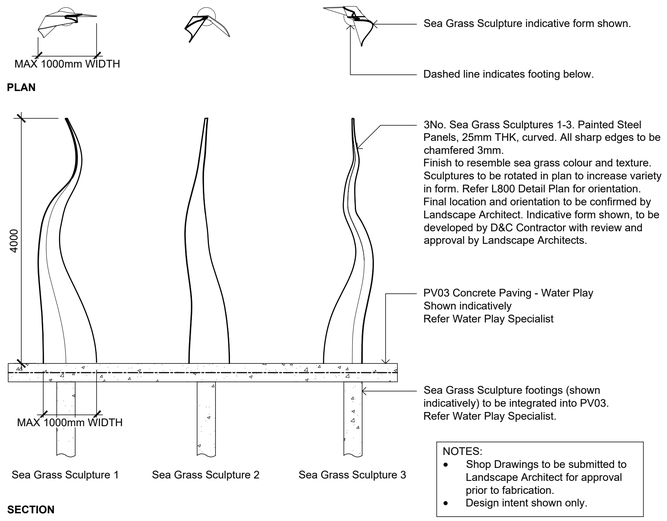
Drawing No.
L852

Rev.
01



NOTES:
- Shop Drawings to be submitted to Landscape Architect for approval prior to fabrication.
- Design intent shown only.

01 SEA GRASS SCULPTURE TYPICAL
Detail — Scale 1:50



NOTES:
- Shop Drawings to be submitted to Landscape Architect for approval prior to fabrication.
- Design intent shown only.

02 SEA GRASS SCULPTURE TYPICAL
Detail — Scale 1:50

Rev	Date	Revision Details	By	Chk	App
01	16.12.22	75% DESIGN DEVELOPMENT	KG	AO	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L
TAYLOR.CULLITY.LETHLEAN

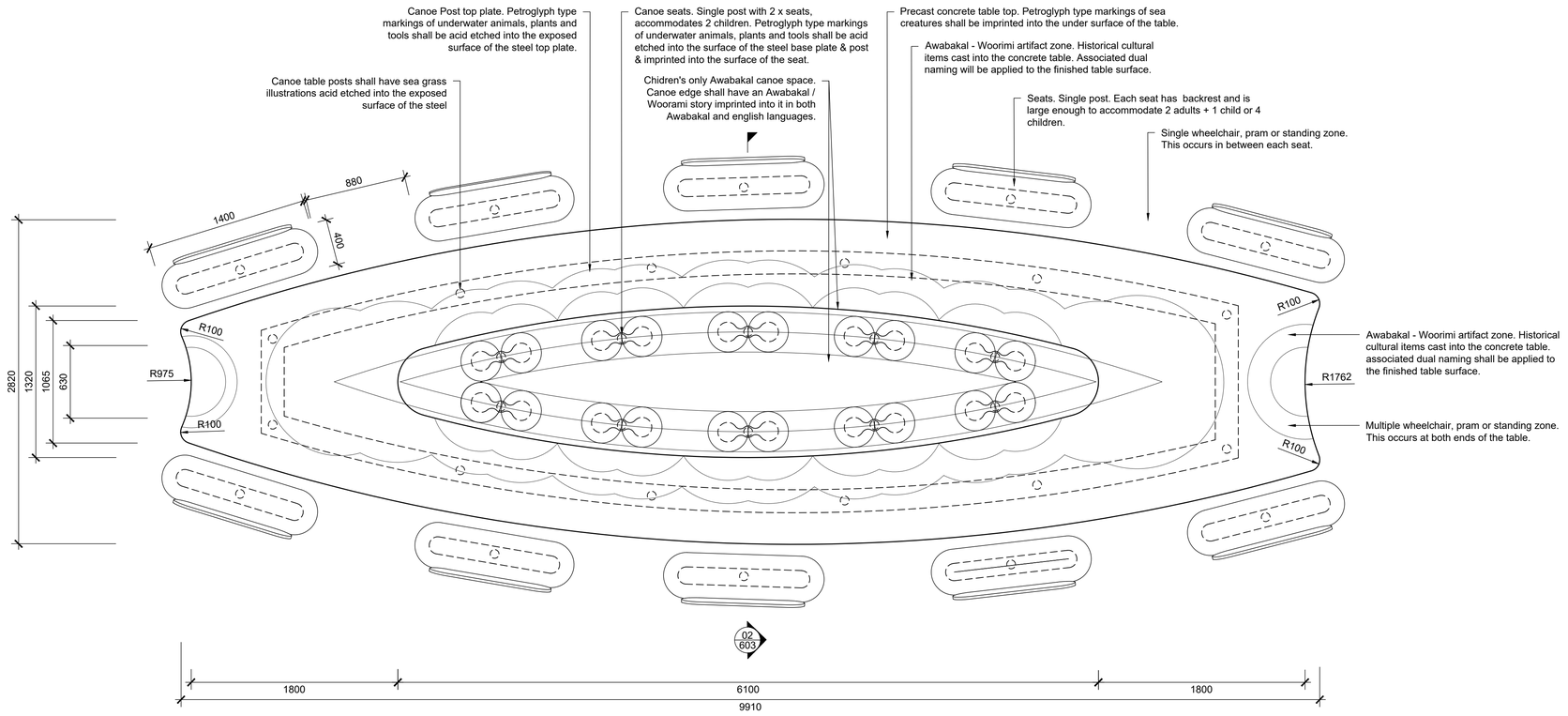
File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	KG	AO	PL

Status: 75% DESIGN DEVELOPMENT
NOT FOR TENDER

Drawing: WATER PLAY - SEA GRASS
Sheet: Sheet 1 of X
Purpose: LANDSCAPE ARCHITECTURE

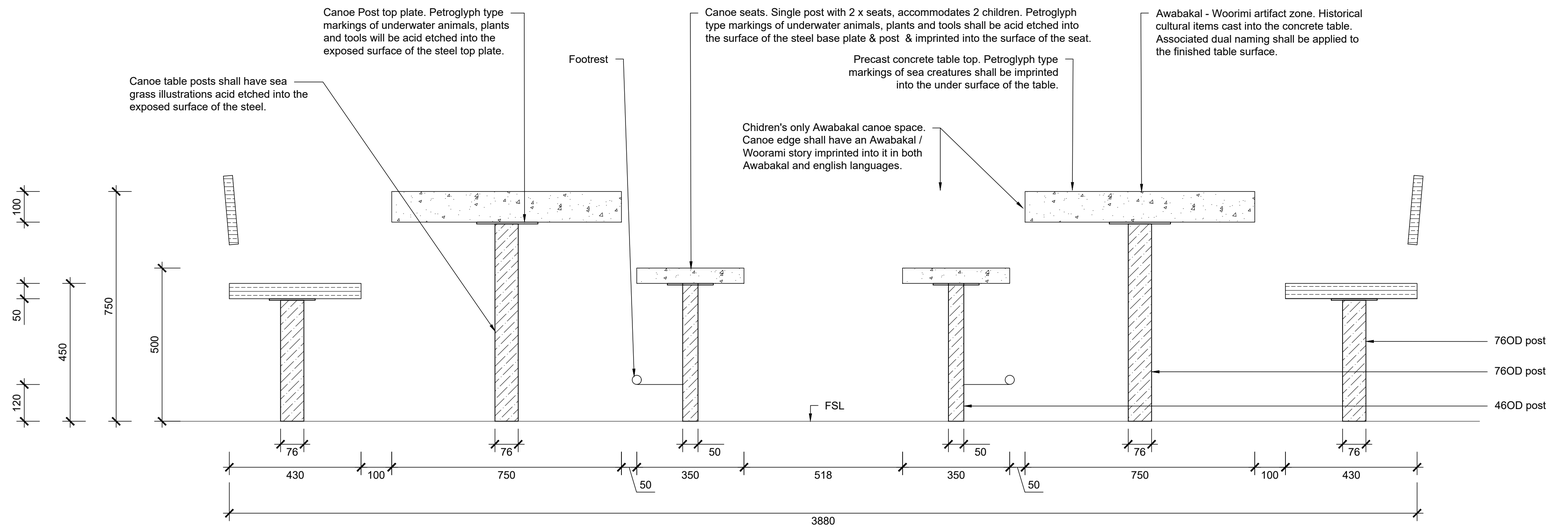
Date: 25.11.22
Scale: AS SHOWN
Drawing No.: L855
Rev.: 01



01 AWABAKAL & WOORAMI TABLE & SEATS

Plan

Scale 1:25



02 AWABAKAL & WOORAMI TABLE & SEATS

Plan

Scale 1:10

Rev	Date	Revision Details	By	Chk	App
01	16.12.22	75% DESIGN DEVELOPMENT	LC	CJ	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

Bosqué Landscape Architecture + T.C.L TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
Bosque + TCL	LC	CJ	PL

Status: 75% DESIGN DEVELOPMENT

NOT FOR TENDER

Drawing: AWBAKAL & WORIMI - TABLE

Sheet: Sheet 1 of X

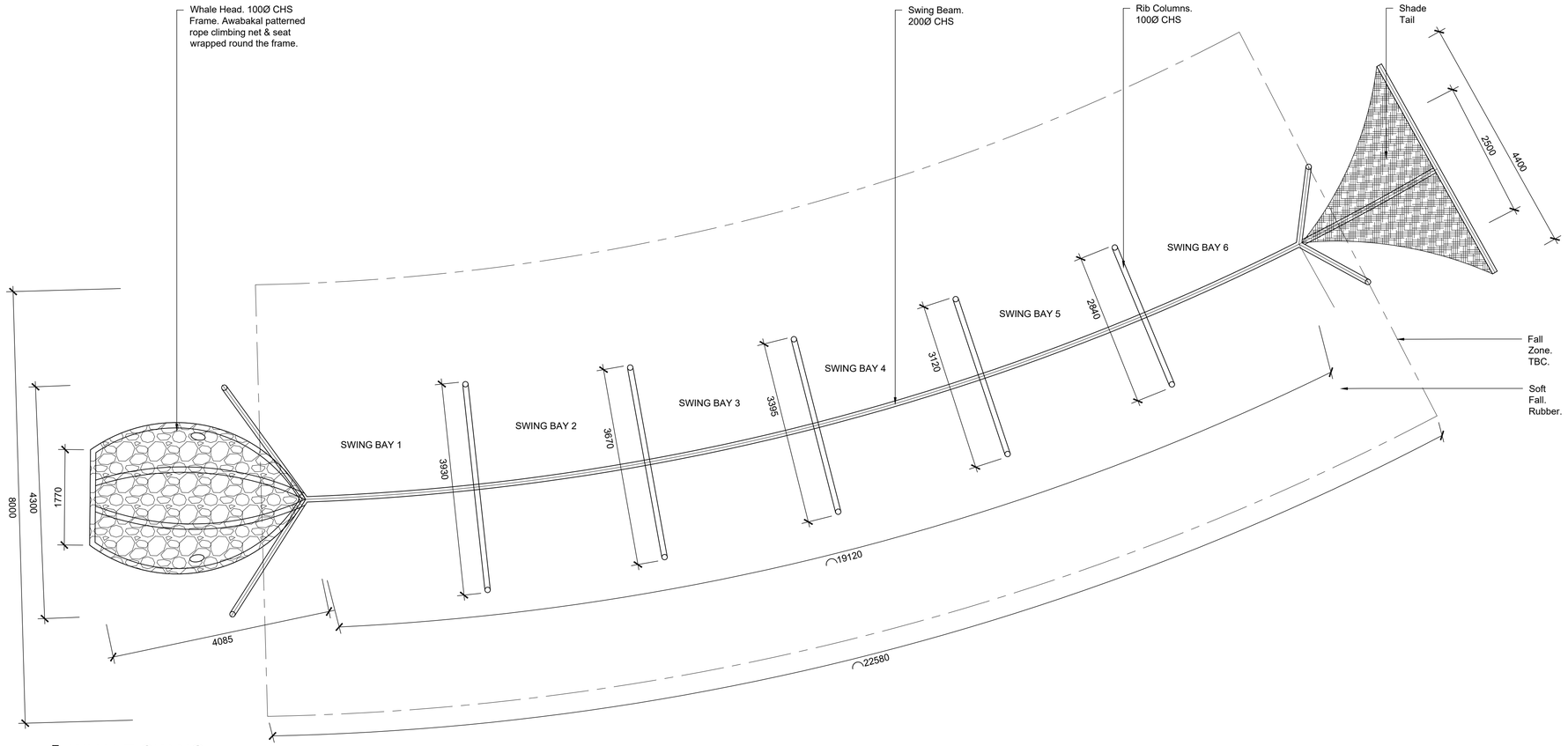
Purpose: LANDSCAPE ARCHITECTURE

Date: 16.12.22

Scale: AS SHOWN

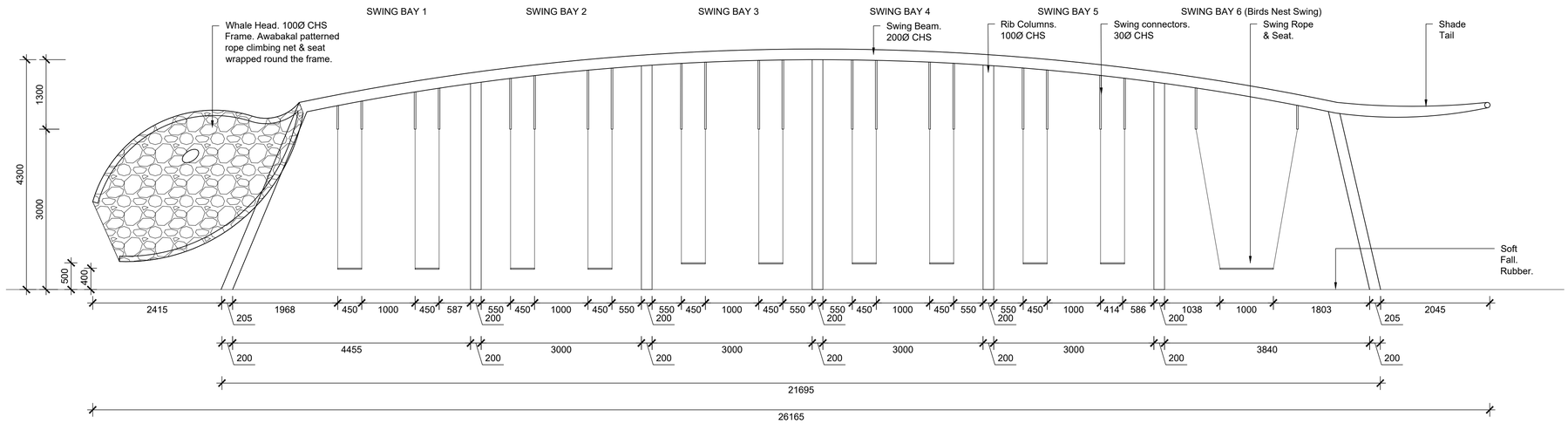
Drawing No. L900

Rev. 01



01 WHALE SWING
Plan

Scale 1:50



02 WHALE SWING
Section / Elevation

Scale 1:50

Rev	Date	Revision Details	By	Chk	App
01	16.11.22	75% DESIGN DEVELOPMENT	LC	CJ	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

Bosqué Landscape Architecture + T.C.L TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
Bosque + TCL	LC	CJ	PL

Status: 75% DESIGN DEVELOPMENT

NOT FOR TENDER

Drawing: AWBAKAL & WORIMI - SWING

Sheet: Sheet 1 of X

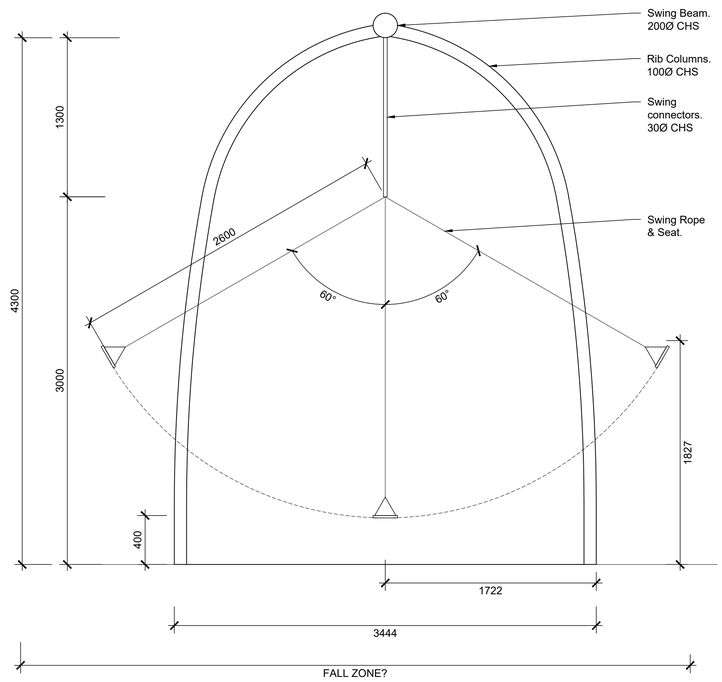
Purpose: LANDSCAPE ARCHITECTURE

Date: 16.12.22

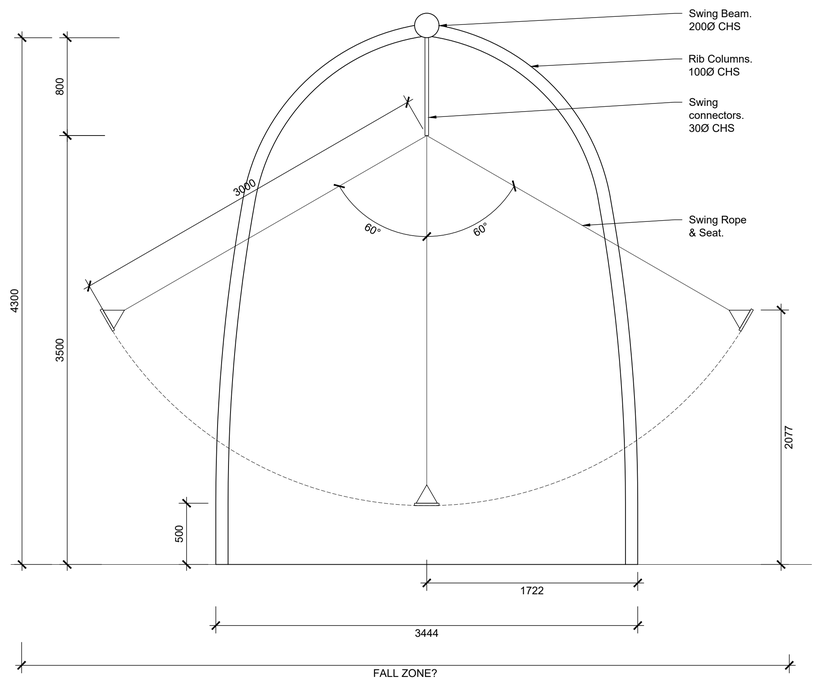
Scale: 1:50 @ A1

Drawing No. L901

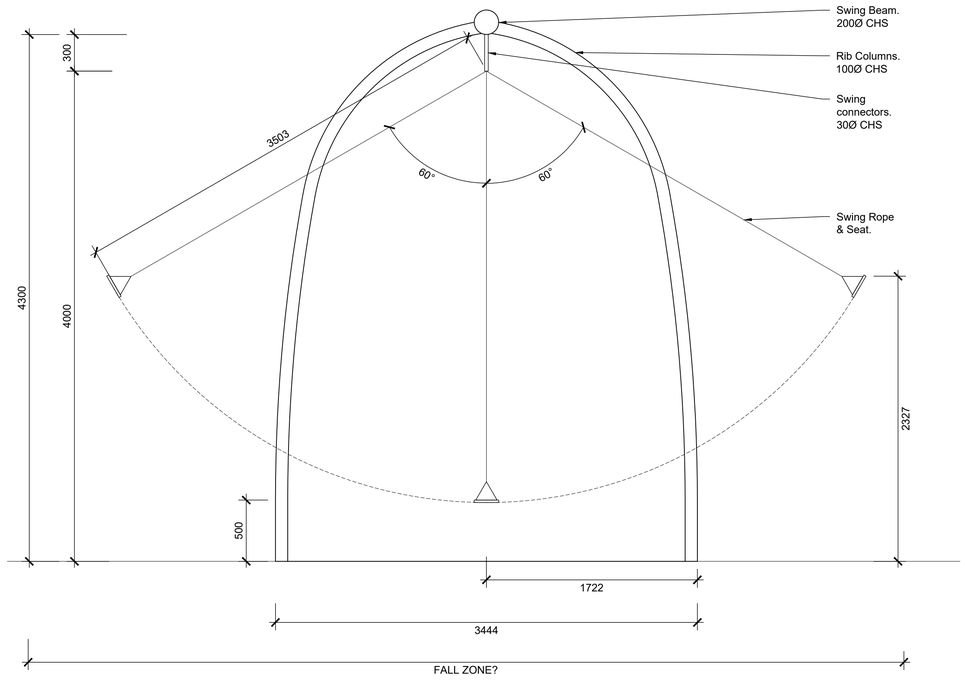
Rev. 01



01 WHALE SWING - SWING BAY 1 & 2 - OPTION 1
Section Scale 1:25



02 WHALE SWING - OPTION 2
Section Scale 1:25



03 WHALE SWING - OPTION 3 (PREFERRED)
Section Scale 1:25

Rev	Date	Revision Details	By	Chk	App
01	16.11.22	75% DESIGN DEVELOPMENT	LC	CJ	PL

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

Bosqué Landscape Architecture + T.C.L TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
Bosque + TCL	LC	CJ	PL

Status: 75% DESIGN DEVELOPMENT
NOT FOR TENDER

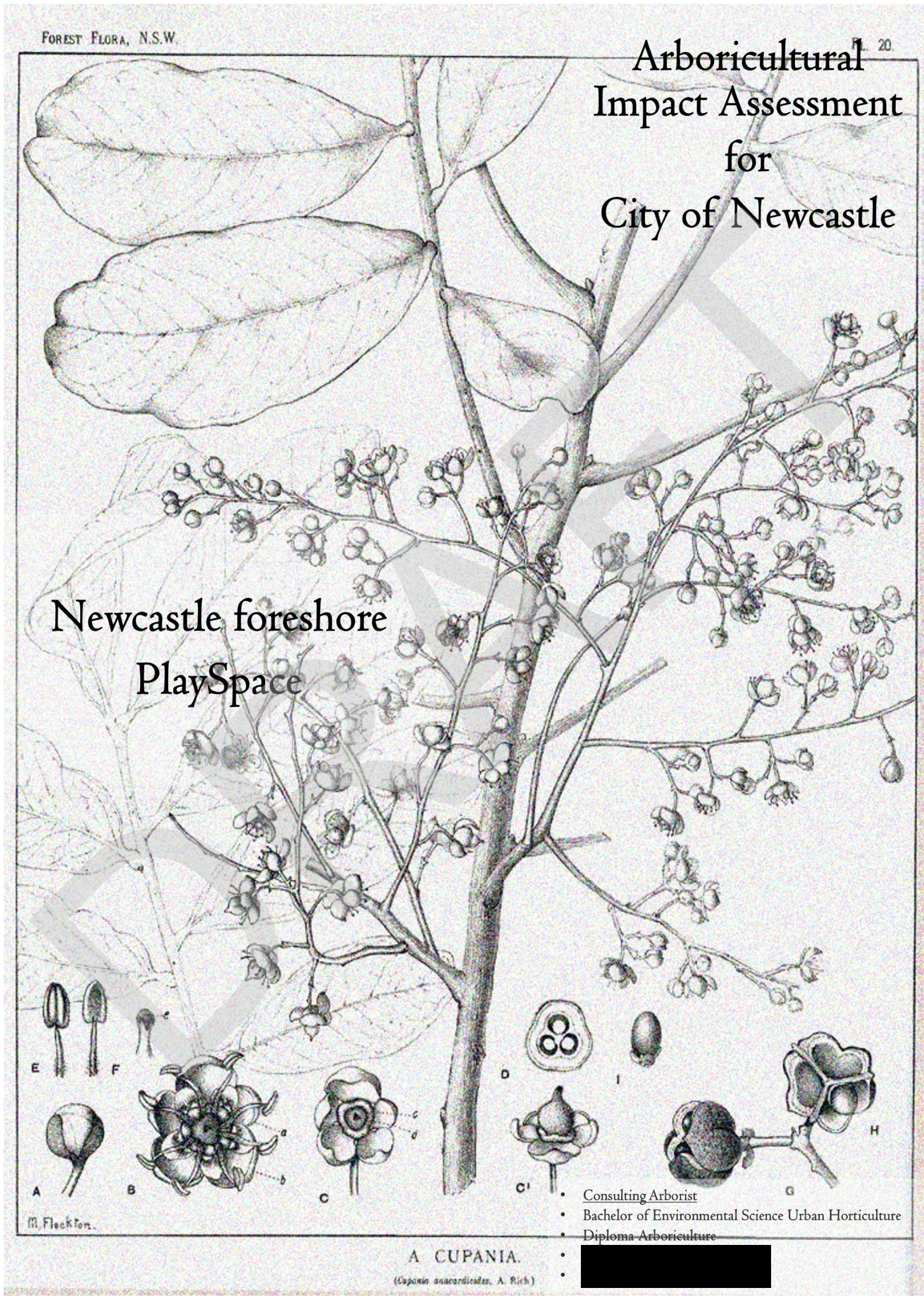
Drawing: AWBAKAL & WORIMI - SWING
Sheet: Sheet 1 of X
Purpose: LANDSCAPE ARCHITECTURE

Date: 16.12.22
Scale: 1:25 @ A1
Drawing No. L902
Rev. 01

Appendix B

Arborist Report

Ha-Bra-Cul-Cha



Arboricultural Impact Assessment for City of Newcastle

Newcastle foreshore PlaySpace

- Consulting Arborist
- Bachelor of Environmental Science Urban Horticulture
- Diploma Arboriculture
- [redacted]

Executive Summary

The City of Newcastle commissioned an Arboricultural Impact Assessment for the Foreshore PlaySpace development project. The assessment, conducted by consulting arborist [redacted], aimed to guide tree preservation and management efforts to minimise tree removals and impacts while ensuring public safety and project feasibility.

Key findings:

1. The site contains 105 trees, none of which are remnant vegetation. All trees provide urban forestry benefits such as shade, cooling, improved air quality, carbon sequestration, stormwater absorption, and enhanced biodiversity.

2. The proposed design at the 75% stage will have varying impacts on the existing trees:

- 20 trees will require removal.
- 16 trees will sustain major impacts and are not viable for retention.
- 5 trees will experience minor impacts but are still viable.
- 9 trees may be viable with appropriate pre-construction works.
- 28 trees will have minor impacts.
- 31 trees will not be impacted.

3. Trees were categorised based on their retention value (high, medium, low) to guide design decisions and protection measures.

4. A group of significant *Araucaria heterophylla* (Norfolk Island Pines) planted as part of a bicentennial celebration with high retention value are being affected by a fungal disease, *Neofusicoccum parvum*, requiring close monitoring and management.

5. A comprehensive Tree Protection Plan has been developed, outlining measures to safeguard trees before, during, and after construction. This includes establishing tree protection zones, using appropriate fencing, mulching, and supervising any work within critical root zones.

6. A novel pre-construction works to the trees noted to be possibly retained in the site should be undertaken one growing season prior to bulk earthworks to ensure these trees remain viable within the landscape during the construction

DRAFT

© HA-BRA-CUL-CHA (ABN:335 476 402 74) 2024

Copyright protects this publication. All rights reserved. Except for purposes permitted by the Australian Copyright Act 1968, reproduction, adaption, electronic storage, transmission, and communication to the public by any means is prohibited without our written permission. Any third material, including images, contained in this publication remains the property of the specified copyright owner unless otherwise indicated and is used subject to their licensing conditions.

Disclaimer

While HA-BRA-CUL-CHA uses care and diligence in preparing this report, it is not responsible or liable for any mistakes, misprints, omissions, or typographical errors. None of HA-BRA-CUL-CHA, nor its editors or authors, are responsible for the results of any actions taken on the basis of information in this publication. HA-BRA-CUL-CHA and its editors and authors expressly disclaim all and any liability and responsibility to any person or organisation in reliance of, or as a consequence of, anything done or omitted to be done by any person or organisation in reliance, whether wholly or partially, upon the whole or part of any of the contents of this publication, including any photographs, statements or descriptions. No representation is made as to the suitability of this publication for any particular purpose. The views expressed in this publication are not necessarily endorsed by this publication, its editors or authors, or the owners or management of HA-BRA-CUL-CHA.

Contents

Executive Summary 3

1. Brief 5
2. Introduction 5
3. Ecological Constraints of the Site 5
4. Urban forestry Values of the site 5
5. Method 6
6. Existing Conditions 6
7. Extent of work 7
8. Arboriculture Impact Plan 8
9. Construction Impact Assessment Summary 11
10. Construction Impact Assessment Discussion 12
11. Tree Protection Plan 13
12. Data Collection 15
13. Terminology 38
14. Arboricultural Impact 44
15. References 45

DRAFT

Rev No.	Report Date	Description	Author	Review Date	Reviewed by
0	*17/01/2023*	*Draft (1) Report for Submission to the client*	[redacted]		*CN- Rachel*

1. Brief

The City of Newcastle is seeking Arboricultural expertise to guide tree preservation and management efforts as part of the Foreshore PlaySpace development in order to minimise tree removals and impacts while ensuring public safety and project feasibility.

2. Introduction

The current design is at the 75% stage, and this report provides an accompanying Tree Protection Plan to help mitigate against the impacts of the proposed development entrees to be retained on the site. The report categorises trees based on their retention value into 'High', 'Medium', and 'Low'. High-retention value trees are large, significant specimens that contribute greatly to the area's amenities and should be incorporated into any redevelopment. Medium retention value trees are moderate-sized specimens in good to fair condition that should be considered for retention and protection from construction impact where practical. Low retention value trees are smaller or in poor condition, offering minimal amenity value and considered easily replaceable, thus not necessary to design around. Tree Protection Zones (TPZs) and Structural Root Zones (SRZs) have been specified for each tree. Minor encroachment (<10%) into TPZs may be acceptable if the area is compensated elsewhere. Major encroachment (>10%) requires root investigation by the project arborist.

This report takes into consideration:

- Tree root architecture
- Australian Standard 4970-2009 Protection of Trees on Development Sites
- Reviewing interface details such as walls in tree protection zones (TPZs), changes to mulch levels over tree roots, and surfaces adjacent to trees

3. Ecological Constraints of the Site

None of the trees within this site are remnants. Therefore, they do not fit the definition of vegetation required to be assessed under the Biodiversity Conservation Act 2016.

4. Urban forestry Values of the site

All of the trees on this site provide the following urban forestry benefits.

- Shade and Cooling: of the urban environment
- Air quality improvement. of the urban environment
- Carbon sequestration:
- Stormwater Absorption
- Enhanced Biodiversity
- Improved Mental Well-Being:

DRAFT

5. Method

Homewood Consulting conducted a 'Visual Tree Assessment (VTA) for each of these trees. A VTA consists of a detailed visual inspection of a tree and its surrounding site, including a complete walk around the tree, looking at the buttress roots, trunk, branches, and leaves. The tree is observed from a distance and close up to consider the crown shape, landscape context, and surroundings.

The assessment was conducted from ground level with no instruments used other than a diameter tape to measure trunks. Any assessments of decay are qualitative only.

6. Existing Conditions

The land is zoned Zone RE1 Public Recreation

Geology and Regolith: Quaternary sand overlying clay deposits. Sediment depth is up to 38 m, comprising 1–3 m of sand, which is generally underlain by stiff estuarine clay.

Topography: Level to undulating, broad (to 5 km), well-drained sand plain. Slope gradients are commonly <2%. Elevation is up to 12 m. Local relief <1 m

Remnant Vegetation: Completely cleared for urban development

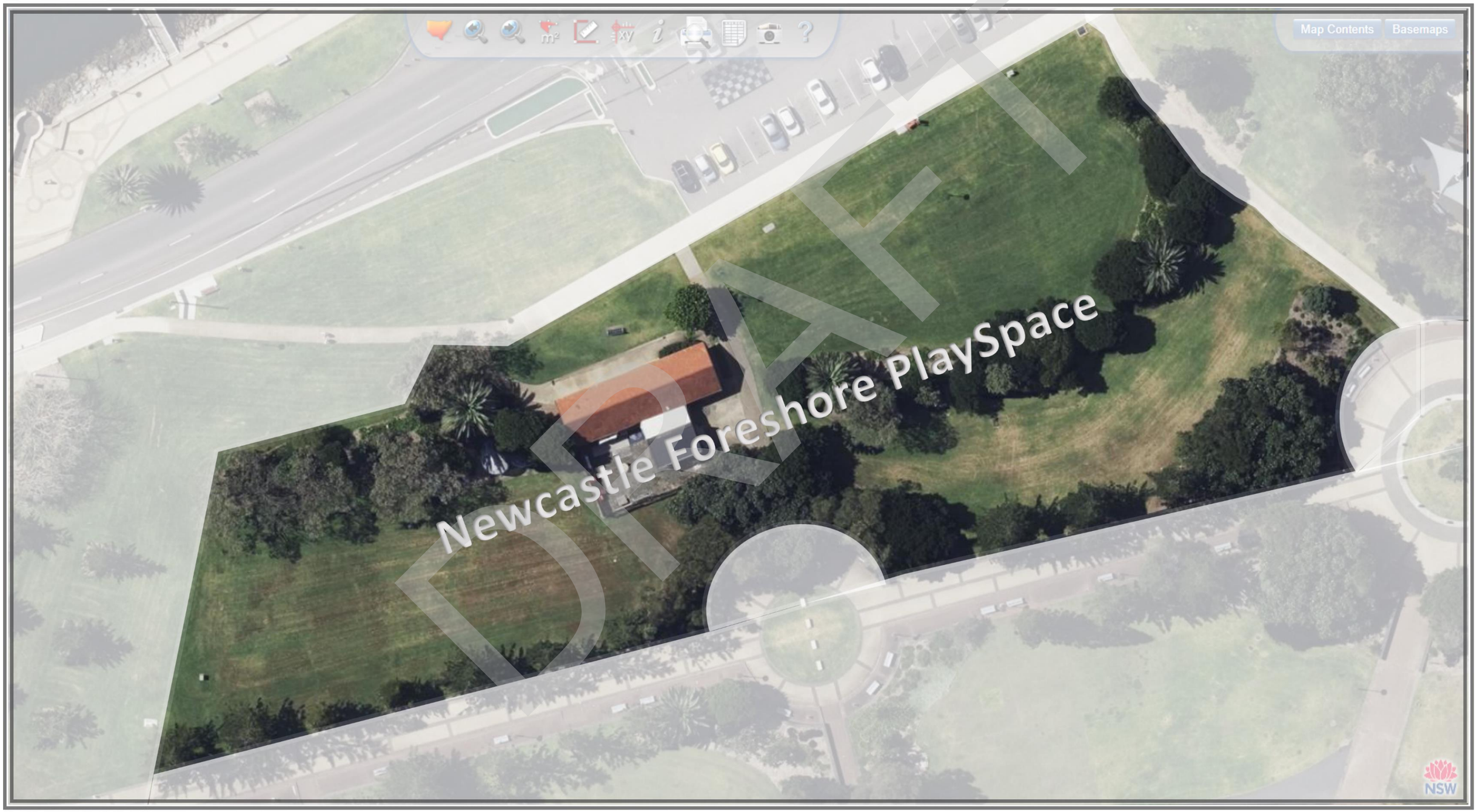
Soils: deep (>15 cm), well-drained weak Podzols. (Uc2.32, Uc2.34), with some deep (>100 cm), well-drained Brown Podzolic Soils (Db1.21) on fans

Climatic conditions: Summers are generally warm and humid, with average temperatures ranging from 18-26°C. The hottest month is typically January, with an average maximum of around 26°C. Heatwaves can occur, with the highest recorded temperature reaching 42.5°C at Nobbys Head in January 2013. Winters are mild, with average temperatures between 8-18°C. Cold fronts and westerly winds can bring cooler conditions, with the lowest recorded temperature being 1.8°C in July 1986. Rainfall is highest in late autumn and early winter, with June being the wettest month on average.

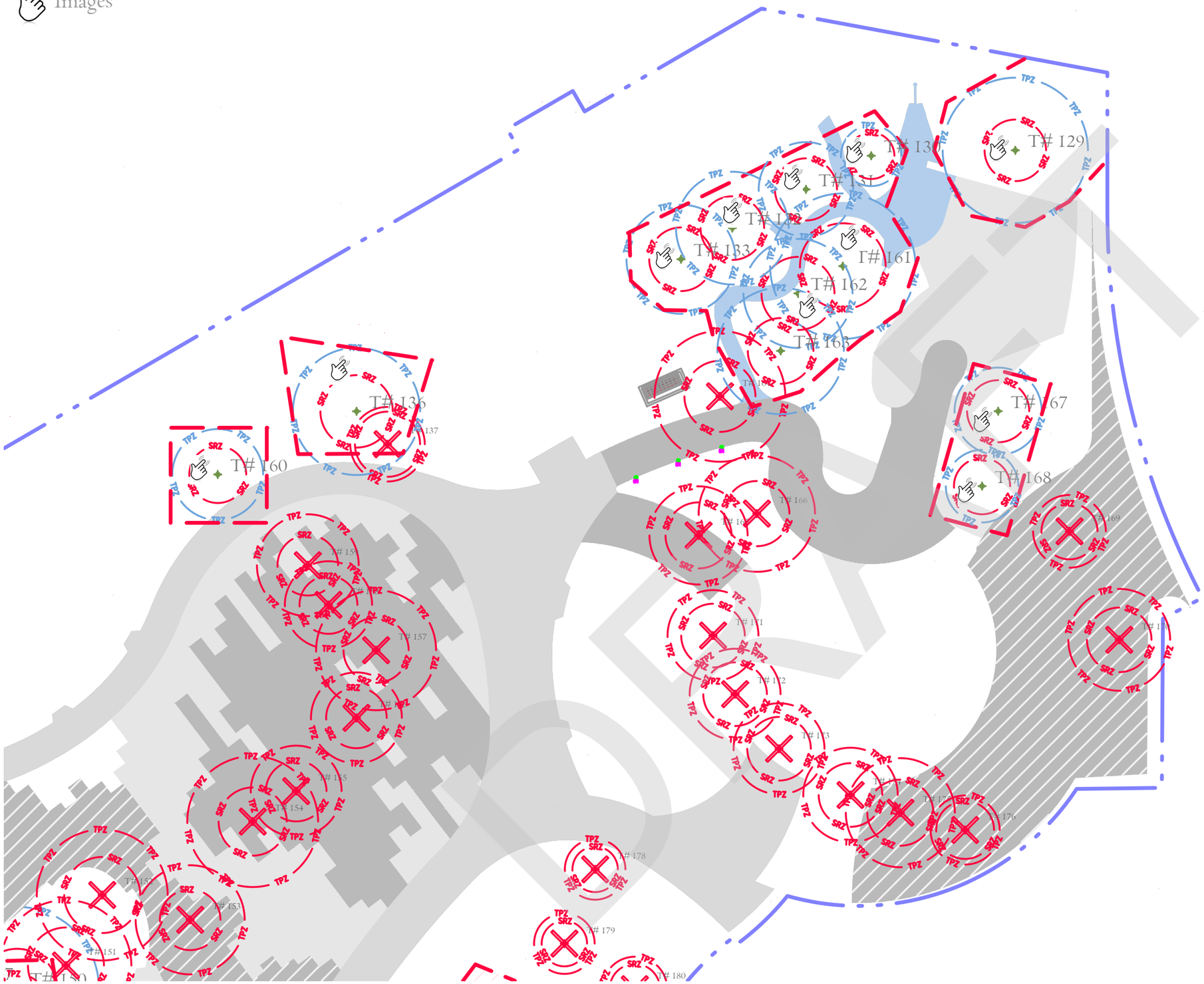
Wind Conditions: The wind conditions in Newcastle Harbour are characterised by distinct seasonal patterns. Wind roses, which depict the frequency and strength of winds from different directions, provide valuable insights into these patterns. Data from the Bureau of Meteorology (BoM) indicates that the prevailing winds in Newcastle Harbour generally come from the southeast and northeast directions, with variations throughout the year. Newcastle Harbour is also subject to extreme wind events, such as those associated with east coast lows and tropical cyclones.

DRAFT

7. Extent of work



Images



DATUM	PM
A.H.D.	R.L
SURVEY:	
DESIGNED:	
CHECKED:	

Plan -5 -2.5 0 5 10 15 20 / -5 -2.5 0 5 10 15 20 / -1 -0.5 0 1 2 3 4

Produced By Sticky Fingers

SCALES DO NOT APPLY TO THIS DRAWING

Images

Concrete

SoftFall

Concrete Path

T# 138
T# 139
T# 140
T# 141
T# 142
T# 143
T# 144
T# 145
T# 146
T# 147
T# 148
T# 149
T# 150
T# 151
T# 152
T# 153
T# 154
T# 155
T# 156
T# 157
T# 158
T# 159
T# 160
T# 161
T# 162
T# 163
T# 164
T# 165
T# 166
T# 167
T# 168
T# 169
T# 170
T# 171
T# 172
T# 173
T# 174
T# 175
T# 176
T# 177
T# 178
T# 179
T# 180
T# 181
T# 182
T# 183
T# 184
T# 185
T# 186
T# 187
T# 188
T# 189
T# 190
T# 191
T# 192
T# 193
T# 194
T# 195
T# 196
T# 197
T# 198
T# 199
T# 200
T# 201
T# 202
T# 203
T# 204
T# 205
T# 206
T# 207
T# 208
T# 209
T# 210
T# 211
T# 212
T# 213
T# 214
T# 215
T# 216
T# 217
T# 218
T# 219
T# 228

[redacted]

Images



DATUM PM
A.H.D. R.L

SURVEY:
DESIGNED:
CHECKED:

Plan -5 -2.5 0 5 10 15 20
-5 -2.5 0 5 10 15 20
-1 -0.5 0 1 2 3 4
Produced By Sticky Fingers

SCALES DO NOT APPLY TO THIS DRAWING

[redacted]

9. Construction Impact Assessment Summary

Table 1: Summary of construction impact of the proposed design

Construction Impact	Tree Retention Value			Total number of trees	TAMS Asset ID
	High	Medium	Low		
Impact Removal		9	11	20	10734, NAID (3), NAID (7), NAID (8), 10744, NAID (9), 10749, 10717, 10718, 10716, 10715, 10714, 10699, 10322, 10700, NAID (26), NAID (27), NAID (29), 10853, 10852
Impact Major-Not Viable				16	3780712, NAID (4), NAID (5), NAID (6), 3780718, 3780719, 10321, 10320, 10319, 10318, 10317, 10316, 10792
Impact Minor - Viable				5	3780713, 10779, 10790, 10791, 10711
Impact Major -Possible Viable				9	3780,716, 3780717, 10739, 10741,10856, 10858, 10861, 6780943,10855
Impact Minor	7	13	8	28	10687, NAID (1), NAID (2), 10691, 10692, 3780713, 3780711, 10727, 10741, 10711, 10695, 10698, 3780716, 3780717, 10311, 10307, 10779, 10790, 10791, 10839, 10840, 10841, 10842, 10843, 10844, 10845, NAID (25), NAID (28), NAID (30), 10854
No Impact	3	11	17	31	NAID (12), 10784, 10782, 10783, 10781, 10780, 10796, 10797, 10798, 10313, 10300, 10309, 10312, 10308, 10301, 10297, 10296, 10299, NAID (13), NAID (14), NAID (15), NAID (16), NAID (17), NAID (18), NAID (19), NAID (20), NAID (21), NAID (22), NAID (23), NAID (24)

DRAFT

10. Construction Impact Assessment Discussion

Based on the Foreshore Park Tree Schedule, the different impact levels indicate the degree to which each tree will be affected by the planned construction activities. A summary of the significance of each impact level:

No Impact: Construction will not impact 31 trees at all and can be retained as is. Eight of these trees are considered root suckers of *Casuarina Glauca* and have been classified No Assets ID (NAID)

Impact Minor: 28 trees will experience minor impacts from construction activities, such as having a small percentage of their Tree Protection Zone (TPZ) or Structural Root Zone (SRZ) impacted. These trees can likely be retained with proper protection measures during construction.

Impact Minor - Viable: 5 trees will sustain minor impacts but are still considered viable to retain. This suggests the construction impacts, while minor, may require additional monitoring or remedial measures to ensure these trees' long-term health and stability.

Impact Major Possibly Viable: With the appropriate pre-construction works, these trees may be retained within the landscape but have been flagged for possible removal. The preconstruction works include applying fertiliser and installing drip irrigation within the Structural Root Zone to promote feeding roots, followed by root pruning to the proposed excavation area.

Impact Major-Not Viable: 16 trees will be severely impacted to the point that they are not viable to retain. Major encroachment into the TPZ/SRZ will result in severe root loss, significantly compromising these trees' health and structural integrity.

Impact Removal: 20 trees will need to be removed entirely due to direct impacts from the construction footprint. This includes trees located within the alignment of proposed hardscape elements like paths, walls, or structures that cannot be retained.

In summary, the impact levels provide a framework for the project team to assess each tree and plan the construction approach accordingly. Trees with no or minor impacts would be retained and protected, while those deemed non-viable or within the removal category will likely require removal and replacement as part of the project.

Trees: NAID (29), NAID (9), and 1077 were noted to be environmental weeds.

Trees: NAID (3), 10734 Lagunaria Patersonia have been slated to be removed due to allergic reactions to their seed pods.

Palms 10729, 10721 & 10860 have been recommended for transplant.

Trees 10839, 10840, 10841, 10842, 10843, 10844, 10845, 10796, 10797, 10798 have been designated as High retention value trees and were part of the bicentennial planting. Araucaria heterophylla. These trees are being affected by the fungal disease Neofusicoccum parvum, colloquially known as the "top-down" disease, because it kills the branches at the top of the tree first. Management of this disease can be challenging, as no effective fungicides are available for treating infected trees. The best approach is to maintain the overall health of the trees through proper cultural practices, such as providing adequate water and nutrients, avoiding mechanical damage to the trunk and branches, and promptly removing and destroying infected plant material to prevent the spread of the disease to nearby trees. Given the historical and sentimental value of these Araucaria heterophylla trees, it is crucial to closely monitor their health and take appropriate measures to manage the Neofusicoccum parvum infection

DRAFT

11. Tree Protection Plan

The Tree Protection Plan outlines measures to safeguard trees during a construction project. The plan is a critical component of the development process, ensuring that valuable trees are preserved while enabling the project to proceed.

11.1 Before the Commencement of any Works

A. The arborist Impact Plan and Tree Protection Plan will form part of the documentation supplied to the contractor undertaking the proposed works.

B. The project arborist will identify all trees on-site using the City of Newcastle TAMS protocol.

C. Trees with no asset identification will be allocated an asset identification number.

D. The project arborist shall identify trees that have been approved for removal from the site by applying pink marking paint to the ground.

E. Staff are to be made aware of tree protection measures during induction to the site.

F. Tree protection temporary fencing will be established before bulk earthworks commence.

G. The temporary fence will consist of panels from anti-climb mesh, measuring 2.1 m high x 2.4 m wide; the temporary fence must comply with Australian standards, AS4687:2007 Temporary fencing and hoardings to guarantee safety and security.

H. The Arborist Impact Plan denotes the tree's temporary fencing location. The location of the tree protection temporary fencing has been sighted to ensure machinery will not clash with first-order branches

I. Tree protection temporary fencing can only be modified after discussions with the project arborist.

J. Tree protection temporary fencing will be denoted with appropriate signage, and signage will be consistent with AS 4970-2009, the protection of trees on development sites, and Part B of Newcastle Council's Urban Forestry Technical Manual.

K. Tree protection zones and structural root zones will be marked on the ground prior to the commencement of bulk earthworks and will be maintained during the proposed works.

11.2 During Construction

A. Installation of mulch around the tree to remain on site as per the Arborist Impact Plan will occur immediately after tree removal has occurred.

B. The tree protection fence will be installed prior to bulk earthworks.

C. The tree protection fence will be certified by the project arborists.

D. The tree protection temporary fencing will stay in situ for the project's duration.

E. No storage of equipment or materials is permitted within the TPZ, and no asphalt wasting or other pollutants must be allowed to enter the TPZ

F. All machinery working within the tree protection zones of heritage-listed trees will mitigate their impact on tree roots and soil structure by reducing manoeuvrability.

DRAFT

G. Footings and foundations for play equipment, steppingstones, sandstone logs, and park furniture located within the tree protection zone and the structural root zone will be hand-dug under the supervision of the project arborist.

H. The project arborist will undertake all tree roots that require severing.

I. No equipment or machinery will be allowed within the tree protection fence.

J. All new infrastructure will not be re-routed through the tree protection zone.

K. No storage of equipment or materials is permitted within the Tree Protection Zone. All equipment and materials will not impede drainage from the trade protection zones.

L. During prolonged absence of rain, additional irrigation will be supplied to tree identified by the project arborist

M. Damage to any part of a TPZ must be reported to the certifying project arborist for assessment.

<u>After Construction</u>

1. All disturbed areas within the Tree Protection Zone & and Structural Root Zone will be mulched to a depth of 200mm and adequate moisture will be supplied for the duration of the project

2. Post-Construction Assessment: It is essential to conduct a thorough assessment of the trees after construction to identify any damage or stress the trees might have undergone

DRAFT

ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
129	10687	*Hibiscus tiliaceus*	6 x 9	40	Mature	Fair	Poor	44105	Medium	Medium	4.8	3.57	Difficult to ascertain impact due to horizontal trunk	Impact Minor
130	NAID (1)	*Cupaniopsis anacardioides*	3 x 3	14	Semi mature	Fair	Fair	40+	Low	Low	2	1.53		Impact Minor
131	NAID (2)	*Cupaniopsis anacardioides*	6 x 6	26	Mature	Good	Fair	20 - 40	Medium	Medium	3.12	2.05		Impact Minor
132	10691	*Cupaniopsis anacardioides*	6 x 7	31	Mature	Good	Fair	20 - 40	Medium	Medium	3.72	2.1		Impact Minor
133	10692	*Cupaniopsis anacardioides*	6 x 6	30	Mature	Good	Fair	20 - 40	Medium	Medium	3.6	2.13		Impact Minor
136	3780713	*Banksia integrifolia*	7 x 6	35	Mature	Fair	Fair	20 - 40	Medium	Medium	4.2	2.39	Power Conduit within SRZ	Impact Minor - Viable
137	3780712	*Cupaniopsis anacardioides*	4 x 5	22	Semi mature	Good	Fair	20 - 40	Low	Low	2.64	2.15	Path cuts thru SRZ	Impact Major-Not Viable
138	3780711	*Cupaniopsis anacardioides*	5 x 5	28	Mature	Good	Fair	20 - 40	Low	Low	3.36	2.18	TPZ 5% impact to	Impact Minor
139	10725	*Cupaniopsis anacardioides*	6 x 6	29	Mature	Good	Fair	20 - 40	Medium	Medium	3.48	2.18	30% of TPZ impacted by path	Impact Major-Not Viable
140	10729	*Phoenix canariensis*	7 x 8	101	Mature	Fair	Fair	40+	Medium	Medium	5	3.65		TRANSPLANT
141	10734	*Lagunaria patersonia*	7 x 2	16	Semi mature	Fair	Good	40+	Low	Low	2	1.85	respiratory and skin irritations	Impact Removal
142	10727	*Casuarina equisetifolia*	9 x 8	32	Mature	Fair	Fair	44105	Medium	Medium	3.84	2.13		Impact Minor
143	NAID (3)	*Lagunaria patersonia*	7 x 3	22	Semi mature	Fair	Good	40+	Low	Low	2.64	2.13	respiratory and skin irritations	Impact Removal
144	NAID (4)	*Banksia integrifolia*	5 x 3	11	Semi mature	Good	Good	40+	Low	Low	2	1.5	SRZ impacted by path	Impact Major-Not Viable
145	NAID (5)	*Cupaniopsis anacardioides*	4 x 4	19	Semi mature	Good	Fair	40+	Low	Low	2.28	1.79	SRZ impacted by path	Impact Major-Not Viable
146	NAID (6)	*Cupaniopsis anacardioides*	4 x 4	16	Semi mature	Fair	Fair	40+	Low	Low	2	1.57	SRZ impacted by path	Impact Major-Not Viable
147	10739	*Cupaniopsis anacardioides*	7 x 7	31	Mature	Good	Fair	20 - 40	Medium	Medium	3.72	2.18		Impact Major - Possible Viable
148	NAID (7)	*Cupaniopsis anacardioides*	4 x 3	11	Semi mature	Good	Good	40+	Low	Low	2	1.5	within hard stand	Impact Removal
149	NAID (8)	*Lagunaria patersonia*	7 x 7	20	Semi mature	Good	Fair	40+	Medium	Medium	2.4	1.91	respiratory and skin irritations	Impact Removal
150	10741	*Cupaniopsis anacardioides*	7 x 9	45	Mature	Good	Fair	20 - 40	Medium	Medium	5.4	2.63	Grade Change, possible to retain	Impact Major - Possible Viable
151	10744	*Ligustrum lucidum*	7 x 8	36	Mature	Fair	Fair	44105	Low	Medium	4.32	2.51	Weed Species	Impact Removal
152	NAID (9)	*Ligustrum lucidum*	5 x 4	18	Semi mature	Fair	Fair	20 - 40	Low	Low	2.16	1.82	Weed Species	Impact Removal
153	10749	*Cupaniopsis anacardioides*	6 x 7	30	Mature	Good	Fair	20 - 40	Medium	Medium	3.6	2	concrete waves	Impact Removal
154	10717	*Cupaniopsis anacardioides*	7 x 8	36	Mature	Fair	Fair	20 - 40	Medium	Medium	4.32	2.25	concrete waves	Impact Removal
155	10721	*Phoenix canariensis*	7 x 8	109	Mature	Good	Good	40+	Medium	Medium	5	3.68		TRANSPLANT
156	10718	*Cupaniopsis anacardioides*	6 x 6	25	Mature	Fair	Fair	20 - 40	Medium	Medium	3	2	concrete waves	Impact Removal
157	10716	*Cupaniopsis anacardioides*	6 x 7	33	Mature	Good	Fair	20 - 40	Medium	Medium	3.96	2.15	concrete waves	Impact Removal
158	10715	*Cupaniopsis anacardioides*	5 x 6	24	Mature	Good	Fair	20 - 40	Low	Low	2.88	1.91	concrete waves	Impact Removal
159	10714	*Cupaniopsis anacardioides*	5 x 6	28	Mature	Good	Fair	20 - 40	Low	Low	3.36	2	concrete waves	Impact Removal
160	10711	*Cupaniopsis anacardioides*	5 x 5	25	Mature	Fair	Fair	20 - 40	Low	Low	3	1.88	Path Cuts thru TPZ	Impact Minor - Viable
161	10695	*Casuarina equisetifolia*	9 x 9	40	Mature	Fair	Fair	44105	Medium	Medium	4.8	2.83		Impact Minor
162	10694	*Casuarina equisetifolia*	9 x 9	30	Mature	Good	Fair	20 - 40	Medium	Medium	3.6	2.41		Impact Minor
163	10698	*Hibiscus tiliaceus*	9 x 11	35	Mature	Good	Fair	20 - 40	Medium	Medium	4.2	2.18		Impact Minor
164	10699	*Hibiscus tiliaceus*	9 x 11	36	Mature	Good	Fair	20 - 40	Medium	Medium	4.32	2.43	Path	Impact Removal
165	10322	*Casuarina glauca*	8 x 7	27	Mature	Good	Fair	40+	Medium	Medium	3.24	2.18	Path	Impact Removal
166	10700	*Cupaniopsis anacardioides*	6 x 8	32	Mature	Good	Fair	20 - 40	Medium	Medium	3.84	2.15	Path	Impact Removal
167	3780716	*Cupaniopsis anacardioides*	5 x 7	24	Mature	Good	Fair	20 - 40	Medium	Medium	2.88	2.05	SW & PIT >20% SRZ IMPACT	Impact Major - Possible Viable
168	3780717	*Cupaniopsis anacardioides*	5 x 7	24	Mature	Good	Fair	20 - 40	Medium	Medium	2.88	2.05	SW & PIT >20% SRZ IMPACT	Impact Major - Possible Viable
169	3780718	*Cupaniopsis anacardioides*	4 x 5	20	Semi mature	Fair	Poor	44105	Low	Low	2.4	1.85	Impact Not Viable SRZ impact by path	Impact Major-Not Viable
170	3780719	*Cupaniopsis anacardioides*	5 x 8	28	Mature	Good	Fair	20 - 40	Medium	Medium	3.36	2.13	Impact Not Viable SRZ impact by path	Impact Major-Not Viable
171	10321	*Casuarina glauca*	7 x 6	22	Mature	Fair	Fair	40+	Low	Low	2.64	1.94	Impact Not Viable SRZ impact by	Impact Major-Not Viable
172	10320	*Casuarina glauca*	9 x 7	25	Mature	Good	Fair	40+	Medium	Medium	3	2.1	Impact Not Viable SRZ impact by	Impact Major-Not Viable

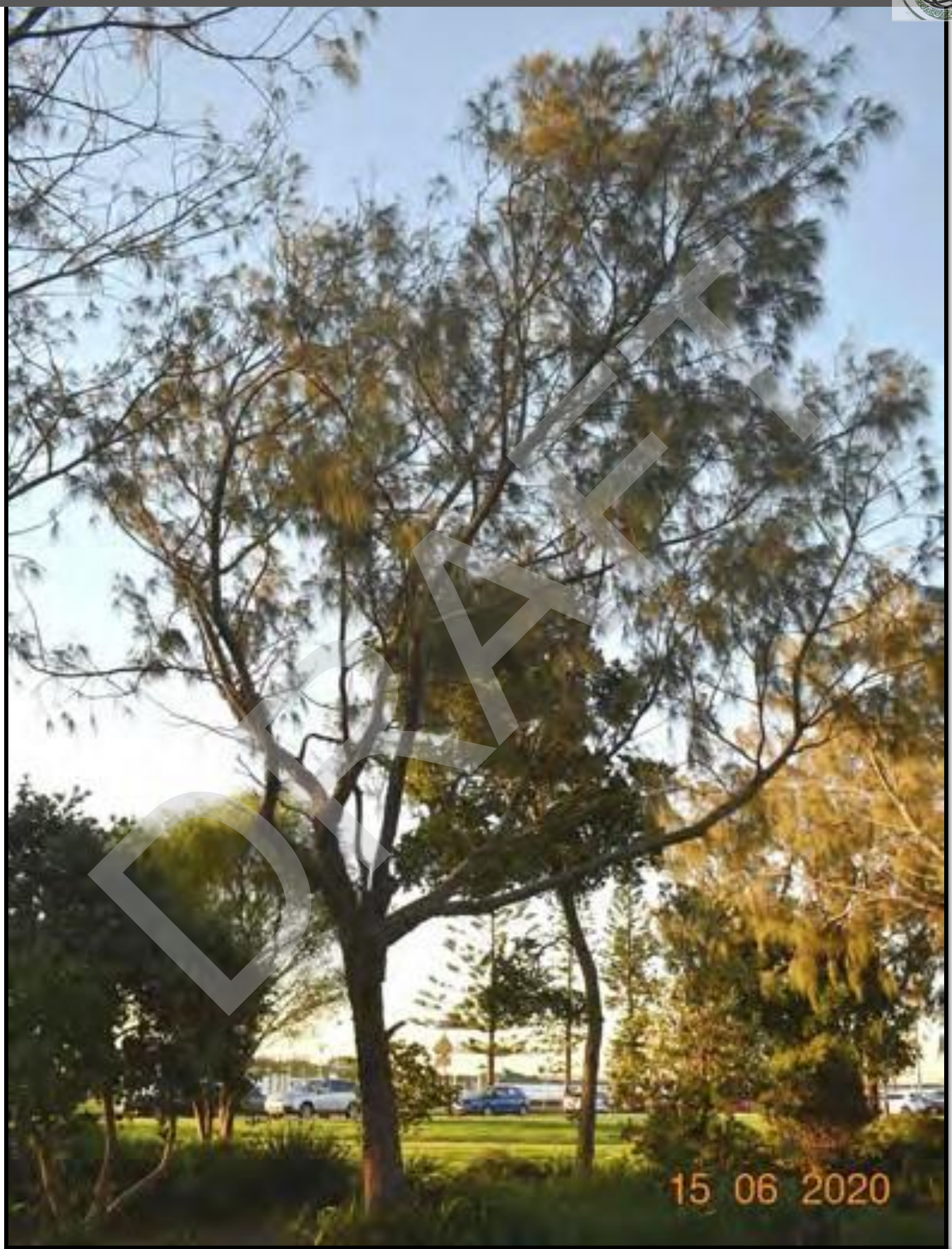
DRAFT

ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
173	10319	*Casuarina glauca*	8 x 7	28	Mature	Good	Fair	40+	Medium	Medium	3.36	2.13	Impact Not Viable SRZ impact by	Impact Major-Not Viable
174	10318	*Casuarina glauca*	9 x 7	26	Mature	Good	Fair	40+	Medium	Medium	3.12	2.1	Impact Not Viable SRZ impact by	Impact Major-Not Viable
175	10317	*Casuarina glauca*	9 x 8	30	Mature	Fair	Fair	40+	Medium	Medium	3.6	2.18	Impact Not Viable SRZ impact by	Impact Major-Not Viable
176	10316	*Casuarina glauca*	7 x 6	19	Semi mature	Fair	Fair	40+	Low	Low	2.28	1.91	Impact Not Viable SRZ impact by	Impact Major-Not Viable
178	10311	*Metrosideros excelsa*	4 x 4	20	Semi mature	Good	Fair	40+	Low	Low	2.4	2.18	Impact Not Viable SRZ impact by footing for wall	Impact Major-Not Viable
179	10307	*Casuarina cunninghamiana*	5 x 5	21	Semi mature	Fair	Fair	45204	Low	Low	2.52	1.94	Hand dig Irrigation	Impact Minor
180	10315	*Banksia integrifolia*	3 x 5	16	Semi mature	Good	Fair	20 - 40	Low	Low	2	1.5	Hand dig Irrigation	Impact Minor
181	10310	*Banksia integrifolia*	6 x 4	18	Semi mature	Fair	Fair	20 - 40	Low	Low	2.16	1.82		No Impact
182	10779	*Cupaniopsis anacardioides*	8 x 9	43	Mature	Fair	Fair	20 - 40	Medium	Medium	5.16	2.53	POSSIBLE NICE TREE	Impact Minor - Viable
183	NAID (11)	*Cupaniopsis anacardioides*	4 x 3	16	Semi mature	Fair	Poor	20 - 40	Low	Low	2.16	1.82	PATH within SRZ	Impact Major-Not Viable
184	NAID (12)	*Casuarina glauca*	7 x 4	17	Semi mature	Good	Fair	40+	Low	Low	2.04	1.97		No Impact
185	10784	*Casuarina glauca*	9 x 8	42	Mature	Fair	Fair	40+	Medium	Medium	5.04	2.74		No Impact
186	10782	*Cupaniopsis anacardioides*	7 x 9	38	Mature	Good	Fair	20 - 40	Medium	Medium	4.56	2.32		No Impact
187	10783	*Casuarina equisetifolia*	9 x 3	14	Semi mature	Fair	Fair	20 - 40	Medium	Medium	2	1.65		No Impact
188	10781	*Cupaniopsis anacardioides*	5 x 5	19	Semi mature	Good	Fair	20 - 40	Low	Low	2.28	1.91		No Impact
189	10780	*Cupaniopsis anacardioides*	7 x 8	41	Mature	Good	Fair	20 - 40	Medium	Medium	4.92	2.45		No Impact
190	**10796**	***Araucaria heterophylla***	**14 x 9**	**51**	**Mature**	**Good**	**Good**	**40+**	**High**	**High**	**6.12**	**2.69**		No Impact
191	**10797**	***Araucaria heterophylla***	**14 x 9**	**50**	**Mature**	**Good**	**Good**	**40+**	**High**	**High**	**6**	**2.61**		No Impact
192	**10798**	***Araucaria heterophylla***	**14 x 7**	**40**	**Mature**	**Fair**	**Good**	**40+**	**High**	**High**	**4.8**	**2.37**		No Impact
193	10313	*Casuarina cunninghamiana*	7 x 7	21	Mature	Fair	Poor	44105	Low	Medium	2.52	2.13		No Impact
194	10300	*Hibiscus tiliaceus*	7 x 9	31	Mature	Fair	Poor	20 - 40	Medium	Medium	3.72	2.37		No Impact
195	10309	*Casuarina cunninghamiana*	9 x 9	47	Mature	Fair	Fair	44105	Medium	Medium	5.64	2.61		No Impact
196	10312	*Metrosideros excelsa*	3 x 2	10	Mature	Fair	Poor	45204	Low	Low	2	2.32		No Impact
197	10308	*Casuarina cunninghamiana*	8 x 3	23	Mature	Fair	Fair	44105	Low	Low	2.76	2		No Impact
198	10301	*Hibiscus tiliaceus*	7 x 14	43	Mature	Good	Poor	20 - 40	Medium	Medium	5.16	3.04		No Impact
199	10297	*Cupaniopsis anacardioides*	3 x 3	14	Semi mature	Good	Fair	44105	Low	Low	2	1.5		No Impact
200	10296	*Cupaniopsis anacardioides*	4 x 4	18	Semi mature	Good	Fair	44105	Low	Low	2.16	1.68		No Impact
201	10299	*Hibiscus tiliaceus*	7 x 13	25	Mature	Good	Poor	20 - 40	Medium	Medium	4.68	3.01	DAB estimated	No Impact
202	10790	*Hibiscus tiliaceus*	7 x 10	39	Mature	Good	Poor	20 - 40	Medium	Medium	4.68	3.01	POSSIBLE	Impact Minor - Viable
203	10791	*Hibiscus tiliaceus*	7 x 9	35	Mature	Good	Fair	20 - 40	Medium	Medium	4.2	2.23	POSSIBLE	Impact Minor - Viable
204	10792	*Hibiscus tiliaceus*	8 x 14	47	Mature	Good	Poor	20 - 40	Medium	Medium	5.64	3.09	QUIET SPACE	Impact Major-Not Viable
206	NAID (13)	*Casuarina glauca*	6 x 2	15	Semi mature	Good	Good	40+	Low	Low	2	1.57	Sucker off root	No Impact
207	NAID (14)	*Casuarina glauca*	9 x 2	16	Semi mature	Good	Good	40+	Low	Low	2	1.75	Sucker off root	No Impact
208	NAID (15)	*Casuarina glauca*	9 x 2	25	Mature	Good	Fair	40+	Medium	Medium	3	2.3	Sucker off root	No Impact
209	NAID (16)	*Casuarina glauca*	9 x 4	22	Semi mature	Good	Fair	40+	Medium	Medium	2.64	2	Sucker off root	No Impact
210	NAID (17)	*Casuarina glauca*	9 x 3	16	Semi mature	Fair	Good	44105	Low	Low	2	1.79	Abutting wall	No Impact
211	NAID (18)	*Casuarina glauca*	9 x 3	17	Semi mature	Fair	Good	44105	Low	Low	2.04	1.85	Abutting wall	No Impact
212	NAID (19)	*Casuarina glauca*	9 x 4	25	Mature	Fair	Fair	20 - 40	Medium	Medium	3	2.47	DAB estimated-multiple stems at	No Impact
213	NAID (20)	*Casuarina glauca*	6 x 3	13	Semi mature	Good	Fair	40+	Low	Low	2	1.72	Sucker off root	No Impact
214	NAID (21)	*Casuarina glauca*	6 x 1	10	Semi mature	Fair	Good	40+	Low	Low	2	1.61	Sucker off root	No Impact
215	NAID (22)	*Callistemon 'Kings Park Special'*	4 x 4	16	Mature	Fair	Fair	44105	Low	Low	2	1.94		No Impact
216	NAID (23)	*Casuarina glauca*	7 x 4	19	Semi mature	Good	Fair	40+	Low	Low	2.28	1.94	Sucker off root	No Impact
217	NAID (24)	*Casuarina glauca*	6 x 2	10	Semi mature	Good	Good	40+	Low	Low	2	1.57	Sucker off root	No Impact

DRAFT

ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
218	10839	*Araucaria heterophylla*	13 x 7	45	Mature	Fair	Fair	40+	High	High	5.4	2.43	The fence post will need tp be strategically place to miss structural roots. Irrigation hand dug	Impact Minor
219	10840	*Araucaria heterophylla*	14 x 6	40	Mature	Fair	Good	40+	High	High	4.8	2.39		Impact Minor
220	10841	*Araucaria heterophylla*	14 x 8	51	Mature	Fair	Good	40+	High	High	6.12	2.65		Impact Minor
221	10842	*Araucaria columnaris*	12 x 4	45	Mature	Good	Good	40+	High	High	5.4	2.61		Impact Minor
222	10843	*Araucaria columnaris*	11 x 4	38	Mature	Fair	Good	40+	High	High	4.56	2.34		Impact Minor
223	10844	*Araucaria heterophylla*	14 x 9	52	Mature	Fair	Good	40+	High	High	6.24	2.85		Impact Minor
224	10845	*Araucaria heterophylla*	13 x 9	50	Mature	Fair	Good	40+	High	High	6	2.71		Impact Minor
228	10856	*Cupaniopsis anacardioides*	6 x 6	36	Mature	Good	Fair	20 - 40	Medium	Medium	4.32	2.2	Heavily Mulch & fertilise	Impact Major - Possible Viable
229	10858	*Cupaniopsis anacardioides*	7 x 7	32	Mature	Good	Fair	20 - 40	Medium	Medium	3.84	2.3	Heavily Mulch & fertilise	Impact Major - Possible Viable
230	10860	*Phoenix canariensis*	7 x 7	95	Mature	Good	Fair	40+	Medium	Medium	4.5	3.53		TRANSPLANT
231	10861	*Casuarina equisetifolia*	9 x 11	38	Mature	Fair	Fair	20 - 40	Medium	Medium	4.56	2.51	POSSIBLE	Impact Major - Possible Viable
232	6780943	*Cupaniopsis anacardioides*	4 x 5	20	Semi mature	Good	Fair	20 - 40	Low	Low	2.4	1.85	POSSIBLE	Impact Major - Possible Viable
233	NAID (25)	*Cupaniopsis anacardioides*	5 x 5	23	Semi mature	Good	Fair	20 - 40	Low	Low	2.76	1.91	IRRIGATION	Impact Minor
234	10855	*Casuarina equisetifolia*	9 x 9	44	Mature	Fair	Fair	20 - 40	Medium	Medium	5.28	2.53	IRRIGATION to be hand dug	Impact Major - Possible Viable
235	NAID (26)	*Banksia integrifolia*	3 x 2	10	Semi mature	Fair	Fair	40+	Low	Low	2	1.5	BBQ AREA	Impact Removal
236	NAID (27)	*Cupaniopsis anacardioides*	7 x 3	18	Semi mature	Good	Fair	20 - 40	Low	Low	2.16	1.85	BBQ AREA	Impact Removal
237	NAID (28)	*Metrosideros excelsa*	4 x 4	16	Semi mature	Good	Fair	40+	Low	Low	2	2.05		Impact Minor
238	NAID (29)	*Acacia saligna*	4 x 3	20	Mature	Fair	Fair	44105	Low	Low	2.4	1.91	WEED	Impact Removal
239	NAID (30)	*Cupaniopsis anacardioides*	4 x 3	11	Semi mature	Fair	Fair	20 - 40	Low	Low	2	1.5		Impact Minor
240	10854	*Casuarina equisetifolia*	9 x 9	32	Mature	Fair	Fair	20 - 40	Medium	Medium	3.84	2.34		Impact Minor
241	10853	*Casuarina equisetifolia*	9 x 10	33	Mature	Poor	Fair	45204	Low	Medium	3.96	2.51	DEAD	Impact Removal
242	10852	*Casuarina equisetifolia*	9 x 10	38	Mature	Fair	Fair	44105	Medium	Medium	4.56	2.45	Stormwater Pit	Impact Removal

DRAFT

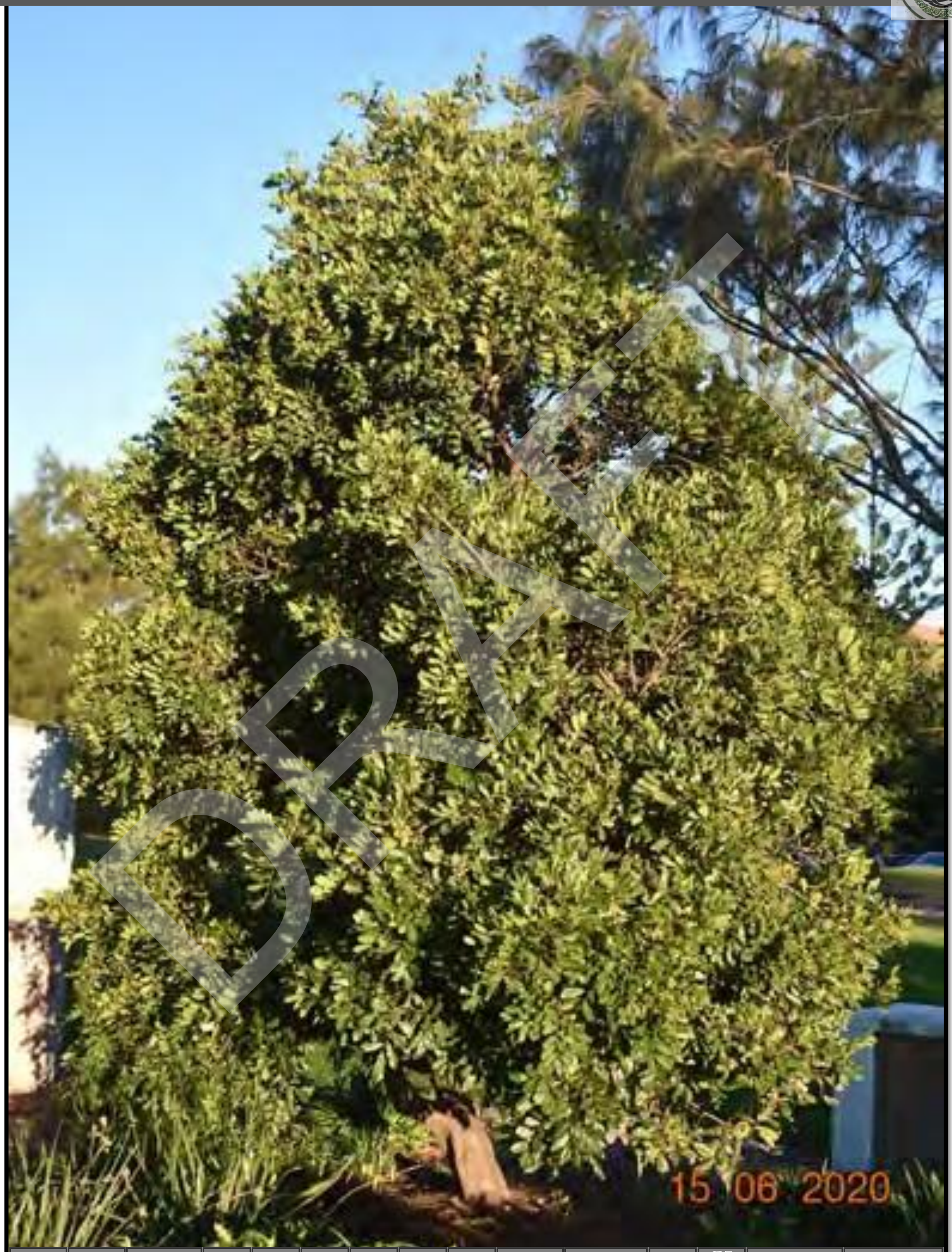


DRAFT

ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
240	10854	*Casuarina equisetifolia*	9 x 9	32	Mature	Fair	Fair	20 - 40	Medium	Medium	3.84	2.34		Impact Minor



ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
234	10855	*Casuarina equisetifolia*	9 x 9	44	Mature	Fair	Fair	20 - 40	Medium	Medium	5.28	2.53	Pre-construction work require	Impact Major - Possible Viable



ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
233	NAID (25)	*Cupaniopsis anacardioides*	5 x 5	23	Semi mature	Good	Fair	20 - 40	Low	Low	2.76	1.91	Pre-construction work require	Impact Major - Possible Viable



ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
229	10858	*Cupaniopsis anacardioides*	7 x 7	32	Mature	Good	Fair	20 - 40	Medium	Medium	3.84	2.3	Pre-construction work require	Impact Major - Possible Viable



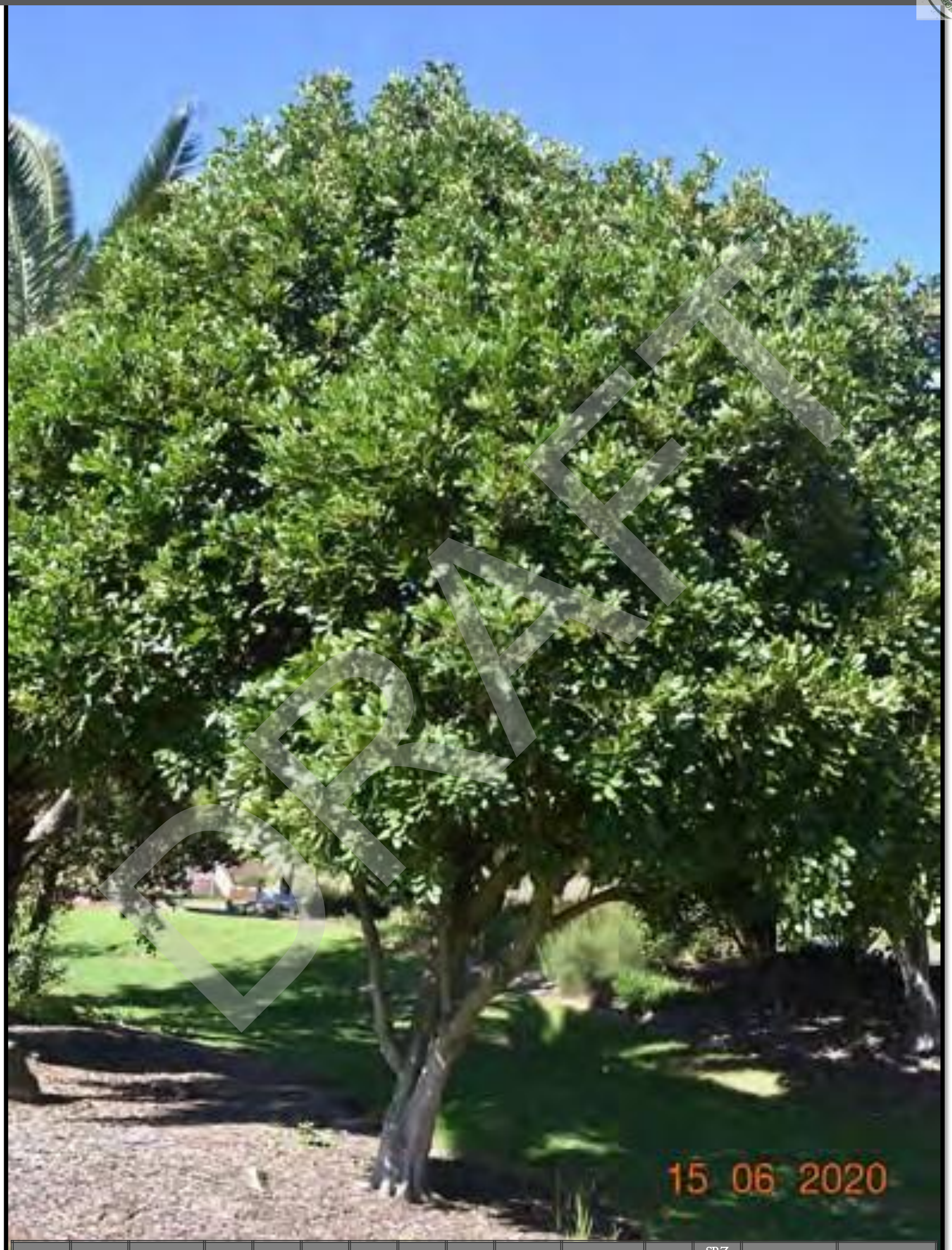
DRAFT

ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
228	10856	*Cupaniopsis anacardioides*	6 x 6	36	Mature	Good	Fair	20 - 40	Medium	Medium	4.32	2.2	Pre-construction work require	Impact Major - Possible Viable



DRAFT

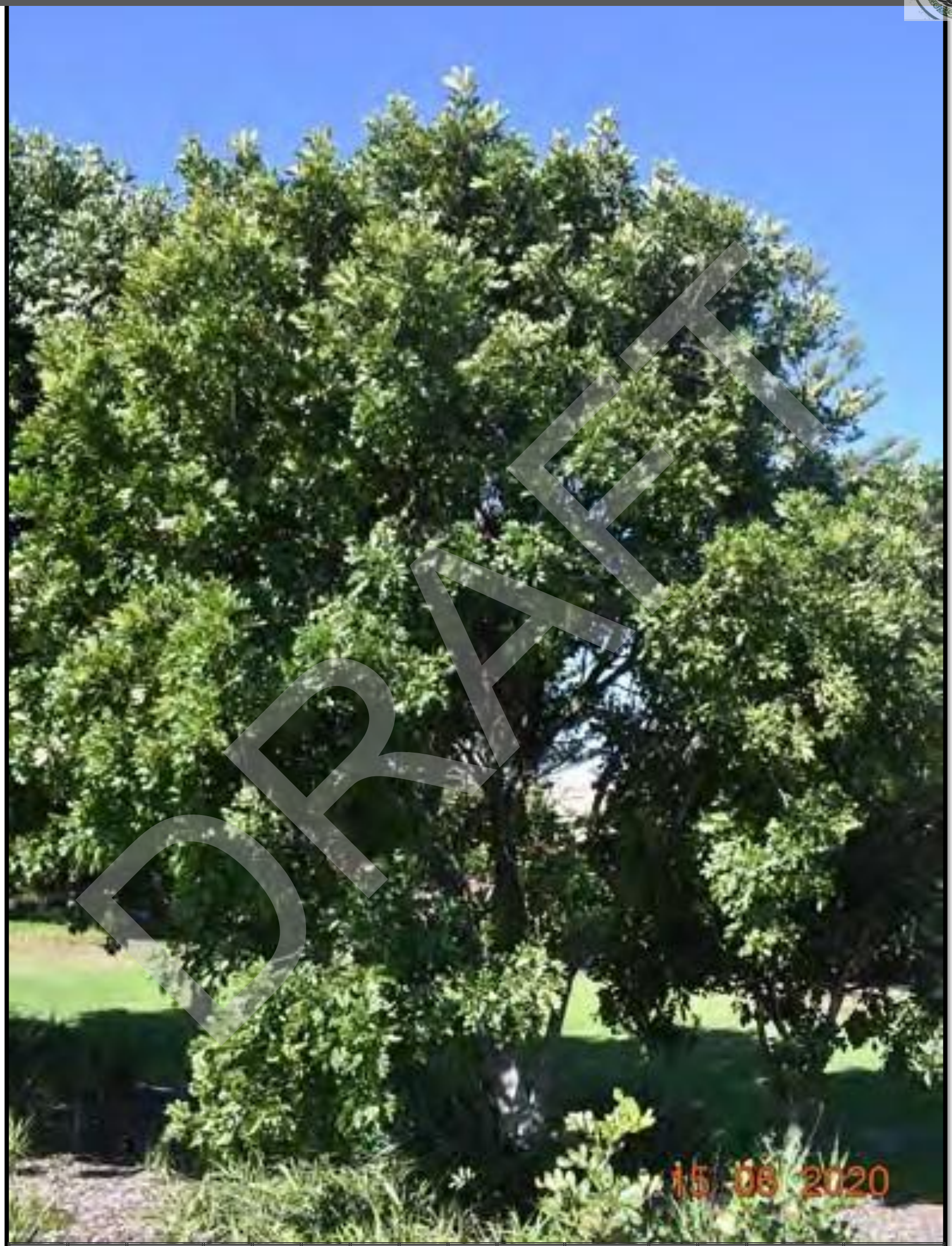
ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
138	3780711	*Cupaniopsis anacardioides*	5 x 5	28	Mature	Good	Fair	20 - 40	Low	Low	3.36	2.18	TPZ 5% impact to	Impact Minor



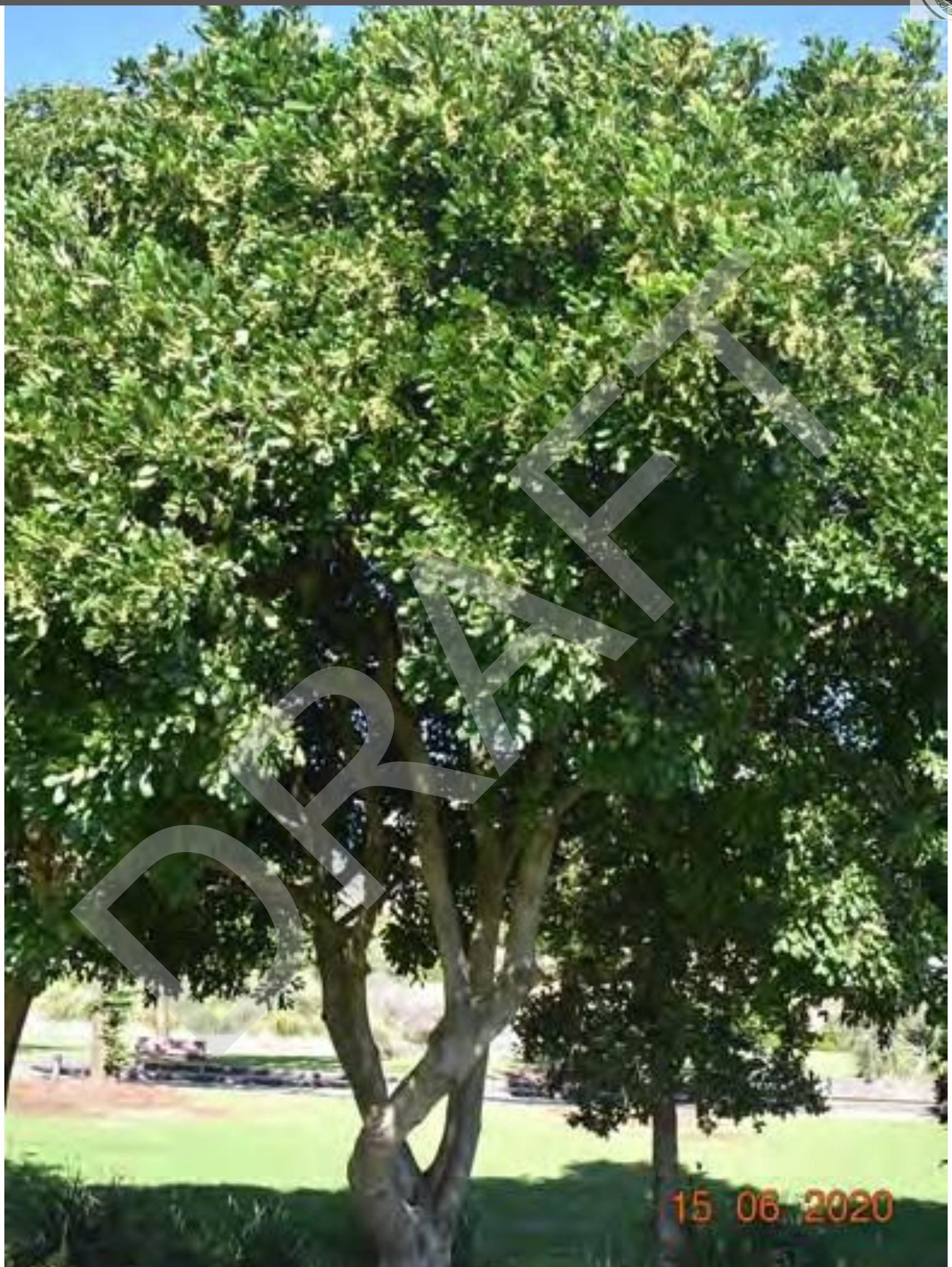
ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
139	10725	*Cupaniopsis anacardioides*	6 x 6	29	Mature	Good	Fair	20 - 40	Medium	Medium	3.48	2.18	30% of TPZ impacted by path	Impact Major - Possible Viable



ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
142	10727	*Casuarina equisetifolia*	9 x 8	32	Mature	Fair	Fair	44105	Medium	Medium	3.84	2.13		Impact Minor



ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
147	10739	*Cupaniopsis anacardioides*	7 x 7	31	Mature	Good	Fair	20 - 40	Medium	Medium	3.72	2.18		Impact Major - Possible Viable



ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
150	10741	*Cupaniopsis anacardioides*	7 x 9	45	Mature	Good	Fair	20 - 40	Medium	Medium	5.4	2.63	Grade Change, possible to retain	Impact Major - Possible Viable



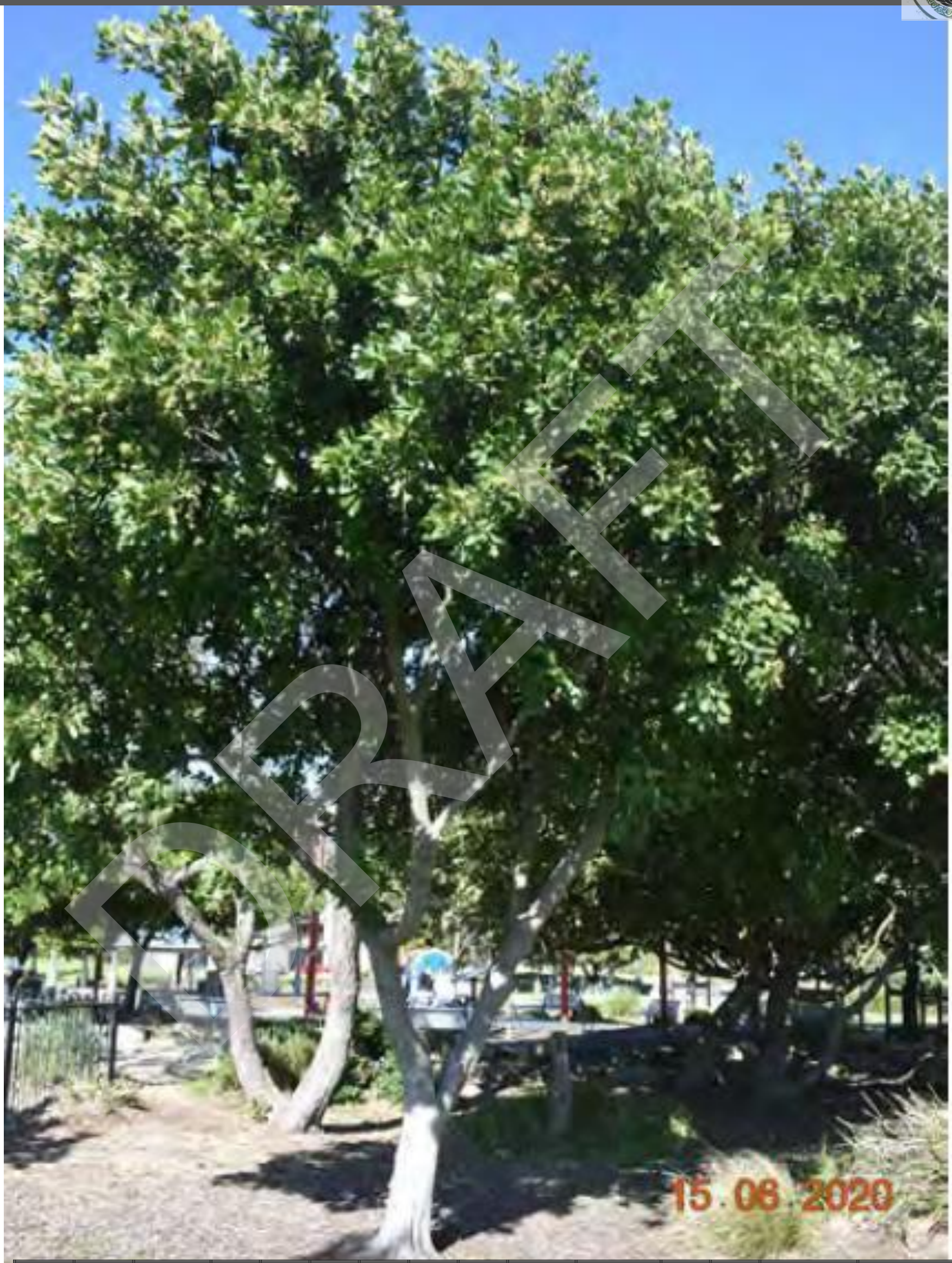
DRAFT

ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
133	10692	*Cupaniopsis anacardioides*	6 x 6	30	Mature	Good	Fair	20 - 40	Medium	Medium	3.6	2.13		Impact Minor



DRAFT

ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
132	10691	*Cupaniopsis anacardioides*	6 x 7	31	Mature	Good	Fair	20 - 40	Medium	Medium	3.72	2.1		Impact Minor



DRAFT

ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
131	NAID (2)	*Cupaniopsis anacardioides*	6 x 6	26	Mature	Good	Fair	20 - 40	Medium	Medium	3.12	2.05		Impact Minor



ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
130	NAID (1)	*Cupaniopsis anacardioides*	3 x 3	14	Semi mature	Fair	Fair	40+	Low	Low	2	1.53		Impact Minor



DRAFT

ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
129	10687	*Hibiscus tiliaceus*	6 x 9	40	Mature	Fair	Poor	44105	Medium	Medium	4.8	3.57	Difficult to ascertain impact due to horizontal trunk	Impact Minor



ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
162	10694	*Casuarina equisetifolia*	9 x 9	30	Mature	Good	Fair	20 - 40	Medium	Medium	3.6	2.41	Reduce over grass	Impact Minor



ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
161	10695	*Casuarina equisetifolia*	9 x 9	40	Mature	Fair	Fair	44105	Medium	Medium	4.8	2.83		Impact Minor



DRAFT

ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
167	3780716	*Cupaniopsis anacardioides*	5 x 7	24	Mature	Good	Fair	20 - 40	Medium	Medium	2.88	2.05	SW & PIT >20% SRZ IMPACT	Impact Major - Possible Viable



ID	CN_ID	Botanical Name	Height & Width (m)	DBH (cm)	Age Class	Health	Structure	ULE (years)	Retention Value	Landscape Contribution	TPZ	SRZ Radius (m)	Comments	Construction Impact
168	3780717	*Cupaniopsis anacardioides*	5 x 7	24	Mature	Good	Fair	20 - 40	Medium	Medium	2.88	2.05	SW & PIT >20% SRZ IMPACT	Impact Major - Possible Viable

13. Terminology

Botanical name The scientific name identifies the genus and species of the tree. Each species has only one scientific name.

Common Name The colloquial name for a tree species is usually in plain English. Common names for a species are often local or regional and each species can have multiple common names.

Tree dimensions Tree height and canopy width in metres (estimated unless stated otherwise).

DBH The diameter of the trunk at breast height (1.4m above ground level) was measured using a diameter tape. Used to calculate the Tree Protection Zone radius.

DAB The diameter of the trunk above the root buttress, was measured using a diameter tape. Used to calculate the Structural Root Zone radius.

Botanical name The scientific name identifies the genus and species of the tree. Each species has only one scientific name.

Common Name The colloquial name for a tree species is usually in plain English. Common names for a species are often local or regional and each species can have multiple common names.

Tree dimensions Tree height and canopy width in meters (estimated unless stated otherwise).

DBH The diameter of the trunk at breast height (1.4m above ground level) was measured using a diameter tape. Used to calculate the Tree Protection Zone radius.

DAB The diameter of the trunk above the root buttress, was measured using a diameter tape. Used to calculate the Structural Root Zone radius.

DRAFT

Health

Category	Description
Very Good	The tree is demonstrating excellent or exceptional growth. The tree exhibits a full canopy of foliage and is free of pest and disease problems.
Good	The tree is demonstrating good or exceptional growth. The tree exhibits a full canopy of foliage and has only minor pest or disease problems.
Fair	The tree is in reasonable condition and growing well. The tree exhibits an adequate canopy of foliage. There may be some deadwood present in the crown. Some grazing by insects or possums may be evident.
Poor	The tree is not growing to its full capacity; extension growth of the laterals is minimal. The canopy may be thinning or sparse. Large amounts of deadwood may be evident throughout the crown. Significant pest and disease problems may be evident or there may be symptoms of stress indicating tree decline.
Very Poor	The tree appears to be in a state of decline. The tree is not growing to its full capacity. The canopy may be very thin and sparse. A significant volume of deadwood may be present in the canopy or pest and disease problems may be causing a severe decline in tree health.
Dead	The tree is dead.

Age Class

Category	Description
Over Mature	These are older trees that have surpassed their maturity and may be in decline. Overmature trees might exhibit signs of aging, such as a decline in growth, increased susceptibility to diseases, and structural issues.
Mature	The tree has reached the expected size for the species at the site.
Semi-mature	An established tree that has not yet reached the expected size for the species at the site.
Young	Recently planted tree or juvenile self-sown tree (generally less than 5 years old).

Tree Origin

Category	Description
Exotic	The species originates in a country other than Australia.
Australian Native	The species originates in Australia.
Indigenous / Remnant	The species originates within the local environs.

Tree Retention Value

Term	Description
Very High	Tree of exceptional quality in good condition. A prominent landscape feature and/or of historic, cultural, ecological, or other significance. Has the potential to be a medium to long-term landscape component were managed appropriately. All efforts should be made to retain the tree and protect it from construction impact.

DRAFT

High	Tree of high quality in good to fair condition. Generally a prominent landscape feature. Has the potential to be a medium to long-term landscape component were managed appropriately. All efforts should be made to retain the tree and protect it from construction impact.
Medium	Tree of moderate quality in fair condition. Generally a modest landscape feature. May have a health or structural issue that can be resolved with arboricultural input, or may refer to a medium to small tree in good condition. Has the potential to be a medium to long-term landscape component were managed appropriately. Where practical, design modifications should be considered to retain and protect from construction impact.
Low	Tree of low quality in poor condition. Generally provides little amenity value. Unlikely to be a long or medium-term landscape component. The tree may be considered a weed species, structurally unsound, dead/dying/diseased, nearing the end of its ULE, or may not be suitable for the site. Or: small tree of good or fair condition which is easily replaced in the landscape through planting of advanced stock.

Tree Sustainability Useful Life Expectancy (ULE)

Category	Description
40+ years	The tree is in excellent condition and under normal conditions and with appropriate management is expected to continue as a viable landscape component for over 40 years.
20 - 40 years	The tree is in good condition and under normal conditions and with appropriate management is expected to continue as a viable landscape component for 20-40 years.
10 - 20 years	The tree is in fair condition and under normal conditions and with appropriate management is expected to continue as a viable landscape component for 10-20 years.
5 - 10 years	The tree is in fair to poor condition or it is not a long-lived species. Removal and replacement may be required within the next 10 years.
1 - 5 years	The tree is in poor condition due to advanced decline or structural defects. Removal and replacement may be required within the next 5 years.
0 years	The tree is dead or is considered hazardous in the location. Removal may be required.

DRAFT

Landscape Significance

Category	Description
1. SIGNIFICANT	• The tree is listed as a heritage Item under LEP with a local, state or national level of significance, or • The tree forms part of the curtilage of a heritage item (building /structure/artefact/place of significance) as listed in LEP and has a known or documented association with that item, or • Aboriginal cultural artefact, evidence by identifiable markings or other documentary evidence, or • The tree is a commemorative planting relating to an important historical event, or • The tree is listed as a threatened plant species or is a key indicator species of a threatened ecological community under the Biodiversity Conservation Act 2016 or the Environmental Protection and Biodiversity Conservation Act 1999, or • The tree is an endemic species, representative of the original vegetation of the area and is known as an important food, shelter or nesting tree for endangered or threatened fauna species, or • A remnant tree in existence prior to development of the local area, or • The tree has a very large live crown size (greater than 200m²) with normal to dense foliage cover, is visually prominent in the landscape, exhibits good form and habit typical of the species and makes a significant contribution to the amenity and visual character of the area by creating a sense of place or creating a sense of identity, or • The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance.
2. VERY HIGH	• The tree has a strong historical association with a heritage item (building, structure, artefact, garden, etc) within or adjacent the property and/or exemplifies a particular style or era of landscape design associated with the original development of the site, or • The tree is a locally-indigenous species and representative of the original vegetation of the area and the tree is located within a key wildlife corridor or has known wildlife habitat value; or is uncommon in cultivation, and • Visible from surrounding properties, the street or other thoroughfares (including waterways), and • The tree has a very large live crown size (exceeding 200m²); a crown density exceeding 70% Crown Cover (normal-dense), good form and branching habit, good representative of the species or is aesthetically distinctive and makes a positive contribution to the visual character and amenity of the area. • The tree has a suspected historical association with a heritage item or landscape supported by anecdotal evidence or based on knowledge of similar sites, tree age, etc, or • The tree is a locally-indigenous species and representative of the original vegetation of the area, and The tree is beneficial for native wildlife, or
3. HIGH	• The tree has a large live crown size (exceeding 100m²), and The tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (e.g. crown distortion/suppression) with a crown density of at least 70% Crown Cover (normal), and • The subject tree is visible from surrounding properties and makes a fair/neutral contribution to the amenity of the property/visual character of the area. • The tree has a medium live crown size (exceeding 40m²), and • The tree is a fair representative of the species, exhibiting fair form and habit, moderate distortion or suppression with a crown density of more than 50% Crown Cover (thinning to normal), and
4. MODERATE	• The tree makes a fair contribution to the visual character and amenity of the area, and • The tree is visible from surrounding properties. Not visually prominent – view may be partially obscured by other vegetation or built forms, or • The tree has no known or suspected historical value or association. • The tree has a small live crown size(less than 40m²) and can be replaced within the short term with new tree planting, or
5. LOW	• The tree is a poor representative of the species, poor form and habit with significant distortion or canopy suppression, with a crown density of less than 50% Crown Cover (sparse), and • The tree is not visible from surrounding properties (obscured by other trees or built forms) and makes a negligible contribution to the amenity of the property/surrounding properties, or detracts from the visual character of the area.

DRAFT

6. VERY LOW	• The tree is listed as an undesirable species as listed in Part A, Table 7 of this Technical Manual; and • The tree does not meet any of the above criteria and has no heritage importance or value, no known or suspected historical association.
7. INSIGNIFICANT	• The tree is an undesirable species as listed in Part A, Table 7 of this Technical Manual.

DRAFT

Structure

Category	Description
Good	The tree has a well-defined and balanced crown. Branch unions appear to be sound, with no significant defects evident in the trunk or the branches. Major limbs are well-defined. The tree is considered a good example of the species.
Fair	The tree has some minor problems with the structure of the crown. The crown may be slightly out of balance, and some branch unions may be exhibiting minor structural faults. If the tree has a single trunk, it may be on a slight lean or exhibit minor defects.
Poor	The tree may have a poorly structured crown. The crown may be unbalanced or exhibit large gaps. Major limbs may not be well defined. Branches may be rubbing or crossing over. Branch unions may be poor or faulty at the point of attachment. The tree may have suffered root damage.
Very Poor	The tree has a poorly structured crown. The crown is unbalanced or exhibits large gaps with possibly large sections of deadwood. Major limbs may not be well defined. Branches may be rubbing or crossing over. Branch unions may be poor or faulty at the point of attachment. Branches may exhibit large cracks that are likely to fail in the future. The tree may have suffered major root damage.
Has Failed	A section of the tree has failed or is in imminent danger of failure and the tree is no longer a viable specimen.

Data Collection

Tree location was recorded using differentially corrected GPS (generally +/- 1.0m accuracy) and aligned to the provided feature survey. Only trees greater than 3m in height and 15cm DBH were assessed. The following parameters were collated from each tree

1	**Coordinates**
2	Image of Tree
3	Botanical name
4	Tree Height and Width
5	Health and Structure
6	Useful Life Expectancy (ULE)
7	Retention Value
8	Diameter at Breast Height (DBH)
9	Diameter above root buttress (DAB)
10	Tree Protection Zone (TPZ) as a radius
11	Tree Protection Zone (TPZ) as area
12	Structural Root Zone as a radius
13	Tree Protection Zone (TPZ) as area

DRAFT

14. Arboricultural Impact

The arboricultural impact of a proposed design is determined based on the level of encroachment into the SRZ of a tree as specified in Australian Standard AS4970-2009.

Table 2: Arboricultural Impact categories

Level of encroachment	Description/definition
Impact - Removal	The tree is within the footprint of the proposed design and will require removal to facilitate the design. To successfully retain the tree, a design modification would be required.
Impact – Major, viable	The design has a TPZ area encroachment greater than 10%, or it impacts the SRZ. In order to successfully retain the tree and minimise the impact upon the Root rhizosphere modifications to the depth of excavation will occur when tree roots larger than 25 millimetres in diameter are encountered
Impact – Minor, viable	The proposed design has a TPZ area encroachment is less than 10% or impacts the SRZ. The tree is expected to remain viable because of one, or a combination of the following: • Alternative construction methods are proposed that reduce the impact on the tree. • Site conditions have limited root development within the proposed area of works. • The species is known to be particularly tolerant of root disturbance. • A non-destructive root exploration was undertaken and demonstrated that root distribution was limited in the proposed area of work. The tree will require establishing a TPZ before the commencement of works, which may require compensation for the area lost to encroachment.
Impact - Minor	The proposed design has a TPZ area encroachment of less than 10% and does not impact the structural root zone. The tree is expected to remain a viable landscape component with the establishment of a TPZ prior to the commencement of works, which may require compensation for the area lost to encroachment.
No impact	The proposed design does not enter the TPZ. The tree is expected to remain a viable landscape component with the establishment of a TPZ prior to the commencement of works.

DRAFT

15. References

AS 4970 - 2009, *Australian Standard, Protection of Trees on Development Sites*, Standards Australia.

AS 4374 - 2007, *Australian Standard, Pruning of Amenity Trees*, Standards Australia.Biddle, P.G., 1998, *Tree root damage to buildings, Causes, Diagnosis, and Remedy,*

Willowmead Publishing Ltd., Wantage, UK.

Mattheck, C. and Breloer, H. 1994, *The body language of trees: a handbook for failure analysis*, London: HMSO.

DRAFT

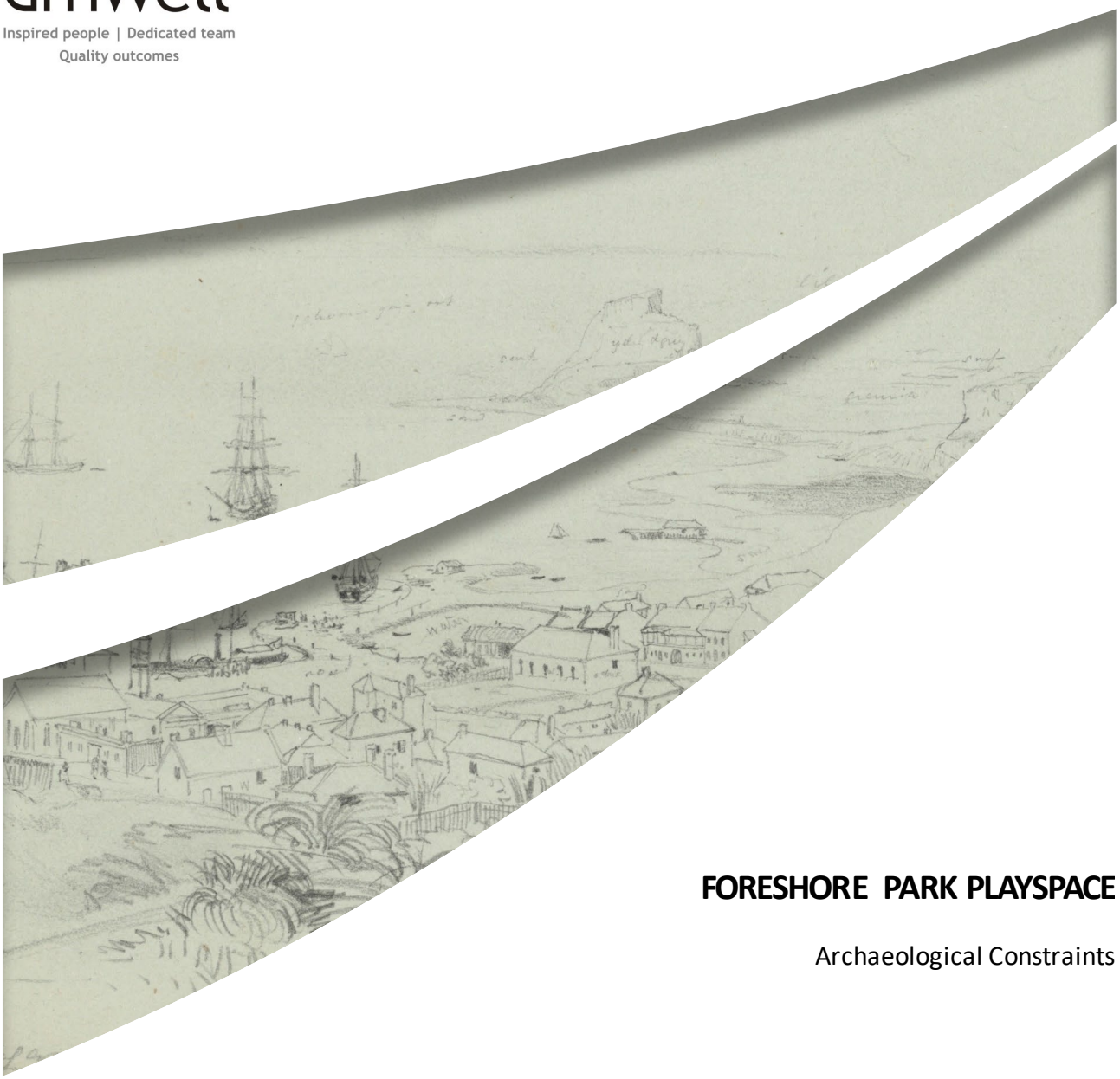
Appendix C

Archaeological Constraints Analysis

Umwelt Environmental & Social Consultants

umwelt

Inspired people | Dedicated team
Quality outcomes



FORESHORE PARK PLAYSPACE

Archaeological Constraints

FINAL

March 2023

FORESHORE PARK PLAYSPACE

Archaeological Constraints

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
City of Newcastle

Project Director: [redacted]
Report No. 22455_R01
Date: March 2023

umwelt
Environmental & Social Consultants

APPROVED COMPANY ISO 9001
QMS Certification Services

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Cover Image: Detail of Newcastle, NSW 1853 sketch by [redacted]

Disclaimer

This document has been prepared for the sole use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Umwelt (Australia) Pty Ltd (Umwelt). No other party should rely on this document without the prior written consent of Umwelt.

Umwelt undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. Umwelt assumes no liability to a third party for any inaccuracies in or omissions to that information. Where this document indicates that information has been provided by third parties, Umwelt has made no independent verification of this information except as expressly stated.

©Umwelt (Australia) Pty Ltd

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Draft V0	[redacted]	16 June 2022	[redacted]	16 June 2022
Final V1	[redacted]	17 March 2023	[redacted]	17 March 2023

Table of Contents

1.0 Introduction 1

1.1 The Foreshore Park Playspace Project 1

2.0 Aboriginal Heritage Information Management System 3

3.0 Archaeological Management Plans 5

3.1 Newcastle Archaeological Management Plan 1997 5

3.2 Draft Newcastle Archaeological Management Plan Review 2013 6

4.0 Historical Context 9

4.1 Reclamation of Foreshore 9

4.2 Reclamation and the Great Northern Railway 10

4.3 Boat Harbours 15

4.3.1 Market Street Boat Harbour 15

4.3.2 Perkins Street Boat Harbour 17

4.4 Railyards 18

5.0 Site Evaluation 24

6.0 Aboriginal Archaeology 26

6.1 Due Diligence Assessment 26

6.1.1 Assessment of Aboriginal Archaeological Potential 26

7.0 Historical Archaeological Potential 28

7.1 Newcastle Archaeological Management Plans 28

7.2 Archaeological Potential of the Project Area 28

7.2.1 Pre-reclamation 28

7.2.2 Post Reclamation 30

7.3 Heritage Act Relics Provision 33

7.4 Conclusion 33

7.4.1 Exception to S139(1) and (2) of the Heritage Act 1977 34

8.0 Conclusions and Recommendations 35

9.0 References 36

Figures

Figure 1.1	The Project Area	1
Figure 1.2	Schematic Design Plan	2
Figure 2.1	AHIMS Registered Sites	4
Figure 3.1	Detail of Indicative Archaeological Sites Plan	6
Figure 3.2	Detail of Inventory of Archaeological Sites Mapping	7
Figure 3.3	Detail of Archaeological Potential Mapping	8
Figure 4.1	Detail of J. Armstrong's Plan of the Town of Newcastle, 1830	11
Figure 4.2	Detail of 1846 Plan of the City of Newcastle	12
Figure 4.3	Detail of Newcastle, NSW 1853 sketch by G.F. Angas	13
Figure 4.4	Detail of c1858 Crown Plan Survey of the Foreshore	14
Figure 4.5	Detail of Moriarty's 1858 Plan of the Harbour of Newcastle	14
Figure 4.6	Detail of 1854 Plan of Newcastle	16
Figure 4.7	Detail of Crown Plan 22-2137 showing the Market Street Boat Harbour	16
Figure 4.8	Newcastle and Suburbs Sheet 013 – City of Newcastle 1917–1923	17
Figure 4.9	Detail of 1874 Plan of the Government Railway	19
Figure 4.10	Detail of approximately 1875 lithographic view of Newcastle	20
Figure 4.11	Detail of 1895–1897 Newcastle Detail Series	21
Figure 4.12	Detail of 1924 Photograph	22
Figure 4.13	Detail of 1966 Aerial Photograph	23
Figure 7.1	Detail of 1846 Plan of the City of Newcastle	30
Figure 7.2	Detail of 1895–1897 Newcastle Detail Series	31

Tables

Table 3.1	NAMP Indicative Archaeological Sites	5
Table 3.2	AMP Review Inventory No. 2176285	7
Table 5.1	Project Area Photographs	24
Table 7.1	Archaeological Evidence of Reclamation	29
Table 7.2	Former Railyard Archaeological Remains	32

Appendices

Appendix 1	AHIMS Search Results

1.0 Introduction

Umwelt has been commissioned to prepare a preliminary archaeological assessment for the City of Newcastle's (CoN) proposed Foreshore Park Playspace project (the project) (refer to **Figure 1.1** and **Figure 1.2**).

This assessment comprises an:

- Aboriginal due diligence assessment.
- Preliminary historical (non-Aboriginal) archaeological assessment.

1.1 The Foreshore Park Playspace Project

The project works proposed to be undertaken as part of the Foreshore Park Playspace project include:

- Sewer connection from proposed amenities to sewer (nominal 3 metres deep).
- Potential sewer relocation comprising directional drilling / under boring with excavation at junctions.
- Screw piles to major structures (amenities, industrial climbing structure).
- Mass concrete block footings to swings and play equipment.



Figure 1.1 The Project Area

Figure shows the project area (outlined in red) within the western portion of Foreshore Park.

Source: Nearmaps 2022 / CoN.

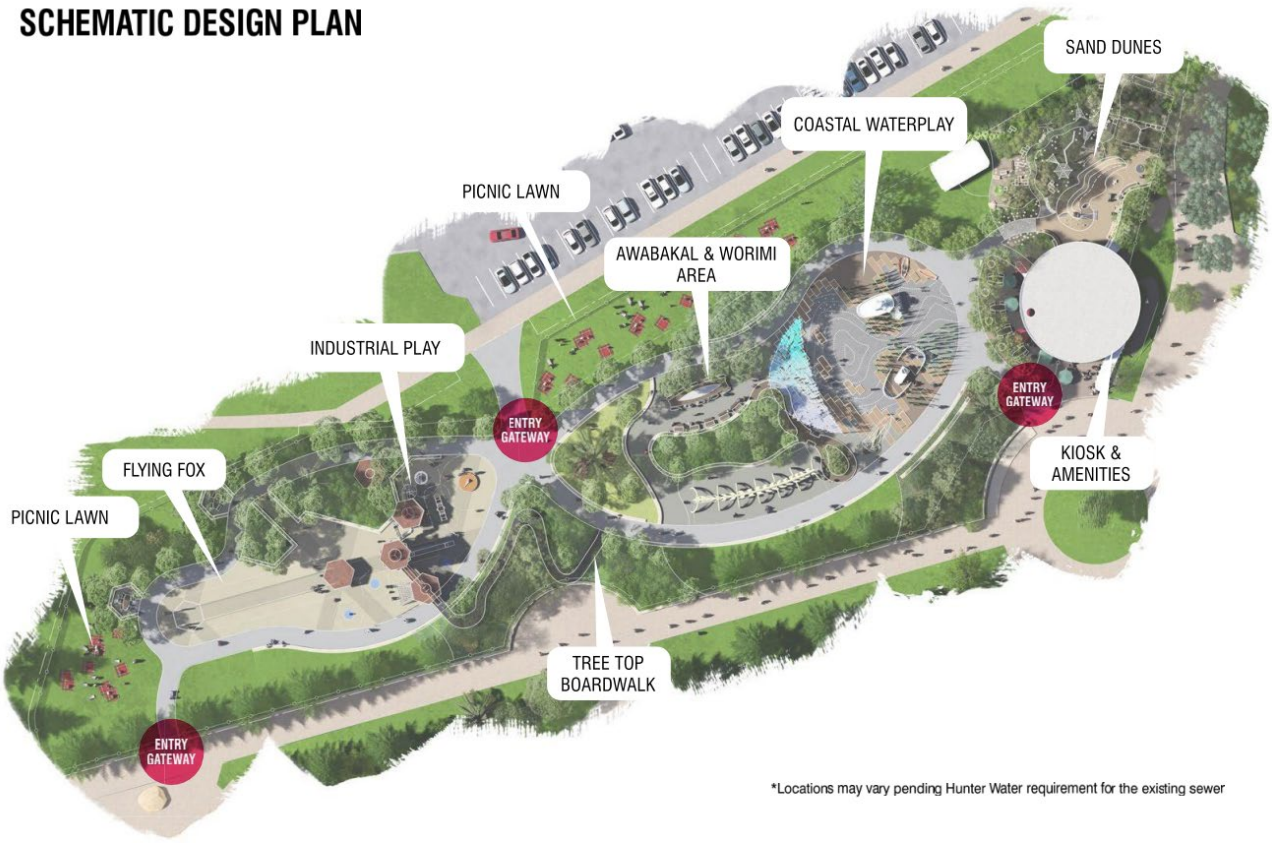


Figure 1.2 Schematic Design Plan

Source: T.C.L + Bosque.

2.0 Aboriginal Heritage Information Management System

A search of the Aboriginal Heritage Information Management System (AHIMS) undertaken on 3 June 2022 identified no Aboriginal sites within the project area.

The AHIMS search result is provided as **Appendix 1**.

Four sites are identified in the general vicinity of the project area; between 50 and 180 metres to the south (refer to **Figure 2.1**):

- AHIMS # 38-4-1632: The TA1 Newcastle artefact scatter was originally recorded while undertaking historical excavations along Watt Street. As part of the excavations, an AHIP was sought, and the site was salvaged and is identified as 'destroyed' on the AHIMS register.
- AHIMS # 38-4-1695: The 11–15 Watt Street IF 1 is a recorded open artefact camp. However, on 13 March 2015 an AHIP was granted for the collection and salvage of the site as part of the re-development works. As such, this site has either been destroyed as part of an AHIP or is to be destroyed through salvage as part of the AHIP.
    - Note this site was the only site identified in the immediate vicinity of the project area (refer to AHIMS search result is provided as **Appendix 1**). The site was registered in the wrong location. **Figure 2.1** below indicates AHIMS # 38-4-1695 in the correct location at 11–15 Watt Street.
- AHIMS # 38-4-1020: Coutts Sailors Home PAD1 is located within the former convict lumber yard site along Scott Street, Lot 2 DP 706760. AHIMS advanced search data identifies that a permit has been issued for this PAD. It is unknown whether any further archaeological works have been undertaken as part of the permit issued for this PAD. It is noted however, that the AHIMS site 38-4-0957 (below) is located within the same Lot and DP as 38-4-1020.
- AHIMS # 38-4-0957: The NCL 931 site is identified as an open camp site and is located along Bond Street. It was noted that the assemblage was recovered from backfill deposits which dated from the 1987 excavations of the area. The AHIMS data indicates that a permit was issued for the site. It is unknown whether any further archaeological works have been undertaken as part of the permit issued for the site.



Figure 2.1 AHIMS Registered Sites

Green shows sites registered as 'artefact'. Yellow indicates 'potential artefact deposit.

Source: Nearmap (April 2022) Data source: AHIMS (2022), NSW DFSI (2021).

3.0 Archaeological Management Plans

3.1 Newcastle Archaeological Management Plan 1997

The Newcastle Archaeological Management Plan (NAMP – Suters Architects 1997) was prepared to give an indication of the nature and extent of historical archaeological resources in central Newcastle and to provide a framework to ensure historical archaeological resources are recognised and integrated into the urban planning framework.

The NAMP is a planning tool that provides an overview of areas that require the consideration of archaeological issues in conjunction with any development applications.

The NAMP identified nine archaeological precincts within Newcastle that define areas 'in which a common pattern of development has occurred and may be expected to contain an archaeological resource of some cohesive characteristic' (Suters Architects 1997:40). The project area is located in Precinct 8 Harbour Foreshore described as:

That land north of Hunter Street being the original Harbour Foreshore. This includes the previously identified Honeysuckle Point, and that narrow strip of land controlled by the AA Company. Associated with the development of the railways, coal loading, wharfage and industry (Suters 1997).

The project area is located partially within Indicative Archaeological Sites as identified in the NAMP. **Table 3.1** and **Figure 3.1** detail the Indicative Archaeological Sites the project area is partially located within.

Table 3.1 NAMP Indicative Archaeological Sites

NAMP Item No	Street Address	NAMP Occupation History	NAMP Archaeological Potential
1007 Boat Harbour	51 to 55 Wharf Road, Newcastle East	Boat harbour relocated to position near Market Street 1852. Land reclamation east of Watt Street commenced during 1840s, and was boosted after the arrival of the Railway, which later extended into this area, with the extensive marshalling (goods) yards.	Potential site.
1198 Wharf Street Wharf and Boat Harbour	51 to 53 Church Street	Timber Wharf at Watt Street built 1804. Replaced 1833 by rounded-end stone wharf. Straight 'Ballast Wharf' added 1840. Ballast Wharf extended 1863/1864 to become Kings/Queens Wharf.	Disturbed / Potential site. Ballast Wharf, and some of Watt Street stonework, might survive under Wharf Road and Promenade. Rest of the boat harbour would be under west end of The Foreshore, but was unformed and not recognisable.

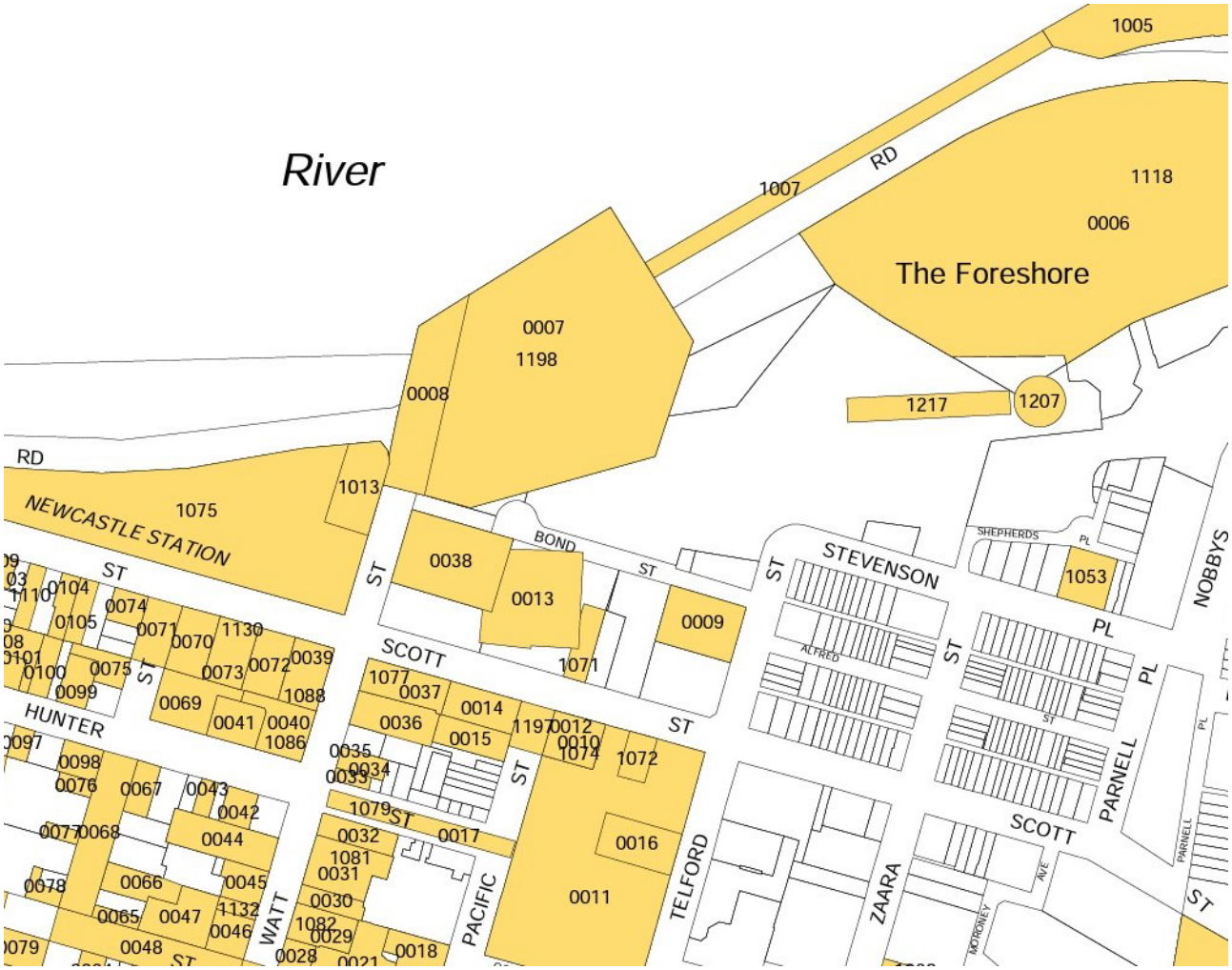


Figure 3.1 Detail of Indicative Archaeological Sites Plan

The project area is located partially within Indicative Archaeological Sites 0007 and 1198 – labelled as 'The Foreshore'.

Source: City of Newcastle.

3.2 Draft Newcastle Archaeological Management Plan Review 2013

The NAMP 1997 is currently being reviewed. At present, the Draft Newcastle Archaeological Management Plan Review 2013 (AMP Review) is a draft working document. However, the AMP 1997 and the AMP Review are both identified as the current operative documents. The AMP Review has been referenced to identify whether there are any additional considerations relevant to the project area.

The project area falls within AMP Review Inventory No. 2176285 which comprises the '*blocks bounded by the Hunter River, Nobbys Road, Stevenson Place, Telford and Bond Streets, including parts of adjacent streets (Wharf Road)'* (Higginbotham 2013).

Table 3.2 and **Figure 3.2** and **Figure 3.3** –detail Inventory No. 2176285.

Table 3.2 AMP Review Inventory No. 2176285

Penal Settlement 1801–1821	Town Development, 1820s–1853	Railway and Port Infrastructure
'Initial 1801 settlement used mooring place near base of Watt Street. During second settlement a wooden pier / jetty constructed at foot of Watt Street. This in turn replaced by circular masonry wharf	The area of the foreshore, principally to the east of Pacific Street became known as the Sandhills, because of the problem of wind blown sand, which delayed development in the area.	Plans for reclamation of the harbour or Hunter River Foreshore are seen as early as 1843. A new wharf was constructed to the east of Watt Street and the Old Wharf. The plans to extend a ballast wall from the new wharf in an easterly direction to join the end of Macquarie Pier or the Southern Breakwater are also shown. By 1853, the old wharf is labelled Queens Wharf, while the new wharf is labelled Moriarty's Wharf, with a stonemasons shed upon it. By 1860 substantial progress had been made on reclamation, infilling around the old wharf and the boat harbour, both of which are now no longer shown on plans. There is a railway siding to the end of the wharf as constructed and a goods shed on a branch siding. By 1874 the reclamation of the foreshore is largely completed, with wharfage and steam cranes. There are extensive railway sidings along the river frontage.



Figure 3.2 Detail of Inventory of Archaeological Sites Mapping

Project area is within AMP Review Inventory No. 2176285.

Source: Higginbotham 2013.

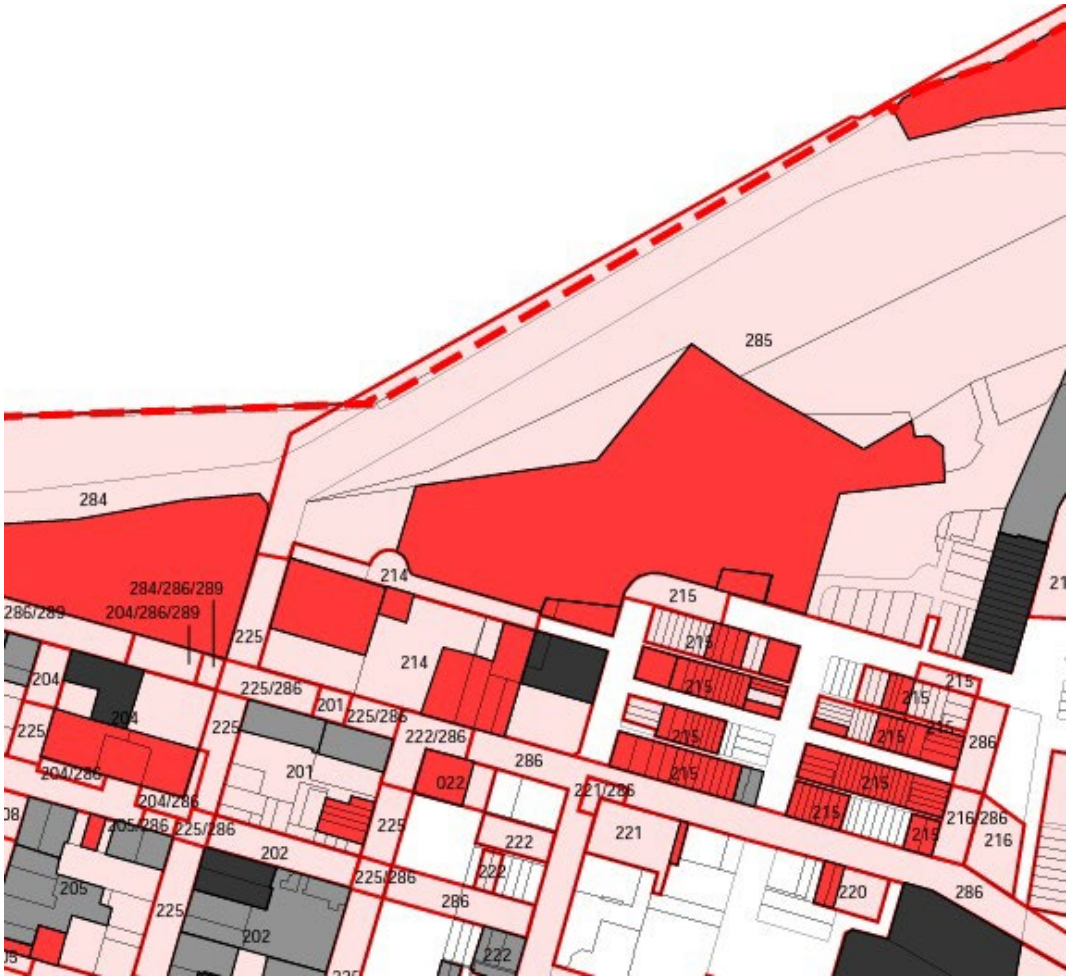


Figure 3.3 Detail of Archaeological Potential Mapping

Project area is within AMP Review Inventory No. 2176285. Red indicates 'Standing buildings or parts of buildings' pink indicates 'little disturbance'.

Source: Higginbotham 2013.

4.0 Historical Context

4.1 Reclamation of Foreshore

The entire foreshore area on the southern side of the harbour was originally a series of mud flats and shoals, with the original shoreline running along what is now the southern side of Scott Street, crossing the Newcastle Railway Station and following the approximate line of Bond Street and Stephenson Place. A number of early plans and maps indicate the original location of the shoreline (refer to **Figure 4.1**).

The first modification of the shoreline was the erection of the government wharf at the foot of Watt Street in approximately 1804. In 1832, as the harbour began to become busier with ships loading coal, work restarted on the breakwater between the shore and Nobby's Island, which although started in 1818 had been suspended in 1822 as convicts were relocated to Port Macquarie. The breakwater was finally completed in 1846, although ongoing repairs to breeches in the wall were required well into the 1870s. With the exception of the Watt Street wharf, Australian Agricultural Company staithes and the unfinished breakwater few other works were undertaken on the harbour until the 1840s.

In late 1841 a new Circular Wharf was started to the east of the Watt Street wharf. Built of masonry blocks shipped in from Sydney, the wharf was not robust enough to withstand the wash of the large ships moving up the harbour and was strengthened first by timber supports and then with the construction of a Ballast Wharf running parallel to the shoreline back to the Watt Street wharf. The effect was the creation of a wharf and a small boat harbour within which boats could shelter (refer to **Figure 4.2** and **Figure 4.3**).

In 1846 with the breakwater finally completed, the harbour became increasingly safer for ships. In June 1846 Newcastle was declared a Free Warehousing Port allowing goods and produce to be exported directly from Newcastle without having to go through Sydney. The following year when the Australian Agricultural Company's monopoly on mining in Newcastle came to an end and new mines began to open, the results of this and the free port were a dramatic increase in the amount of shipping sailing to and from Newcastle, and the need for better berthing facilities for them.

Despite this little was done to improve the harbour. A major concern was the depth of the channel, which was adequate at the entrance but quickly shallowed out once inside the harbour itself and around the available wharfage. Mud banks separated the main channel from the Australian Agricultural Company coal shutes, with small lighters needed to load ships of any size. In 1855 Edward Orpen Moriarty was appointed Engineer-Surveyor responsible for Hunter River Improvements. His plan was to control the sea entrances through extended breakwaters and the river channel through stone training walls.

Work began in 1856–57, with the former Circular Wharf demolished and a new wharf, Queens Wharf built on timber piles, with copper sheathing along the line of the Ballast Wharf from Watt Street. The front of the wharf was dredged to a depth of 20 feet (6 m) and by 1860 500 feet (152 m) had been completed. At the same time as Queens Wharf was being built, a new sea wall was also being constructed to the west between Watt Street and Perkins Street. The combined result of both sets of works was a large section of reclaimed land along the waterfront (refer to **Figure 4.4** to **Figure 4.5**).

4.2 Reclamation and the Great Northern Railway

The construction of the Queens Wharf increased the demands for the extension of the Great Northern Railway (GNR) to meet them. The GNR, running between Newcastle and East Maitland (the original station was to be at Tarro before the line was extended to Victoria Street, East Maitland) had been completed to its then terminus at Honeysuckle, to the west of the Australian Agricultural Company staithes and yards in March 1857. Although the Chief-Engineer of Railways, Frank Whitton had wanted the line to extend to the wharves as early as 1854 when it was being planned, the railways of both the Australian Agricultural Company and Newcastle Coal and Copper Company blocked the route. Whitton argued that stopping the line short of the wharves defeated the point of the line itself, which was being built with the view of extending it through the Hunter Valley to enable the shipping of agricultural produce from inland as much as it was to transport passengers. Recognising the inconvenience of the original plan, a new contract was made to extend the railway closer to the centre of Newcastle and to join the wharves. Newcastle Station at the foot of Watt Street was opened in March 1858, with a branch line running to Queens Wharf.
The necessity of bringing the railway into the town centre in 1858 and building of wharves parallel to the line completed the reclamation project along the foreshore of east Newcastle and allowed for the formation of Scott Street, construction of the railway and construction of Newcastle Station itself.

Much of the reclamation was carried out by the dumping of ballast from visiting ships, both domestic and international. Ballast was used to form a wall behind which sand and silt were pumped from harbour dredges to form newly reclaimed land. A correspondent to the newspaper in 1877 when commenting on the reclamations further along the harbour at Bullock Island noted that:

> *We have geological specimens from every part of the world. The whole expanse of ground has been built up of ballast from the ships that come to our harbour. In one place we tread upon a layer of London flint, next a collection of stones from the Mediterranean, succeeded by a rock mound from Scandinavian Coasts, blue stone from Melbourne, green trap from New Zealand, limestone from Singapore, even sunburnt bricks and glazed uncouth carvings from China.*

By the 1880s much of the work of reclaiming the southern shore of the harbour was complete and the line of foreshore that exists to the present was fixed in place.



Figure 4.1 Detail of J. Armstrong's Plan of the Town of Newcastle, 1830

The project area is located within the harbour at this time; to the east of the wharf.

Source: National Library of New Zealand.



Figure 4.2 Detail of 1846 Plan of the City of Newcastle

Detail shows Queens Wharf and the original Boat Harbour at the end of Watt Street. A 'ballast wharf' encloses the Boat Harbour. The project area is located between the Ballast Wharf and the shoreline.

Source: Newcastle Regional Library – Local Studies Section LHMB 333.3/16.



Figure 4.3 Detail of Newcastle, NSW 1853 sketch by G.F. Angas

Detail shows the boat harbour and ballast wharf to the east of Watt Street.

Source: National Library of Australia/Hunter Living Histories UoN.



Figure 4.4 Detail of c1858 Crown Plan Survey of the Foreshore

The survey shows the first wharf extensions, sea walls and boat harbours.

Source: LPI CP13-652.

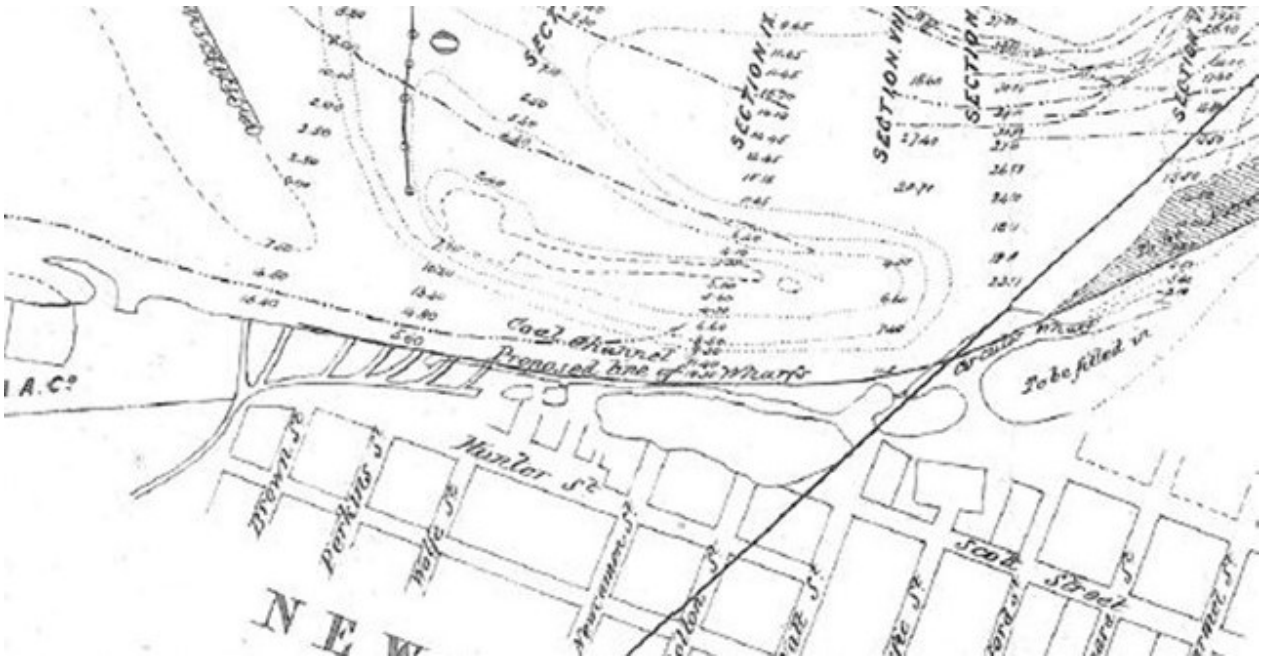


Figure 4.5 Detail of Moriarty's 1858 Plan of the Harbour of Newcastle

The plan notes the old boat harbour to the east of Watt Street is 'to be filled in'.

Source: University of Newcastle Cultural Collections.

4.3 Boat Harbours

In the years prior to the development of the railway or the connection of Newcastle to its surrounding hinterland via good roads, boats and small ships provided the main form of transport for people and goods up and down the Hunter River. Likewise, ships came and went from the harbour taking coal, timber and other agricultural products from the port. While wharves were being constructed from the 1840s for larger ships, the small boats working the river also required safe places to berth, load and unload. The provision of a safe harbour for these vessels was essential for the domestic economy of the Hunter region. A number of small boat harbours were subsequently built to service these lighter vessels as part of harbour reclamations and improvements made in the second half of the nineteenth century.

A new sea wall was also being constructed to the west between Watt Street and Perkins Street.

The boat harbour constructed to the west of Watt Street extended as far as Perkins Street (refer to **Figure 4.4** and **Figure 4.6**). A large sea wall was built to create the boat harbour, although the harbour was removed to make way for the extension of the Great Northern Railway in 1858 and replaced with the Market Street Boat Harbour.

4.3.1 Market Street Boat Harbour

With the loss of the boat harbour east of Watt Street and the reclamation of the temporary harbour west of Watt Street in 1858, another boat harbour was created along the foreshore opposite the Market Place, between Newcomen and Wolfe Streets. This new harbour, also known as the Market wharf basin, was formed by reserving an area during the filling of the temporary boat harbour that had extended to Perkins Street.

In August 1871 Newcastle Borough Council accepted plans for a large borough market building to be erected on the Market Reserve opposite the boat harbour. The announcement of the new market was preceded by the expansion, rather than the removal, of the market boat harbour. In 1881 the basin was recorded as providing wharf frontage of 510 feet (155 metres) of which 250 feet (76 metres) was reserved for farmers landing their produce for the market, 160 feet (49 metres) for use by watermen's boats and 100 feet (30 metres) for slips and sheds to house boats belonging to Government Departments (refer to **Figure 4.7**).



Figure 4.6 Detail of 1854 Plan of Newcastle

The plan shows the boat harbour next to the Watt Street wharf. This was filled in by the late 1850s.

Source: Newcastle Regional Library.

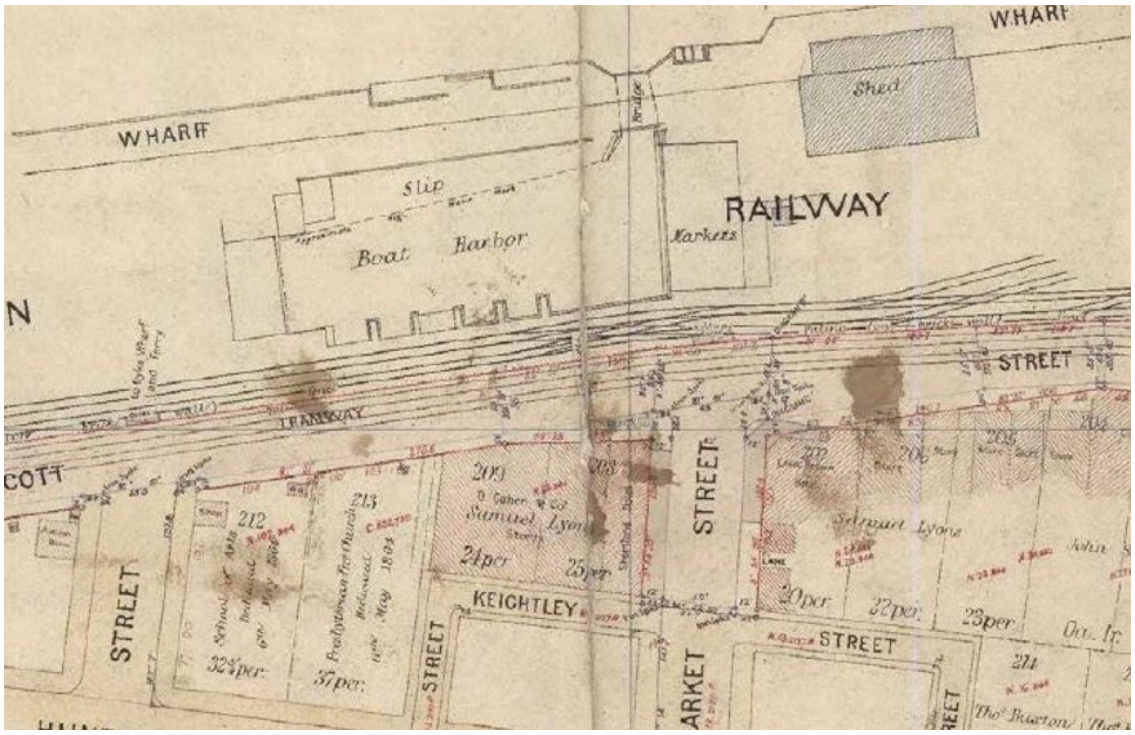


Figure 4.7 Detail of Crown Plan 22-2137 showing the Market Street Boat Harbour

This plan shows the slipway on the northern side and the small finger wharves on the southern side. The market building is also shown on the eastern shore.

Source: LPI.

4.3.2 Perkins Street Boat Harbour

In 1899 work began on the construction of a new boat harbour close to Perkins Street. While work progressed slowly, the market wharf boat harbour continued to serve the river trade until 1901, when the railway commissioners began to plan for the expansion of the railway. Although the markets and boat harbour were managed by the Borough of Newcastle, the land was in the ownership of the railways. The bottom of the new Perkins Street harbour was lined with concrete blocks lowered in by crane, with the sides lined with sandstone, while the old harbour was filled in. Sheds from the old market were relocated to the new boat harbour.

The Perkins Street boat harbour continued to provide shelter to boats until it too was removed in 1960, with resumptions along the foreshore and the boat harbour replaced by a car park (refer to **Figure 4.8**).

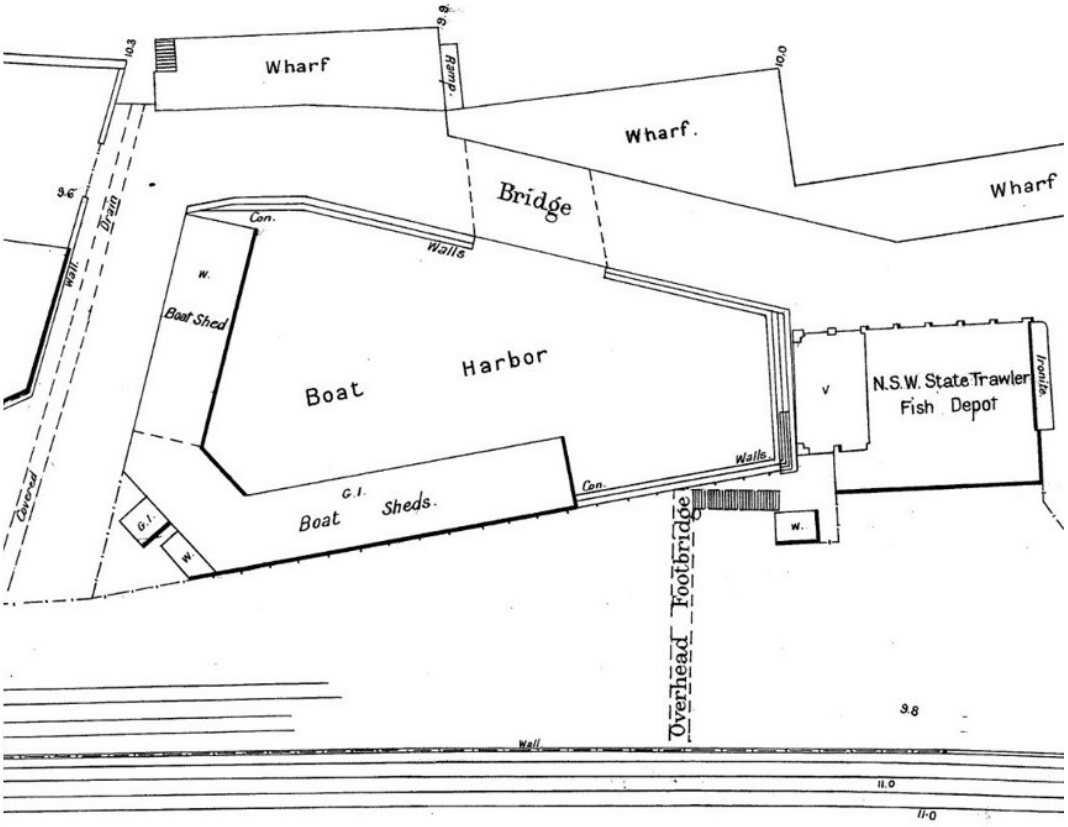


Figure 4.8 Newcastle and Suburbs Sheet 013 – City of Newcastle 1917–1923

Image shows a detail of the Perkins Street Boat Harbour.

Source: Newcastle Cultural Collections.

4.4 Railyards

By the 1860s the area of reclamation of the Foreshore area from the end of Watt Street east towards the Breakwater (Macquarie Pier) had increased in size considerably with the Queens Wharf area at the end of Watt Street being resumed by this time. The Illustrated Sydney News and New South Wales Agriculturalist and Grazier (8 April 1875) reported that:

> *There was little improvement in wharf accommodation till the railway was commenced in 1855. In 1858, it became necessary to reclaim the land for the Railway terminus, and to lay down sidings for the shipment of coal. Sand was rolled down the space over which the tide flowed, up to the upper line of Scott-street, and was filled up to the Market Wharf.*

In the 1870s industrial rail workshops (including carriage sheds) were established at Newcastle (the Honeysuckle Point Locomotive Workshops) both to secure increased accommodation for the rolling stock used on the Great Northern line and in recognition of the facilities required to handle Newcastle's coal traffic. With no rail link to connect the Sydney and Newcastle rail systems until 1889 when the new bridge across the Hawkesbury from Brooklyn was constructed, the Honeysuckle Workshops were established separately from (but ran contemporaneously with) from Redfern/Eveleigh (Otto Cserhalmi + Partners P/L 2002).

As Newcastle Station and the wharf railyards to the east became increasingly busy additional carriage sheds were constructed to the east of the Honeysuckle Workshops. The 1880s saw rapid growth of the railway workshops in Newcastle in response to the expansion of the rail system, port and wharf; including increased coal (and other goods such as wool) and passenger traffic.

Extensive rail yards were established in the area of current Foreshore Park, in addition to the Zaara Street Power Station which was commissioned in 1915 and demolished in 1978 (refer to **Figure 4.9** to **Figure 4.13**).

The redevelopment of the rail yard and Power Station area into the current Harbour Foreshore Park was one of Newcastle's high profile projects for Australia's Bicentennial Celebration (1988). The Bicentennial Project extensively re-landscaped the entire Foreshore area, including the planting of 447 trees (Placemark 2017).

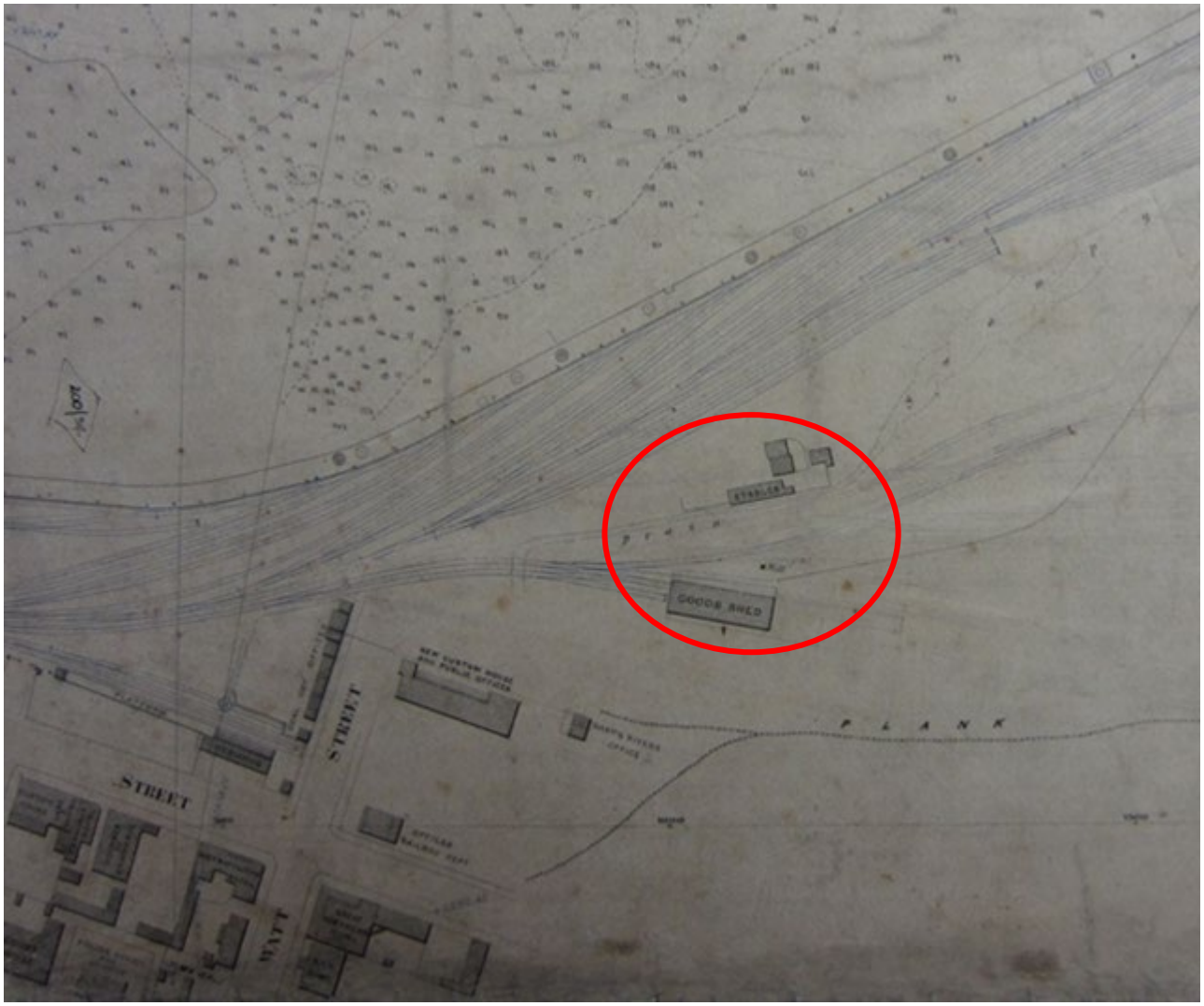


Figure 4.9 Detail of 1874 Plan of the Government Railway

Detail shows rail lines, Goods Shed, stables and other structures within the Foreshore Park area (circled).

Source: State Records NSW Plan 1314 / Higginbotham 2013.



Figure 4.10 Detail of approximately 1875 lithographic view of Newcastle

Detail shows the development of the foreshore area in railyards following reclamation.

Source: State Library of NSW.

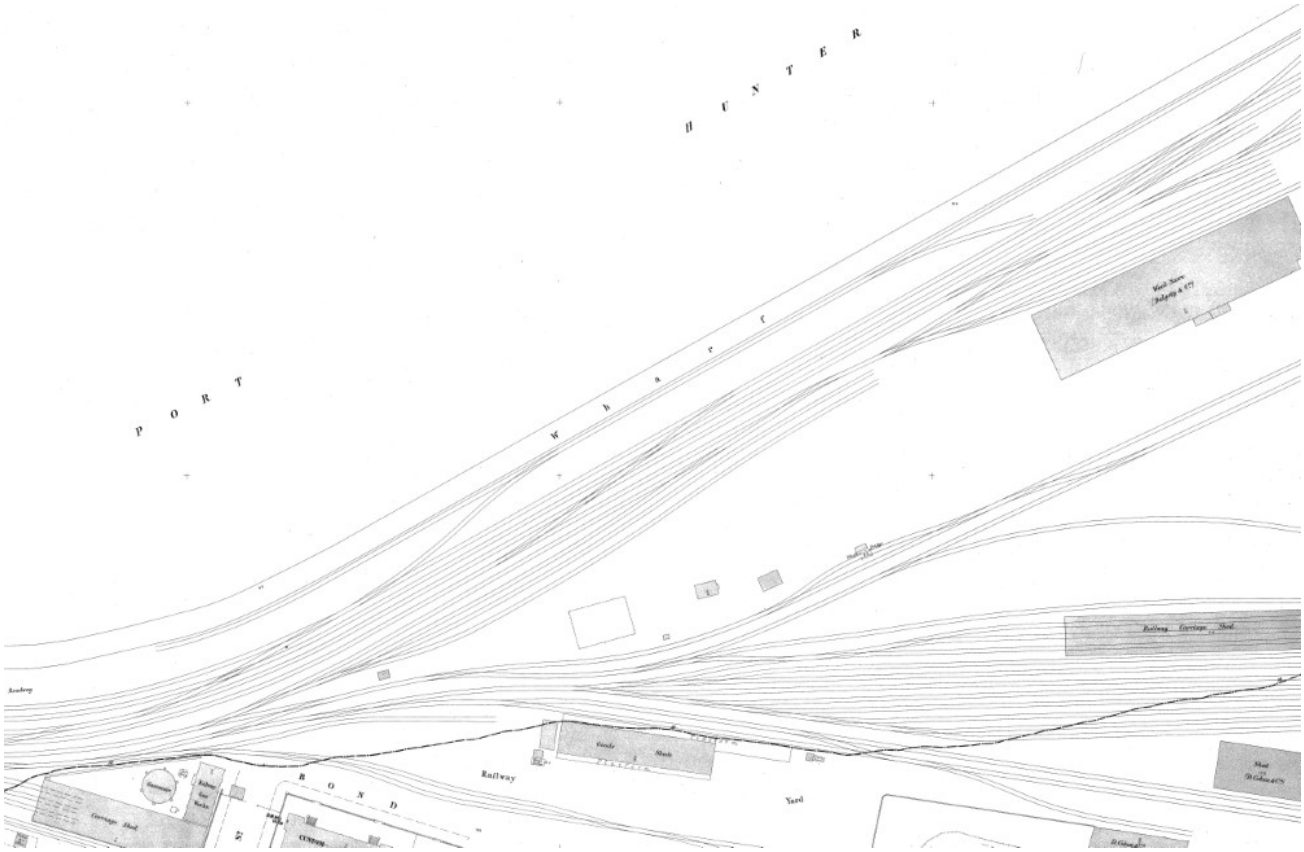


Figure 4.11 Detail of 1895–1897 Newcastle Detail Series

Detail shows the railyards and sheds in current Foreshore park area.

Source: Hunter Living Histories.

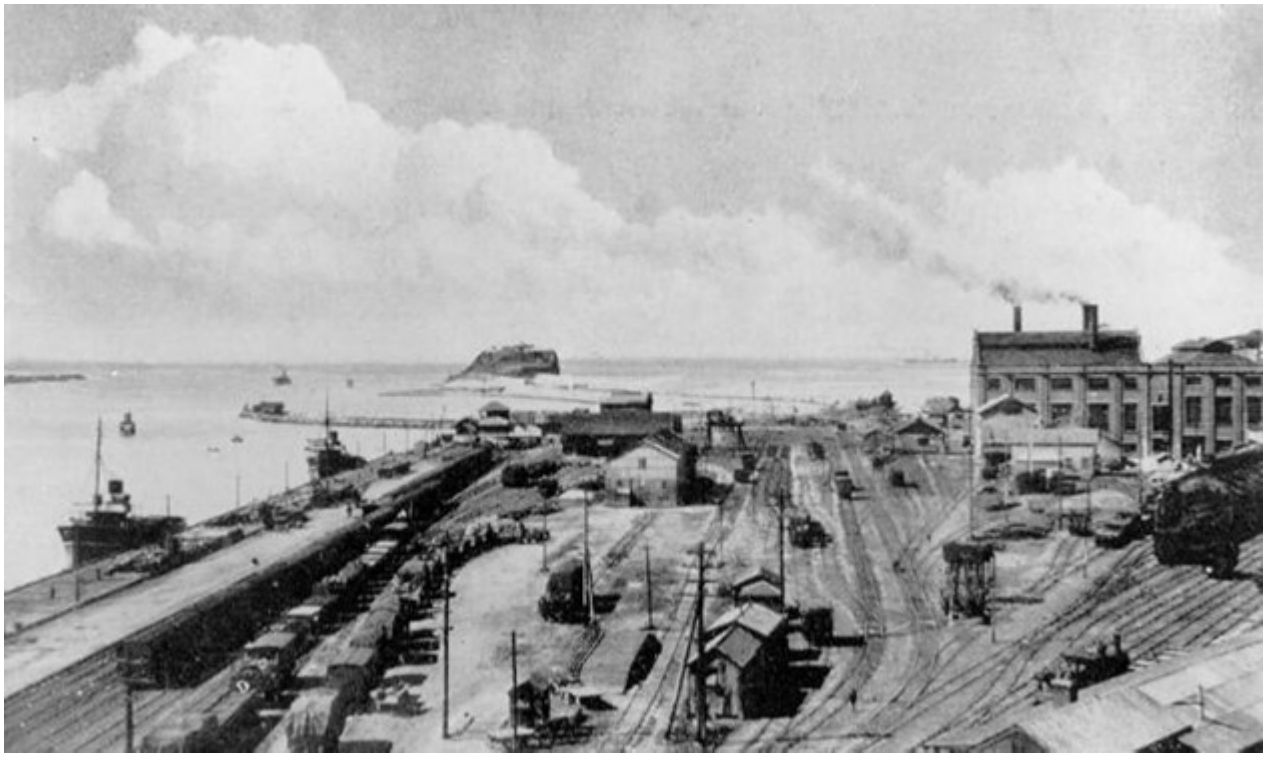


Figure 4.12 Detail of 1924 Photograph

Detail shows the rail yards on Wharf Road and in Foreshore Park area.

Source: Hunter Photobank 09600056.

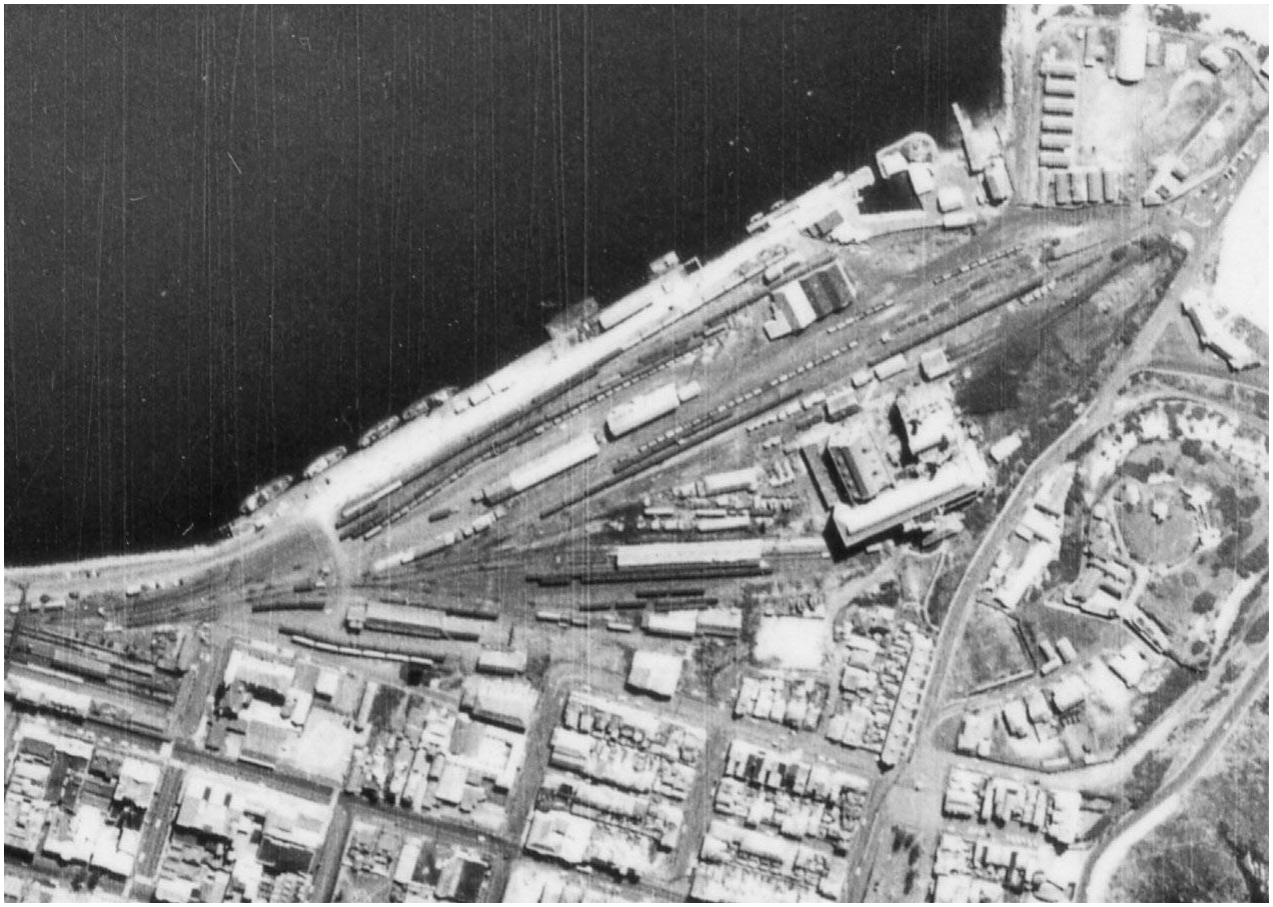


Figure 4.13 Detail of 1966 Aerial Photograph

Detail shows the extensive railyards and the Zaara Street Power Station in the current Foreshore Park area.

Source: Hunter Living Histories.

5.0 Site Evaluation

The project area is located entirely within the western portion of Foreshore Park. As discussed, Foreshore Park was extensively re-landscaped in the late 1980s as one of Newcastle's high profile projects for Australia's Bicentennial Celebration.

Table 5.1 provides select photographs of the project area.

Table 5.1 Project Area Photographs

Photographs	
 View to southwest along northern boundary of project area. Project area on left of image. Wharf Road carpark (constructed 2017) on right.	 View to west showing current play ground equipment
 View to northeast showing Landscaping within Foreshow Park / the project area	 View to southwest along southern boundary of project area. Project area on right.

Photographs



View to northeast across project area



View to south showing existing amenities building



View to northeast along northern boundary of project area



View to southeast across project area towards existing playground equipment (behind trees in background). Note existing utilities within project area.

6.0 Aboriginal Archaeology

As discussed in **Section 2.0**, a search of the Aboriginal Heritage Information Management System (AHIMS) identified no Aboriginal sites within or in the immediate vicinity the project area.

6.1 Due Diligence Assessment

The National Parks and Wildlife Act Regulation 2019 (the Regulation) identifies that compliance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* is taken to constitute due diligence in determining whether a proposed activity will harm an Aboriginal object. Section 87(2,4) of the NSW *National Parks and Wildlife Act 1974* establishes that it is a defence to prosecution under Section 86(2) (the strict liability offence) if due diligence was exercised to reasonably determine that the activity or omission would not result in harm to an Aboriginal object. The following section discusses Aboriginal cultural heritage in consideration of the due diligence code.

6.1.1 Assessment of Aboriginal Archaeological Potential

Section 8 of the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* outlines the process to guide due diligence assessments, summarised below in relation to the proposed works.

Will the activity disturb the ground surface or any culturally modified trees?

Yes. The proposed works will involve ground disturbance within the project area. However, the project area comprises reclaimed land, with land reclamation primarily occurring from the mid nineteenth century. Prior to land reclamation, the project area was located within the harbour; to the north of the original shoreline which ran along what is now the southern side of Scott Street, crossing the Newcastle Railway Station site and following the approximate line of Bond Street and Stephenson Place.

The project area does not contain any original vegetation. There is no potential for culturally modified (carved or scarred) trees to be impacted by the current proposal.

Are there any:

a) Relevant confirmed site records or other associated landscape feature information on AHIMS?

b) Any other sources of information of which a person is already aware?

As discussed, a search of AHIMS identified no site records or other associated landscape feature information on AHIMS within the project area and immediately surrounding area. Sites are located to the south on what was the foreshore area (refer to **Figure 2.1**).

c) Landscape features that are likely to indicate the presence of Aboriginal objects?

The due diligence code identifies landscape features that indicate the likely existence of Aboriginal objects as including areas located on a ridge top, ridge line or headland, within a sand dune system and/or within 200 metres of waters on land that is not disturbed land.

The project area is located approximately 70 metres south of the current alignment of the harbour. Prior to modification (reclamation) of the area, the project area would have located entirely in the harbour / within the Hunter River (based on historical mapping). From the mid-1800s the area has been extensively modified through reclamation. As such the project area is located within an artificial landform created as a result of land reclamation.

In accordance with Clause 80B of the National Parks and Wildlife Regulation, land is defined as disturbed if it has been the subject of human activity that has changed the earth's surface, being changes that remain clear and observable. The area of proposed works meets the description of disturbed land. Under Step 2B of the due diligence code, the area therefore does not meet the definition of a landscape feature likely to indicate the presence of Aboriginal objects.

On the basis of the information presented above, it is considered that there is a low likelihood that the proposed works will result in harm to Aboriginal objects. In accordance with the due diligence code, it is assessed that no further Aboriginal heritage investigations are required, and works can proceed with caution.

In accordance with the controls of Section 5.04.01 (Due diligence and development assessment) of the Newcastle Development Control Plan (NDCP) 2012 it is noted that an Aboriginal Heritage Impact Permit (AHIP) is not required.

In the unlikely event that unexpected Aboriginal archaeological objects are encountered during the course of works, recommendations in **Section 8.0** will apply.

7.0 Historical Archaeological Potential

Historical archaeology in Australia generally relates to the study of the past using physical evidence in conjunction with historical sources. Historical archaeology is generally defined as comprising the period since European arrival in Australia in 1788.

An archaeological resource is the physical evidence of the past and may comprise sub-surface evidence including building foundations, occupation deposits, features, and artefacts. The historical archaeological potential of an area is the likelihood that there may be physical evidence relating to earlier phases of development and occupation beneath the current footprint of the site.

7.1 Newcastle Archaeological Management Plans

As discussed in **Section 3.0**, the NAMP 1997 and the AMP Review discuss the potential for evidence of pre-reclamation wharfage and boat harbours and the railway sidings located along the river frontage following reclamation.

7.2 Archaeological Potential of the Project Area

The archaeological potential of the project area comprises two main periods of historical use:

- Pre-reclamation.
- Post reclamation.

7.2.1 Pre-reclamation

Much of the reclamation of the east Newcastle foreshore was carried out by the dumping of ballast from visiting ships, both domestic and international. Alternatively, ballast was reportedly used to form a wall behind which sand and silt were pumped from harbour dredges to form newly reclaimed land.

Deep sewer and stormwater works in Scott Street during construction of the Newcastle Light Rail exposed extensive deep reclamation fill west of Watt Street in the original foreshore area. Similar evidence of reclamation fill to that exposed during the Light Rail project was exposed within the former Bus Depot area to the rear of Newcastle Station during Hunter & Central Coast Development Corporation's Public Realm Landscaping Project (Umwelt 2021). The reclamation fill essentially comprises sandstone rubble in a silty sand to depths of over two metres (refer to **Table 7.1**).

While no evidence of early boat harbours, jetties or the early enclosing of the harbour foreshore has been exposed during works in the area, it is noted that the project area crosses the former location of the jetty connecting the 1833 constructed ballast wharf to the shoreline. The jetty was likely constructed by 1840 (refer to **Figure 7.1**). Dependant on Hunter Water's requirements for the existing sewer there is potential for deep excavation associated with connecting (or relocating) the sewer to expose remains of the 1840s jetty.

Table 7.1 Archaeological Evidence of Reclamation

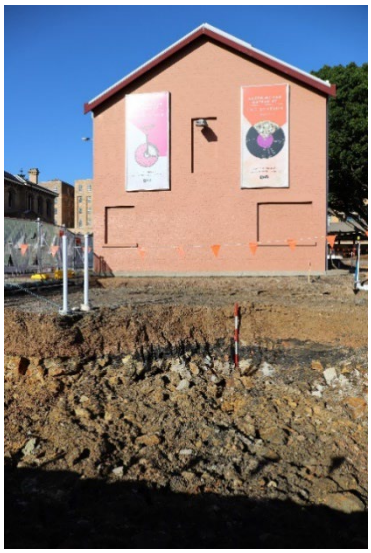
Archaeological Evidence of Reclamation	
 View to east towards Watt and Scott Street intersection showing sandstone rubble reclamation fill beneath Scott Street. Newcastle Station is immediately to left of photograph.	 View to south, west of the intersection of Scott and Bolton Streets, showing sand and silt reclamation fills beneath Scott Street immediately adjacent to Newcastle Station. Scale = 2 metres
 View to south showing excavation alongside Watt Street. Top of rubble reclamation fill exposed beneath compact gravel hard stand base. Scale = 500 millimetres	 View to south showing excavation alongside Watt Street. Top of rubble reclamation fill exposed beneath compact gravel hard stand base. Scale = 500 millimetres



Figure 7.1 Detail of 1846 Plan of the City of Newcastle

Project area shown in red outline. Note location of jetty connecting the Ballast Wharf to the shoreline.

Source: Newcastle Regional Library – Local Studies Section LHMB 333.3/16.

7.2.2 Post Reclamation

By the 1870s extensive rail yards were established in the area of current Foreshore Park; with rail lines, a weigh bridge, goods shed (including associated platform) and other likely shed-like structures located within the project area (refer to **Figure 7.2**).

Archaeological monitoring was undertaken of the civil works required for the circuit of the inaugural Newcastle 500 Supercars event in 2017; including along Wharf Road and within Foreshore Park. An approximately 45 by 6 metre area of concrete footings was exposed along the south side of Wharf Road, on the northern edge of Foreshore Park. The footings were likely associated with a wool store located at the end of the former wharf area wool sidings. In addition, a valve associated with the former Zaara Street Power Station, a rail siding concrete pad and a brick stormwater pit were exposed (refer to **Table 7.2**).

Archaeological evidence of railway sheds have also been exposed recently:

- The redevelopment of Civic Station undertaken as part of the Museum Precinct exposed the brick footing of the 1872 constructed Carriage Shed (Umwelt 2020a).

- Archaeological evidence of the 1880s constructed carriage shed was exposed at 4 Merewether Street (Umwelt 2020b).
- Archaeological evidence of the footings of an 1880s Rail Carriage Shed was exposed within Newcastle Station during Hunter & Central Coast Development Corporation's Public Realm Landscaping Project (Umwelt 2021).

Such archaeological evidence confirms the accuracy of the historical plans, photographs and descriptions of the construction of rail yard sheds in newspapers such as the Maitland Mercury and Hunter River General Advertiser, in particular the detailed 1890 Waterboard plans (refer to **Figure 7.2**). In 1890 the Survey Section of the Land Department was commissioned by the Hunter District Water Board produce the series of large-scale plans of urban Newcastle, for planning purposes. The first plans were produced in 1894 and show detailed footprints of buildings present at the time. Some of the plans were later revised to reflect an approximately 1920 footprint. The plans cover a large portion of Newcastle, from the east end as far west as Lambton, providing accurate information of all buildings (and other features such as wells and cisterns) present at the time (Russell Rigby 2019).

As such, additional similar archaeological remains are considered likely to only be able to provide limited new information and are unlikely to be considered of high research potential or significant archaeological 'relics'.

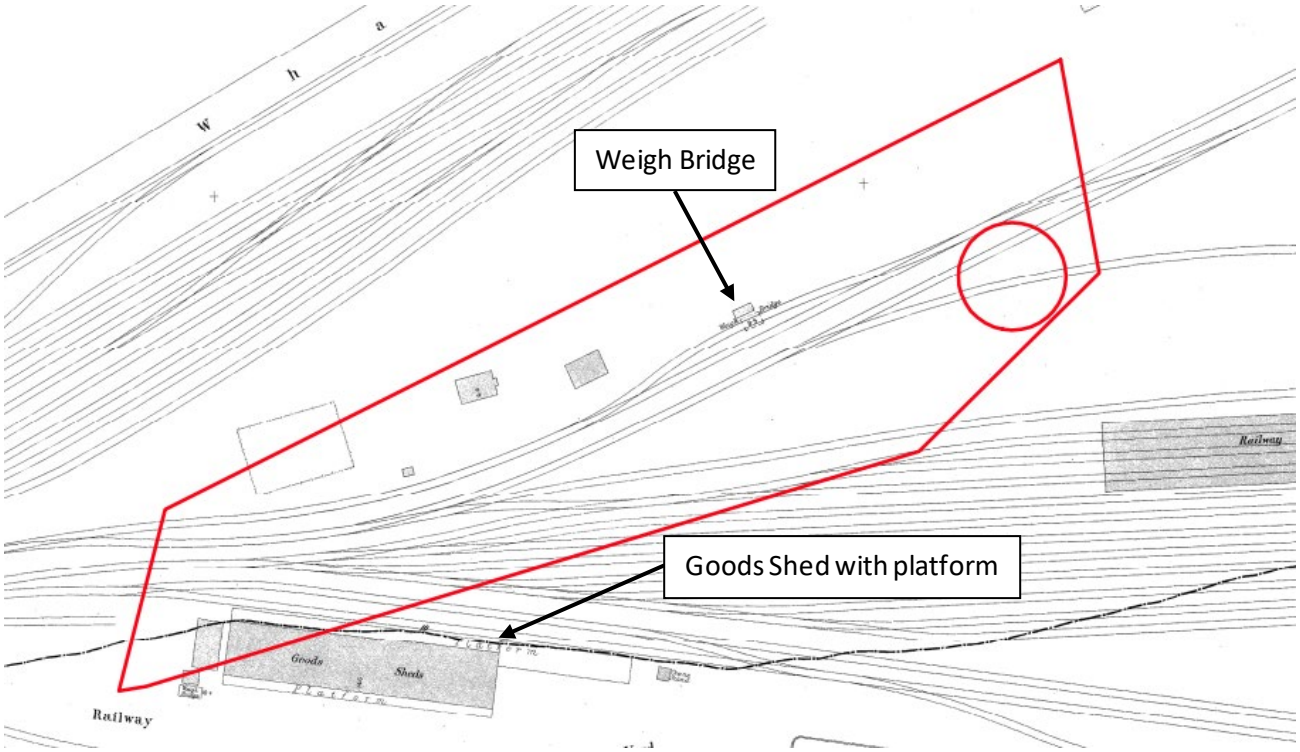
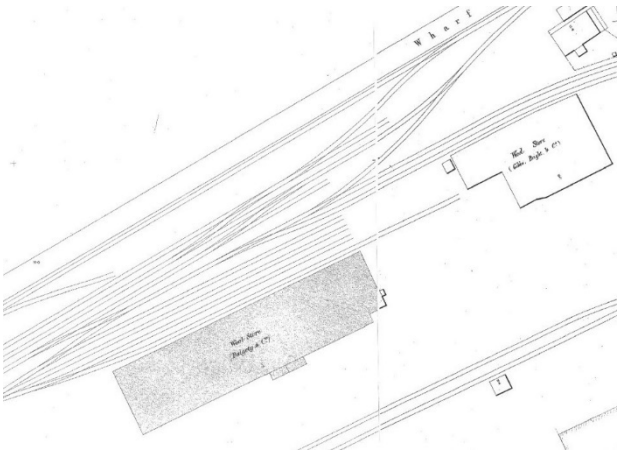


Figure 7.2 Detail of 1895–1897 Newcastle Detail Series

Project area outlined red.

Source: Hunter Living Histories.

Table 7.2 Former Railyard Archaeological Remains

Former Railyard Archaeological Remains	
 View to west showing area of strip footings exposed in Foreshore Park Road in 2017	 View to northwest showing concrete lined pit and adjacent machine bases exposed in Foreshore Park Road in 2017
 Detail of 1890s Hunter District Water Board Plan showing former structures and rail lines located within Foreshore Park to the east of the project area. The concrete footings exposed during construction (2017) of the carparks in Foreshore Park along Wharf were likely the footings of the large shed at the bottom of the image. No rail lines were exposed – these were likely entirely removed during the landscaping for the Bicentennial.	 View to northeast showing large concrete pad exposed in Foreshore Park Road in 2017 (Scale = 2 metres)

Former Railyard Archaeological Remains	
	
View to north showing concrete lined pit with a cast iron valve exposed in Foreshore Park Road in 2017. The valve is likely associated with the Zaara Street Power Station inlet and outlet water cooling channels.	Stormwater pit exposed in Foreshore Park Road in 2017. (Scales = 1 metre)

7.3 Heritage Act Relics Provision

Historical archaeological potential is defined as the likelihood that a site may contain physical evidence related to an earlier phase of occupation, activity, or development. Physical evidence of an archaeological site could be in the form of building foundations, occupation deposits, features and artefacts. Archaeological resources are irreplaceable. They have the potential to contribute to our knowledge and understanding of early history using information that is unavailable from other sources.

However, some below ground archaeological remains are not considered to be relics; but are instead referred to as works or engineering works. Examples of items that can be considered works rather than relics include culverts (drains), historic road formations, historic pavements, buried roads and tramlines or rail lines (RMS 2015 and Higginbotham 2013). Although an approval under the relics provisions of the Heritage Act may not be required, any such archaeological remains still need consideration of appropriate management dependant on their significance. Although an item may not be considered a relic itself, relics may be present associated with it (for example in the form of artefacts).

7.4 Conclusion

The potential below ground archaeological remains within the project area are likely limited to evidence of:

- Post reclamation rail yard structures.
- Reclamation fill.
- Pre-reclamation evidence of the enclosing of the harbour.

It is noted that any reclamation fill is likely to be of considerable depth. Preliminary geotechnical investigation for the project area identified fill depths of between 1.2 to 4.6 metres (Douglas Partners 2021). We understand additional geotechnical investigation is proposed. The results of the investigation should be considered in terms of potential depths and locations of deep reclamation fill.

There is not considered to be potential for significant artefacts (associated with public refuse disposed into the harbour during its use or remediation of the harbour). The majority of the proposed works are unlikely to be of sufficient depth to expose refuse deposited during its use.

In relation to the potential to expose archaeological remains the proposed works are generally considered to be minor in nature with limited depth of below ground disturbance except for the potential sewer works and any deep remediation that may be required. It is considered unlikely that significant historical archaeological 'relics' will be exposed during the proposed works.

However, it is acknowledged this does not negate the potential for archaeological remains to be exposed associated with a pre-reclamation 1840s jetty (refer to **Figure 7.1**), reclamation fill or the post reclamation railyards to be present.

With the exception of the 1840s jetty, such archaeological remains are not expected to be intact or of high research potential and are considered likely to only be able to provide limited new information at best.

It is appropriate for the proposed works to be undertaken in accordance with an exception to subsections 139(1) and (2) of the Heritage Act 1977; with this report as supporting documentation.

7.4.1 Exception to S139(1) and (2) of the Heritage Act 1977

An exception from the requirement for an excavation permit can be granted for disturbance or excavation of land, provided it is for minor works that have minimal impact on relics of local heritage significance.

Minor works with limited impact are considered to comprise works having a small or negligible impact on relics of local heritage significance.

This can be demonstrated by addressing that either:

- the scale or nature of the proposed excavation, regardless of the depth, would not adversely affect the relics and deposits or
- only affect less important areas of an archaeological site and not areas of highest potential (e.g., cesspits, occupation deposits, wells) or
- the scale of works is otherwise consistent with a limited impact, when the precise location of the archaeological relics is known, the area affected by the works is a small portion of the total known area of potential for relics.

Heritage NSW guidelines state that if works are considered to be minor and have a limited impact on relics of local heritage significance, this decision must be documented, in addition to the works themselves, and the records kept for a reasonable time in accordance with the general conditions as gazetted 18 February 2022 (Government Gazette of the State of New South Wales Number 59–Planning and Heritage).

8.0 Conclusions and Recommendations

It is determined that:

- The proposed activities can proceed with caution without requiring further Aboriginal heritage investigations.
- The proposed works should be undertaken in accordance with an exception to subsections 139(1) and (2) of the Heritage Act 1977; with this report as supporting documentation.
- Dependant on Hunter Water's requirements for the existing sewer there is potential for deep excavation associated with connecting (or relocating) the sewer to expose remains of the 1840s jetty. It is noted that any other deep excavation or remediation work also has the potential to expose pre-reclamation remains. The results of the proposed additional geotechnical investigation may provide further information relating to the potential for the 1840s jetty.

As such, the proposed works can proceed without any further historical archaeological or Aboriginal archaeological management being undertaken with the exception of the following recommendations:

- The proposed works should be undertaken in accordance with an exception to subsections 139(1) and (2) of the Heritage Act 1977; with this report as supporting documentation.
- Deep excavation associated with the connection (or relocation) of the sewer should avoid, if possible, the former location of the 1840s jetty structure (refer to **Figure 7.1**). If deep excavation in the former location of the jetty can not be avoided an archaeologist should be consulted with to determine the appropriate archaeological management.
- In the event that any potential archaeological 'relics' are discovered during works all work in the area shall cease immediately and a qualified archaeologist will be consulted to determine an appropriate course of action prior to the recommencement of work in the area.
    - In accordance with an exception to subsections 139(1) and (2) of the *Heritage Act 1977* this will likely comprise archaeological documentation.
- All parties involved in the works must aware that it is an offence under Section 86 of the NPW Act to harm or desecrate an Aboriginal object unless that harm or desecration is the subject of an Aboriginal Heritage Impact Permit.
- In the event that any Aboriginal objects are identified within the area of works, works within the immediate vicinity of the Aboriginal object should cease and a suitably qualified archaeologist should be contacted to confirm the validity of the object. Should the object be confirmed to be of Aboriginal cultural origin, Heritage NSW must be notified so that appropriate management strategies can be identified.
- In the unlikely event that a potential burial site or potential human skeletal material is exposed, work in the vicinity of the remains is to halt immediately to allow assessment and management. If the remains are suspected to be human, it will be necessary to contact local police and Heritage NSW to determine an appropriate course of action.

9.0 References

Douglas Partners 2021. Preliminary Geotechnical Investigation and Waste Classification, Harbour Foreshore Masterplan Wharf Road, Newcastle.

Higginbotham E. 2013 Newcastle Archaeological Management Plan Review – Draft document.

Otto Cserhalmi + Partners P/L 2002. Eveleigh Locomotive Workshops Conservation Management Plan.

Russell Rigby 2019. The Hunter District Water Board Plans of the 1890s A Presentation to the Hunter Living Histories Initiative. https://hunterlivinghistories.com/2019/06/07/hdwb/. Accessed 8 August 2019.

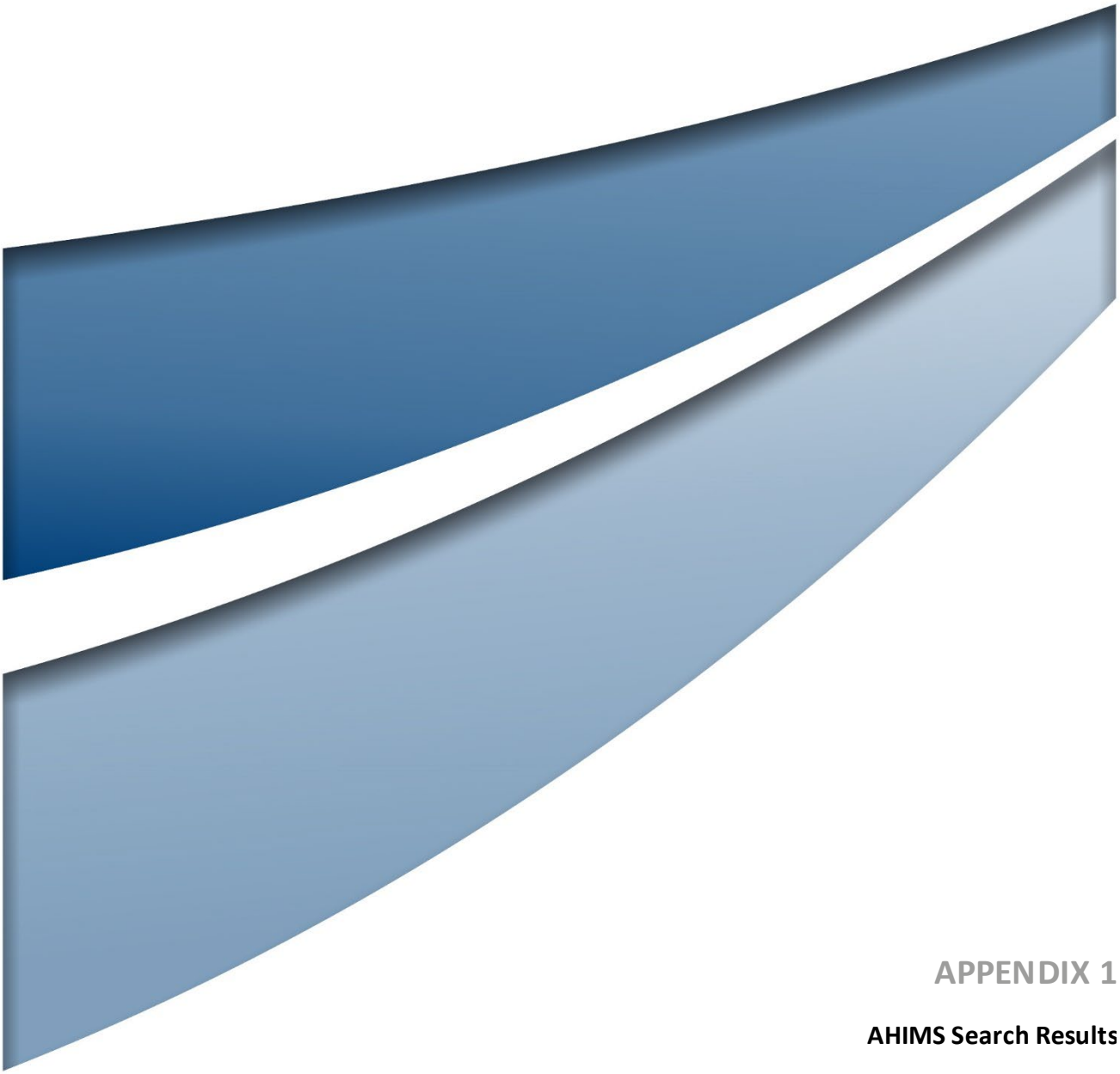
Suters Architects and Planners, Lavelle, S., C and MJ Doring Pty Ltd and Turner, J, 1997. Newcastle Archaeological Management Plan prepared for Newcastle City Council.

Umwelt 2020b. Archaeological Report Newcastle Light Rail Project.

Umwelt 2020c. Archaeological Report Former Civic Station 430 Hunter Street Newcastle.

Umwelt 2020d. Archaeological Report 4 Merewether Street Newcastle, NSW.

Umwelt 2021 Newcastle Railway Station Additional Group Archaeological Report (S^)/2020/006).



APPENDIX 1

AHIMS Search Results

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : 22455

Client Service ID : 688322

Umwelt (Australia) Pty Limited - Individual users

Date: 03 June 2022

75 York Street
Teralba New South Wales 2284

Attention: [redacted]

Email: [redacted]

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -32.92632, 151.78556 - Lat, Long To : -32.92512, 151.78763, conducted by Alison Fenwick on 03 June 2022.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

1	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Level 6, 10 Valentine Ave, Parramatta 2150
Locked Bag 5020 Parramatta NSW 2124
Tel: (02) 9585 6345

ABN 34 945 244 274
Email: ahims@environment.nsw.gov.au
Web: www.heritage.nsw.gov.au

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 22455

Client Service ID : 688853

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
38-4-1695	11-15 Watt St IF 1	AGD	56	386381	6356080	Open site	Valid	Artefact : -		

Contact	Recorders	[redacted]	Permits	3814,3966

**** Site Status**

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 06/06/2022 for Alison Fenwick for the following area at Lat, Long From : -32.92632, 151.78556 - Lat, Long To : -32.92512, 151.78763. Number of Aboriginal sites and Aboriginal objects found is 1

This information is not guaranteed to be free from error omission. Heritage NSW and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

AHIMS Web Services (AWS)

Note: This Excel report shows the sites found in AHIMS on the 06/06/2022. If this date is not the same as the original date of the Search Results letter obtained during the Basic Search, then the search results might be different. The PDF version of this report will always coincide with the Basic Search Results letter.

Site ID	Site name	Datum	Zone	Easting	Northing	Context	Site status	Primary contact	Site features	Site types	Recorders	Reports	Permits	Longitude GDA94	Latitude GDA94
38-4-1695	11-15 Watt St IF 1	AGD	56	386381	6356080	Open site	Valid		Artefact : -		[redacted]		3814,3966	151.79	-32.93

Report generated by AHIMS Web Service on 06/06/2022 for Alison Fenwick for the following area at Lat, Long From : -32.92632, 151.78556 - Lat, Long To : -32.92512, 151.78763. Number of Aboriginal sites and Aboriginal objects found is 1

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.



umwelt
Environmental & Social
Consultants

Umwelt (Australia) Pty Limited
T| 1300 793 267 E| info@umwelt.com.au www.umwelt.com.au

Appendix D

Contamination Report

Douglas Partners

Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Preliminary Geotechnical Investigation and Waste Classification

Harbour Foreshore Masterplan
Wharf Road, Newcastle

Prepared for
City of Newcastle

Project 102159.00
February 2021



Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	102159.00	Document No.	001.Rev0.docx
Document title	Report on Preliminary Geotechnical Investigation and Waste Classification Harbour Foreshore Masterplan		
Site address	Wharf Road, Newcastle		
Report prepared for	City of Newcastle		
File name	102159.R.001.Rev0.docx		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Revision 0	[redacted]	[redacted]	15 February 2021

Distribution of copies

Status	Electronic	Paper	Issued to
Revision 0	1	0	[redacted], City of Newcastle

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author	[redacted]	15 February 2021
Reviewer	[redacted]	15 February 2021

bsi. ISO 9001 Quality Management
FS 604853

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au
15 Callistemon Close
Warabrook NSW 2304
PO Box 324
Hunter Region Mail Centre NSW 2310
Phone (02) 4960 9600

Table of Contents

Page

1. Introduction 1
2. Proposed Development 2
3. Site Description 2
4. Published Data 3
   4.1 Geology 3
   4.2 Hydrogeology 3
   4.3 Acid Sulfate Soils 3
5. Review of Existing Documentation and Information 3
   5.1 Introduction 3
   5.2 Annexure 1 - Contamination Management Plan (CN, 2006) 4
   5.3 Annexure 2 – Water Harvesting and Reuse Project 5
   5.4 Annexure 3 – RCA August 200 – Honeysuckle 5
   5.5 Annexure 4 – Remediation Action Plan, former Fisherman's Co-op Newcastle (RCA, 2000) 6
   5.6 Annexure 5 – Additional Groundwater Contamination Assessment (DP, 1997) 6
   5.7 Annexure 6 –Geotechnical and Contamination Assessment (DP, 1996) 7
   5.8 Targeted Site Investigation, Surplus Rail Lands (DP, 2016) 7
   5.9 Discussions with Council Staff 8
6. Site Walkover 8
7. Preliminary Conceptual Site Model 13
8. Sampling and Analysis Quality Plan 15
   8.1 Data Quality Objectives 15
   8.2 Soil Sampling Rationale 15
9. Field Work 16
   9.1 Field Work Methods 16
   9.2 Field Work Results 16
   9.3 Quality Assurance / Quality Control 17
      9.3.1 Field QA / QC 17
      9.3.2 Laboratory QA/QC 17
10. Laboratory Testing 18
   10.1 Contamination 18
   10.2 Acid Sulfate Soils 18

11. Discussion - Contamination 19
11.1 Soils 19
11.2 Waste Classification 20
11.3 Acid Sulfate Soils 20
11.4 Data Quality Assurance and Quality Control 20
12. Discussion - Geotechnical 21
13. Conclusions and Recommendations 21
14. References 22
15. Limitations 23

Appendix A: About This Report
Sampling Methods
Soil Descriptions
Symbols and Abbreviations
Borehole Logs – Bores 1 to 12
Appendix B: Table B1 - Summary of Results of Soil Analysis – TRH, BTEX, PAH, Metals
Table B2: Summary of Results of Soil Analysis – OCP, OPP, PCB and Asbestos
Table B3: Summary of Results of Soil Analysis - Waste Classification Assessment
Table B4: Summary of Results of Soil Analysis – Water Leach Testing
Table B5: Summary of Results of Soil Analysis – Acid Sulfate Soils
Laboratory Report Sheets
Appendix C: Field Work Methods
Data Quality Report
Data Quality Objectives
Site Assessment Criteria
Chain of Custody (Field and Despatch)
Sample Receipt
Appendix D: Drawing 1 – Test Location Plan;

Report on Preliminary Geotechnical Investigation and Waste Classification
Harbour Foreshore Masterplan
Wharf Road, Newcastle

1. Introduction

This report presents the results of a preliminary geotechnical investigation and waste classification undertaken for the harbour foreshore masterplan at Wharf Road, Newcastle. The investigation was commissioned via letter of agreement 2021/044Q dated 18 September 2020 from City of Newcastle (CN) and was undertaken with reference to Douglas Partners Pty Ltd (DP) proposal NCL200384 dated 10 July 2020.

It is understood that the proposed development of the site includes renewal of public infrastructure and parklands to Wharf Road and Argyle Street, Newcastle.

The aim of the investigation was to assess the subsurface soil and groundwater conditions at locations nominated by the client in order to provide:

- An understanding of geotechnical properties of mounding at the nominated locations;
- Preliminary waste classification of fill soils with reference to NSW EPA (2014a);
- An understanding of groundwater levels;
- Recommendations for reuse of fill/soils;
- Preliminary advice on remediation options, if required.

The investigation included the following scope of work:

- Brief review of the previous investigation reports supplied by CN;
- Review of the previous investigation reports undertaken by DP within and in the vicinity of the proposed investigation area;
- Site inspection to identify areas of potential contamination and assess current site condition;
- Professional service locating of underground utility services in the vicinity of the proposed borehole locations;
- Drilling of twelve boreholes at locations nominated by CN.;
- Laboratory analysis of selected soil samples for preliminary assessment of contamination conditions and waste classification;
- Acid Sulfate Soil (ASS) screening tests and detailed chromium suite testing of selected soil samples to provide a preliminary assessment of ASS conditions within the proposed development area;
- Preparation of this report presenting the results of the assessment including comments on those points listed above.

2. Proposed Development

The proposed development includes the renewal of public infrastructure and parklands at Wharf Road and Argyle Street, Newcastle, including:

- Urban renewal to Wharf Road including shared pathway;
- Potential public utilities adjustments, but retention of overhead powerlines;
- New trees, landscape and streetscape features, public open space and street furniture – existing trees to be retained where practicable;
- Parkland renewal including a regional playspace;
- A cycleway connecting the broader cycleway network plan;
- New drainage infrastructure including water-sensitive urban design;
- Lighting upgrade and smart city upgrades.

3. Site Description

The overall site extent, as provided by CN, is presented in Figure 1 below.



Figure 1: Harbour Foreshore Masterplan site area (in red)

Table 1 presents site identification details.

Table 1: Site Identification

Item	Details
Allotment Identification	Various
Street Address	Wharf Road and Argyle Street
Locality	Newcastle, NSW
Site Area	14 ha approx.
Local Government Area	Newcastle
Zoning	RE1 Public Recreation
Planning Instrument(s)	Newcastle City Council Local Environment Plan
Current Landuse	Recreational, open space, road reserve
Current Owner	City of Newcastle

Subsurface investigation for the current assessment was limited to the Foreshore Park area and the Foreshore Footpath area east of the Queens Wharf Hotel as nominated by CN (refer to Drawing 1 in Appendix D.

4. Published Data

4.1 Geology

Reference to the 1:100 000 Newcastle Coalfield Regional Geology map indicates that the majority of the site is underlain by quaternary alluvium generally comprising gravel, sand, silt and clay. The exception to this is the south-eastern and southern extents of the site within Foreshore park, which is underlain by the Permian aged Lambton subgroup of the Newcastle Coal Measures, which generally comprises sandstone, siltstone, claystone, coal and tuff.

4.2 Hydrogeology

The regional groundwater flow regime is believed to be towards the Hunter River (Newcastle Harbour) located immediately adjacent to the north-western portion of the site and approximately 160 m north-west of the remainder of the site. This water body is considered to be the nearest sensitive receptor. Based on site topography the depth to groundwater is likely to be within approximately 2 m depth from the ground surface. It should be noted that groundwater levels are affected by climatic conditions and soil permeability and will therefore vary spatially, and with time.

4.3 Acid Sulfate Soils

Reference to the Acid Sulfate Soil Risk Map for the site indicates that the site is within an area mapped as having a high probability of occurrence of acid sulfate soils (ASS) at depths between 1 m and 3 m below the ground surface.

5. Review of Existing Documentation and Information

5.1 Introduction

CN provided the following documents for review for the project:

- Annexure 1. ECM_1475231_v1 Contamination Management Plan (May 2006) Newcastle Foreshore Park, Newcastle East, Produced by Health and Environment Services Unit May 2006;
- Annexure 2. Advitech (2003). Water Harvesting and Reuse Project, Prepared for Newcastle City Council, Advitech Pty Limited, ECM 1464692;
- Annexure 3. RCA (2000a), Unreferenced Laboratory testing reports: Honeysuckle Development;
- Annexure 4. RCA (2000b), Remediation Action Plan, Former Fishermans Co-op, Newcastle, prepared for Patterson Britton and Partners, Ref JN 1832;

- Annexure 5. ECM132364_Report_Douglas Partners Pty. Ltd. February 1997, Additional Groundwater Contamination Assessment, Proposed Newcastle Station Interchange CNR Wharf Road and Watt Street Newcastle;
- Annexure 6. ECM_131623_v1_Report Douglas and Partners Pty Ltd December 1996, Geotechnical Investigation and Contamination Assessment Proposed Newcastle Station Interchange _ CNR Wharf Road and Watt Street Newcastle.

The approximate location of the subject area for the above reports, as provided by CN, is shown in Figure 2 below.

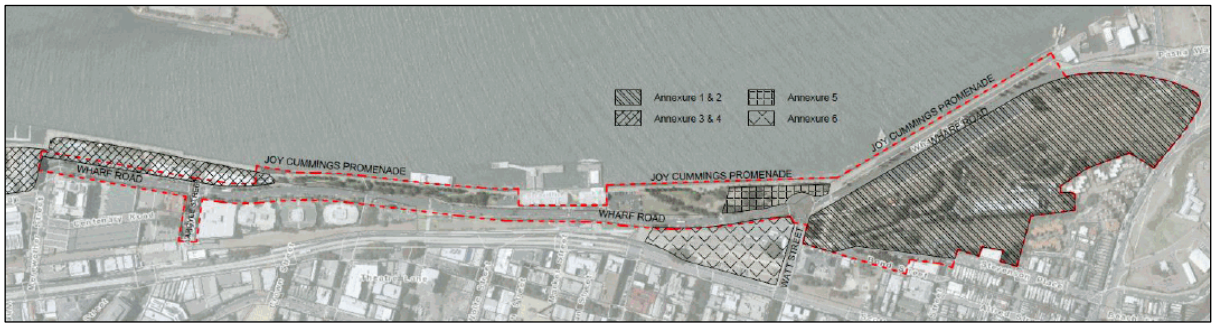


Figure 2: Subject area of annexures (as provided by CN)

5.2 Annexure 1 - Contamination Management Plan (CN, 2006)

CN holds a contamination management plan (CN, 2006) for the foreshore park area. The approximate extent of the foreshore park area is provided in Figure 3 below.



Figure 3: Approximate extent of Foreshore Park, as provided in Annexure 1

CN (2006) notes the following with regards to contamination at the Newcastle Foreshore Park site:

- Areas of the Newcastle Foreshore Park site were previously used as a railway goods yard;
- As a result of the previous site use, there are some identified areas of soil and groundwater contamination within the foreshore park area;
- Following transfer of the foreshore park area to CN in July 1991, initial works indicated the presence of possibly diesel oil in soil in the vicinity of the existing carriage sheds;
- Subsequent investigation identified that the site was used as a rail motor refuelling and maintenance area and that contamination of the soil and possibly groundwater had been identified;
- Investigation suggested that the site had possibly been filled in the past;
- The management plan states that a qualified consultant should be engaged to assess the potential impacts associated with the site for landuse changes or significant development;
- The management plan provides procedures for intrusive works at the site for work health and safety and environmental impacts.

It is noted that the management plan does not provide details of the presence, concentration, location or extent of contamination or any management undertaken (if any) within the Newcastle Foreshore Park.

5.3 Annexure 2 – Water Harvesting and Reuse Project

Newcastle City Council commissioned a report (Advitech, 2003) assessing potential water harvesting options for three sites within the Council area, including Newcastle Foreshore Park.

The report included assessment of the potential for stormwater use for irrigation as an alternative to the existing reticulated irrigation supply.

Activities conducted in Advitech (2003) relevant to the current project comprised installation of boreholes/spearpoints within Newcastle Foreshore Park to assess groundwater quality and hydrogeological factors.

Limited chemical analysis was conducted on samples collected from installed groundwater bores within the Foreshore Park area. The results of analysis were compared to ANZECC (2000) long-term and short-term trigger values for selected contaminants (hydrocarbons, metals) for irrigation and suggested the absence of gross contamination in the samples tested for the targeted analytes. It is noted that the well construction details and groundwater sampling methodology was not provided in Advitech (2003).

5.4 Annexure 3 – RCA August 200 – Honeysuckle

Some appendices have been provided by the client for a report (RCA, 2000) prepared for the honeysuckle area (Merewether Wharf) including results of groundwater analysis and hydrocarbon fingerprinting to assess the likely type of hydrocarbon found in groundwater.

The results suggested the presence of hydrocarbon impact in groundwater at some tested locations. It is noted, however, that the location of groundwater monitoring wells is not clear in the information provided. The investigation area is also located to the west of the Foreshore Park site area and was located between Merewether Street and Argyle Street Newcastle.

5.5 Annexure 4 – Remediation Action Plan, former Fisherman's Co-op Newcastle (RCA, 2000)

A remediation action plan (RAP) was prepared for the former fisherman's co-op building on Wharf Road, which outlined the remediation procedures for identified petroleum hydrocarbon and polycyclic aromatic hydrocarbons contamination in soil and groundwater.

The address of the property was not provided, however it is understood from the current project brief that the former fisherman's coop was located on Wharf Road Newcastle between Merewether Street and Argyle Street Newcastle.

The remediation strategy proposed included excavation and landfill disposal of impacted soils, removal of free hydrocarbon product from groundwater and pump and treat of groundwater to remove dissolved phase contamination.

Information has not been provided as to the extent or success of remediation conducted at the former fisherman's co-op site.

5.6 Annexure 5 – Additional Groundwater Contamination Assessment (DP, 1997)

Additional groundwater assessment was undertaken at the former gasworks site on the corner of Wharf Road and Watt Street Newcastle by DP in 1997. The assessment was conducted following initial investigation by DP as presented in Annexure 6 below.

The assessment comprised additional drilling and well installation to further assess the identified heavy metal and hydrocarbon contamination and to assess the potential for off-site migration of contamination.

The additional investigation indicated the following:

- Limited off-site migration of PAH and TRH was encountered;
- Groundwater assessment results suggesting that the off-site migration of organic contamination was not reaching the nearest water body (Newcastle Harbour to the north);
- Inorganic contamination may have been reaching the harbour, however other sources of contamination were likely;
- Additional remediation works were not warranted, subject to the following:
    - use of the site would be for commercial purposes;
    - Groundwater from the site was not utilised; and
    - The assessed impact on Newcastle Harbour was minimal.

5.7 Annexure 6 –Geotechnical and Contamination Assessment (DP, 1996)

Assessment was conducted by DP in 1996 on the corner of Wharf Road and Scott Street (as in Annexure 5 above), comprising assessment of site history, drilling, well installation, soil and groundwater sampling and testing and an assessment of site contamination.

It is note that the work conducted by DP as presented in Annexure 5 was conducted following the works conducted in Annexure 6.

The results of assessment indicated that the former site use included a gasworks. The subsurface investigation and testing indicated presence of organic contaminant (TRH and PAH) impacts in soil across the site, and also in groundwater as a result of soil impact below the groundwater table and possible leaks from former gasworks infrastructure.

5.8 Targeted Site Investigation, Surplus Rail Lands (DP, 2016)

DP conducted a targeted site investigation for contamination within surplus rail lands between worth place and Watt Street. The investigation included subsurface investigation, groundwater well installation, soil and groundwater testing and report preparation.

The investigation area included the former bus interchange on the corner of Wharf Road and Watt Street (i.e. the subject site of Annexure 5 and 6 above), plus the area of the current subject site immediately north of Watt Street.

The results of the investigation indicated similar conditions to those encountered in Annexure 5 and 6, i.e. organic contamination (TRH and PAH) impacts in soil and groundwater. Assessment of groundwater within the current site area (see Figure 4 below for approximate test locations) suggested the absence of gross impacts in groundwater. The report suggested management/remediation of the identified contamination.

Subsequent to the work conducted by DP, it is understood that the former gasworks area is subject to ongoing on-site management.

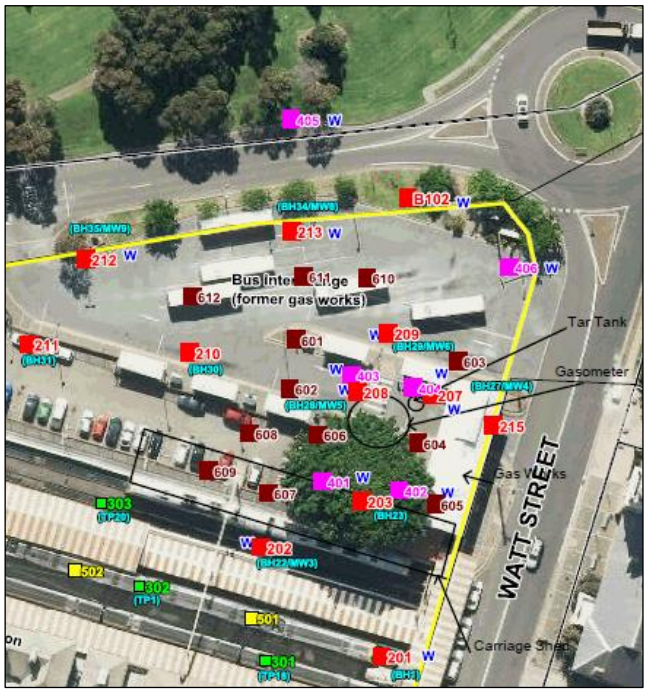


Figure 4: DP investigation within former gasworks and within the subject site (DP, 2016)

5.9 Discussions with Council Staff

Informal discussions with CN staff indicated that the mounds within the subject site area were initially formed during construction of the park. It is also understood that some building materials from demolition following the 1989 Newcastle earthquake may have been brought to the site.

Anecdotal evidence from DP staff and review of borehole information from Annexure 6 and DP (2016) indicated the presence of large inclusions in fill at the test locations to the north of Watt Street, suggesting imported fill, containing cobbles/boulders/building materials, are present.

6. Site Walkover

A site walkover was undertaken by a senior environmental engineer on 30 September 2020. At the time of the walkover, the site generally comprised grassed park areas. Grassed soil mounds, between approximately 0.5 m and 3 m in height above surrounding surface levels, were observed across the majority of the investigation area, as shown in Figures 5 to 12.

Some areas of localised exposed soils were observed across the site, generally comprising sand fill with some intermixed carbonaceous materials (i.e. coal), possible slag, glass and brick (Figure 13). Generally there was no indication of gross contamination impact at the surface (e.g staining, odours, distressed vegetation).



Figure 5: Site condition in the vicinity of Bore 1, looking north



Figure 6: Site condition in the vicinity of Bore 2, looking east



Figure 7: Site condition in the vicinity of Bore 3, looking south-east



Figure 8: Site condition in the vicinity of Bores 4, 5 and 6, looking west



Figure 9: Site condition in the vicinity of Bores 7, 8 and 9, looking east



Figure 10: Site condition in the vicinity of Bore10, looking south-east



Figure 11: Site condition in the vicinity of Bore 11, looking south



Figure 12: Site condition in the vicinity of Bore 12, looking east



Figure 13: Exposed fill/soil on mound in the central eastern portion of the investigation area (in the vicinity of Bore 9) containing carbonaceous materials (i.e. coal), possible slag, glass and brick.

7. Preliminary Conceptual Site Model

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or the future i.e.: it enables an assessment of the potential source – pathway – receptor linkages (complete pathways).

Potential Sources

The current investigation has included a brief review of existing reports for the site and a site walkover. An assessment of site history has not been conducted for the investigation area. The review and walkover have, however, identified the following potential sources of contamination and associated contaminants of potential concern (COPC).

- S1: Demolished Structures – former railway goods yard;
    - o COPC include asbestos, synthetic mineral fibres (SMF), lead (in paint), metals and polychlorinated biphenyls (PCB).

- S2: Fill: fill across majority of the site, likely to be associated with historical landuse and fill importation;
  - COPC include metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), organochlorine pesticides (OCP) and asbestos (depending on the source).
- S3: Former industrial landuse (rail yard), which may include chemical storage, machinery/plant use and servicing, train servicing, fuel storage, adjacent former gas works;
  - COPC include metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), VOCs, coal tar.

Potential Receptors

The following potential human receptors have been identified:

- R1: Current users (recreational land use);
- R2: Future users (likely recreational land use);
- R3: Construction and maintenance workers;
- R4: Adjacent site users (residential land use).

The following potential environmental receptors have been identified:

- R5: Surface water;
- R6: Groundwater; and
- R7: Terrestrial ecology.

Potential Pathways

The following potential pathways have been identified:

- P1: Ingestion and dermal contact;
- P2: Inhalation of dust and/or vapours;
- P3: Surface water run-off;
- P4: Lateral migration of groundwater providing base flow to water bodies;
- P5: Leaching of contaminants and vertical migration into groundwater; and
- P6: Contact with terrestrial ecology.

Summary of Potentially Complete Exposure Pathways

A ‘source–pathway–receptor’ approach has been used to assess the potential risks of harm being caused to human or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways (potential complete pathways). The possible pathways between the above sources (S1 to S3) and receptors (R1 to R7) are provided in below Table 2.

Table 2: Summary of Potentially Complete Exposure Pathways

Source and COPC	Transport Pathway	Receptor	Risk Management Action
S1: Demolished structures, asbestos, SMF, metals and polychlorinated biphenyls (PCB). S2: Imported fill, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols and asbestos. S3: Industrial Landuse, TRH, BTEX, PAH.	P1: Ingestion and dermal contact. P2: Inhalation of dust and/or vapours. P3: Surface water run-off. P4: Lateral migration of groundwater providing base flow to water bodies. P5: Leaching of contaminants and vertical migration into groundwater. P6: Contact with terrestrial ecology.	R1: Current users (recreational land use). R2: Future users (likely recreational land use). R3: Construction and maintenance workers. R4: Adjacent site users (residential and recreational land use). R5: Surface water. R6: Groundwater. R7: Terrestrial ecology.	An intrusive investigation and surface inspection are recommended to assess possible contamination including testing of the soils.

8. Sampling and Analysis Quality Plan

8.1 Data Quality Objectives

The contamination testing scope conducted as part of this assessment was devised with reference to the seven-step data quality objective process which is provided in Appendix B Schedule B2, NEPC (2013). The DQO process is outlined in Appendix C.

8.2 Soil Sampling Rationale

The client nominated test locations generally corresponding to raised/filled areas within the site.

Borehole depths included assessment of the fill mound, plus preliminary assessment of underlying fill and natural soils and groundwater (where encountered).

Soil samples were collected from each borehole at regular depth intervals, and changes in lithology or signs of contamination.

The general sampling methods are described in the field work methodology, included in Appendix C.

9. Field Work

9.1 Field Work Methods

The general sampling methods are described in the field work methodology, included in Appendix C.

9.2 Field Work Results

The borehole logs for this assessment are included in Appendix A. The logs recorded the following general sub-surface profile:

- Fill: encountered in all boreholes to depths of between 1.2 m and 4.6 m below ground level (bgl), generally comprising sand/silty sand fill with gravel, trace coal, slag, ash and brick;
- Sand (natural): encountered in Bores 1 to 9, generally comprising brown medium dense sand.

A summary of encountered subsurface conditions is presented in Table 3 below.

Table 3: Summary of subsurface conditions

Bore	Fill Depth (m bgl)	Groundwater Depth (m bgl)	Potential Contaminant observations
1	1.2	2.2	Trace ash, coal
2	4.6	2.8	Trace coal
3	2.1	3.1	Trace ash, coal
4	1.95	3.5	Trace brick, ash, coal
5	2.6	3.9	Trace ash, coal, brick, granulated slag, coal
6	1.3	1.3	Trace ash, coal
7	2.2	3.2	Trace ash, coal, ceramic
8	1.7	2.2	Trace coal
9	1.6	1.8	Trace coal, brick, slag
10	>2.6 (refusal on obstruction)	Not encountered	Trace ash, coal, brick, slag
11	>2.6 (refusal on obstruction)	Not encountered	Trace coal, ash, brick, slag
12	>2.85 (refusal on obstruction)	Not encountered	Trace coal, slag, brick, plastic

With the exception of the above-mentioned inclusions/contaminant observations, there were no other apparent visual or olfactory evidence (e.g.: staining, odours, free phase product) to suggest the presence of gross contamination within the soils or groundwater observed at the test locations during the investigation.

Although asbestos containing materials (ACM) were not observed within the test locations, there is a risk that ACM and other Hazardous Building Materials (HBM) are present within the site due to the presence of extensive uncontrolled fill across the site, possible presence of historical demolition waste and the observed anthropogenic inclusions in fill.
The PID screening indicated the general absence of VOC in the tested samples with all recorded values of less than 1 ppm.

Free groundwater was observed whilst drilling at the locations and depths provided in Table 3 above. It should be noted that groundwater levels are affected by climatic conditions, soil permeability and tidal influence at this site, and will therefore vary with time.

9.3 Quality Assurance / Quality Control

9.3.1 Field QA / QC

Quality assurance (QA) and quality control (QC) procedures were adopted throughout the field sampling programme and comprised the following:

- Following DP standard operating procedures;
- Collection of replicate samples;
- Storage of samples under secure, temperature-controlled conditions; and
- Use of COC documentation for the handling, transport and delivery of samples to the selected laboratory.

9.3.2 Laboratory QA/QC

The NATA accredited chemical laboratories undertook in-house QA/QC procedures involving the routine testing of:

- Reagent blanks;
- Spike recovery analysis;
- Laboratory duplicate analysis;
- Analysis of control standards;
- Calibration standards and blanks; and
- Statistical analysis of QC data.

10. Laboratory Testing

10.1 Contamination

Laboratory testing for the assessment of soils was undertaken by Envirolab Services Pty Ltd, a NATA registered laboratory. Analytical methods used are shown in the laboratory sheets attached.

A total of 18 soil samples, including one QA/QC soil samples (replicates D1/JRK), were selected as part of the current assessment of soil conditions.

The soil samples were analysed for the following potential contaminants:

- Metals: Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Zinc (Zn), Mercury (Hg), Nickel (Ni), Manganese (Mg) and Iron (Fe);
- Total Recoverable Hydrocarbons (TRH);
- Benzene, Toluene, Ethyl Benzene, Xylene (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Polychlorinated Biphenyls (PCB);
- Organochlorine and Organophosphorus Pesticides (OCP/OPP).

Furthermore, testing for the presence of asbestos materials was undertaken by Envirolab, a NATA-registered laboratory. A total of eight samples were analysed for asbestos identification in soil.

Following receipt of initial testing results (i.e. total contaminant concentrations in soil), an additional eight samples were selected for toxicity characteristic leaching procedure (TCLP – acid leach) testing or Australian Standard Leaching Procedure (ASLP – water leach), to assess leachability characteristics of the soil for further assessment for possible off-site disposal to an appropriately licensed landfill or for retention on site.

The results of laboratory analysis are summarised in the following tables in Appendix B:

- Table B1: Summary of Results of Soil Analysis – TRH, BTEX, PAH, Metals;
- Table B2: Summary of Results of Soil Analysis – OCP, OPP, PCB and Asbestos;
- Table B3: Summary of Results of Soil Analysis - Waste Classification Assessment;
- Table B4: Summary of Results of Soil Analysis – Water Leach Testing.

The laboratory certificate(s) of analysis are provided in Appendix B. The chain of custody and sample receipt information are provided in Appendix C.

10.2 Acid Sulfate Soils

Acid sulfate soil (ASS) testing for the assessment comprised the following:

- 43 ASS screening tests on soils collected from the boreholes to provide a preliminary assessment of potential and actual acidity in the samples;

- Five detailed ASS laboratory tests (chromium suite) to confirm the ASS status of the soils.

The results of screening tests and detailed testing are summarised in Table B5, Appendix B. ASS Laboratory report sheets are provided in Appendix B.

11. Discussion - Contamination

11.1 Soils

The analytical results for the samples tested were below the SAC with the exception of:

- B(a)P TEQ in samples Bore 5/1.5, Bore 8/0.0-0.05, Bore 10/1.0 and Bore 11/1.0 which exceeded the HIL-C of 3 mg/kg and the EIL of 0.7 mg/kg. The B(a)P EIL was also exceeded for Bore 7/1.5 and Bore 12/1.0 in addition to the above samples;
- Lead in sample Bore 1/0.5 which exceeded the HIL-C of 600 mg/kg;
- EIL/ESL were exceeded in Bore 1/0.5 for arsenic, zinc and F3;
- ESL was exceeded in Bore 2/2.0 for F3;
- EIL was exceeded in Bore 10/1.0 for zinc;
- EIL was exceeded in Bore 11/1.0 for copper;

In the current investigation, six samples had a concentration of B(a)P that exceeded the ESL of 0.7 mg/kg. It is noted that the B(a)P ESL is a low reliability value. Higher reliability screening levels have been published in CRC CARE *Risk-based Management and Remediation Guidance for Benzo(a)pyrene* (CRC CARE, 2017). The high reliability value of 33 mg/kg (or ranging from 21 mg/kg to 135 mg/kg) for fresh B(a)P suggests that the concentrations of B(a)P detected at the site are unlikely to pose an unacceptable risk to terrestrial ecology and therefore the B(a)P ESL exceedances are not considered to be of concern.

The results of testing indicated the absence of asbestos in soil (40 g sample) at the locations and depths tested.

The results of water leach testing on selected samples with elevated PAH and lead concentrations indicated the following:

- The general absence of leachable PAH concentrations in the samples tested;
- Moderate propensity of lead to leach in the sample tested.

It is noted that the ASLP test includes tumbling the contaminated soil sample in water for 18 hours, followed by analysis of the leachant. This testing methodology is considered to provide a conservative assessment of the propensity to leach contamination in water.

11.2 Waste Classification

The concentrations of lead and benzo(a)pyrene in several soil samples exceeded 'General Solid Waste' (total concentration CT1) criteria. Leachability (TCLP) testing was conducted on selected samples to further assess the waste classification status of the tested soils

On the basis of total (SCC1) and leachable (TCLP1) concentrations, the selected samples tested were within the NSW EPA criteria (NSW EPA, 2014) for classification as "General Solid Waste" for chemical contaminants.

11.3 Acid Sulfate Soils

(Dear, et al., 2014) suggest that a soil pH<4 in water (pH_F) is an indicator of actual ASS. The results of screening tests therefore suggest the absence of actual ASS at the locations and depths tested.

(Dear, et al., 2014) guidelines also suggest that indicators of potential acid sulfate soils (PASS) include the following:

- Soil pH <3.5 in H_2O_2 (i.e. pH_{FOX});
- Drop of 1 pH unit or more between pH_F and pH_{FOX}.

Twenty-eight (28) of the forty-three (43) tested samples exhibited a drop in pH greater than one. No samples exhibited a soil pH following oxidation (pH_{FOX}) of less than 3.5.

It is noted that the above test method is a qualitative method only and gives an indication of the intensity of total acidification (pH). (Stone, Ahern, & Blunden, 1998) indicate that peroxide may also oxidise organic matter (in addition to pyrite) to produce acids which are unlikely to form under natural conditions, thus giving falsely high indication of acid sulfate potential.

The results of the detailed chromium suite testing indicate that the existing and potential acidity from one of the upper topsoil samples tested exceed the QASSIT action criteria (i.e. Bore 4/1.5).

Based on the results of chromium suite laboratory testing and the geological formations present, it is considered that marginal ASS conditions may be present within the sandy soils encountered on the site to the depth of investigation.

Additional ASS investigation is recommended to further assess the potential for ASS at the site, particularly in areas of possible future excavation and/or dewatering.

11.4 Data Quality Assurance and Quality Control

The data quality assurance and quality control (QA/QC) results are included in Appendix C. Based on the results of the field QA and field and laboratory QC, and evaluation against the data quality indicators (DQI), it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.

12. Discussion - Geotechnical

The results of subsurface investigation at the nominated mound locations indicate that the mounds generally comprise uncontrolled granular (sand) fill with inclusions from various industrial sources (slag, ash, coal reject), underlain by sand fill and sand to the depth of investigation.

The observed fill is uncontrolled and generally not suitable for the support of structural loads or as pavement subgrade without further assessment, re-shaping, compaction and testing to confirm relative strength/density of reworked material.

It is noted that obstructions were encountered during drilling of Bores 10, 11 and 12 in the western portion of the site. the potential for obstructions during excavation, service installation, footing excavation etc. across the site cannot be discounted.

Additional geotechnical investigation is recommended for pavement thickness design and foundation support. Additional investigation could include specific geotechnical investigation during detailed design for assessment of relative soil strength/density, subgrade strength for pavement design, settlement estimation (including underlying compressible fine-grained layers), depth to rock (if required) and earthworks/site preparation measures.

13. Conclusions and Recommendations

Review of previous investigations at the site and surrounds indicated the presence of several potentially contaminating activities, including fill placement, former industrial landuse (e.g. rail yards) and demolition of structures. The preliminary conceptual site model for the site is presented in Section 7.

Borehole locations were nominated by the client to target selected soil mounds within the site.

The results of subsurface investigation indicated the presence of fill at the test locations, containing ash, slag, coal reject and some building rubble (brick, glass), likely to be sourced from industrial activities and/or imported fill and demolition wastes.

Observations made during subsurface investigation indicated the general absence of gross contamination in fill, underlying natural soil and groundwater (i.e. general absence of visual or olfactory evidence of gross contamination at the test locations).

Generally minor exceedances of human-health and ecological criteria were found in soils at some test locations, generally associated with the fill in the investigated mounds. The lateral extent of this fill across the site has not been assessed.

Lead in soil was shown to have a moderate propensity to leach in water in the tested sample.

Asbestos was not detected either by visual identification or by laboratory testing in the samples analysed. It is noted that the method of investigation (i.e. drilling/geoprobe sampling/solid flight auger) provides a relatively small total sample volume and does not allow for observation of an excavated soil profile. The presence of building rubble and the demolition of former structures at the site suggests that

asbestos in soil is possible/likely at the site. Additional investigation is recommended to further assess the fill materials on the site for the presence of Hazardous Building Materials including asbestos.

On the basis of site observations and the results of laboratory testing, the fill materials tested are are considered to be suitable to remain on the site from a contamination perspective, provided that remediation/management is implemented to manage the observed and potential contamination risks.

Remediation/management of the site could comprise the following:

- Removal/off-site disposal of impacted fill/soils to an appropriately licensed facility to remove the identified and potential human health and ecological impacts;
- On-site management of the impacted soils to manage the identified and potential human health and ecological impacts, comprising management of impacted soils beneath capping (pavements, building slabs, clean soils).

Remediation/management of identified and potential contamination would require the preparation of a site specific Remediation Action Plan (RAP with reference to NSW EPA (2020)), outlining the procedures, methodology, remediation acceptance criteria and contingency measures for management of contamination.

It is noted that the current assessment is considered to be preliminary. Additional assessment is recommended prior to remediation / management to further assess source of potential contamination, including targeted assessment of areas of former industrial use, fill placement and demolition as well as systematic assessment across the site.

Groundwater investigation is recommended to assess the potential for impacts from previous site uses, including rail yard and fill placement. Groundwater assessment could also be conducted to assess the potential for leaching of contaminants from the fill/soil profile.

Additional ASS investigation is also recommended in areas of possible future excavation and/or dewatering. Specific geotechnical investigation will also be required for pavement thickness design and foundation support.

14. References

Advitech (2003). Water Harvesting and Reuse Project, Prepared for Newcastle City Council, Advitech Pty Limited, ECM 1464692.CRC CARE. (2017). *Risk-based Management and Remediation Guidance for Benzo(a)pyrene.* Technical Report no. 39: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

Dear, S., Ahern, C., O'Brien, L., Dobos, S., McElnea, A., Moore, N., & Watling, K. (2014). *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines.* Brisbane: Department of Science: Department of Science, Information, Technology, Innovation and the Arts, Queensland Government.

NSW EPA. (1995). *Contaminated Sites, Sampling Design Guidelines.* NSW Environment Protection Authority.

NSW EPA. (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* NSW Environment Protection Authority.

Stone, Y., Ahern, C. R., & Blunden, B. (1998). *Acid Sulfate Soil Manual.* Acid Sulfate Soil Management Committee (ASSMAC).

NSW EPA. (2020). Guidelines for Consultants Reporting on Contaminated Land. Contaminated Land Guidelines: NSW Environment Protection Authority.

RCA (2000a), Unreferenced Laboratory testing reports.

RCA (2000b), Remediation Action Plan, Former Fishermans Co-op, Newcastle, prepared for Patterson Britton and Partners, Ref JN 1832.

Stone, Y., Ahern, C. R., & Blunden, B. (1998). Acid Sulfate Soil Manual. Acid Sulfate Soil Management Committee (ASSMAC).

15. Limitations

Douglas Partners (DP) has prepared this report for this project at Newcastle Foreshore Park with reference to DP's proposal NCL200384 dated 10 July 2020. The work was carried out under City of Newcastle contract No 2021/044Q and the letter of agreement dated 18 September 2020. This report is provided for the exclusive use of the City of Newcastle for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected*d by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical / environmental components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Asbestos has not been detected by observation or by laboratory analysis, either on the surface of the site, or in filling materials at the test locations sampled and analysed. Building demolition materials, such as brick and glass, were, however, located in below-ground filling, and these are considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to undetected variations in ground conditions or to budget constraints (as discussed above), or to parts of the site being inaccessible and not available for inspection/sampling, or to vegetation preventing visual inspection and reasonable access. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

Douglas Partners Pty Ltd

Appendix A

About This Report
Sampling Methods
Soil Descriptions
Symbols and Abbreviations
Borehole Logs – Bores 1 to 12

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Soil Descriptions

Douglas Partners

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

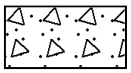
Symbols & Abbreviations

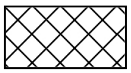
Graphic Symbols for Soil and Rock

General

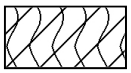

Asphalt

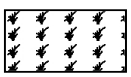

Road base

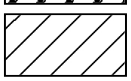

Concrete


Filling

Soils


Topsoil

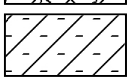

Peat


Clay


Silty clay

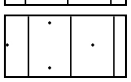

Sandy clay

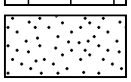

Gravelly clay

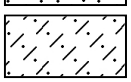

Shaly clay

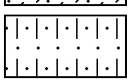

Silt


Clayey silt


Sandy silt

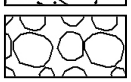

Sand


Clayey sand


Silty sand


Gravel

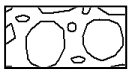

Sandy gravel


Cobbles, boulders

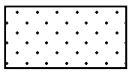

Talus

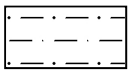
Sedimentary Rocks

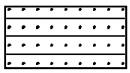

Boulder conglomerate

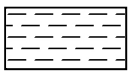

Conglomerate


Conglomeratic sandstone

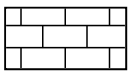

Sandstone


Siltstone

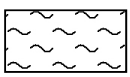

Laminite

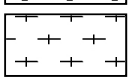

Mudstone, claystone, shale

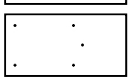

Coal


Limestone

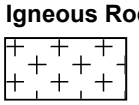
Metamorphic Rocks

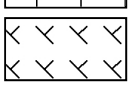

Slate, phyllite, schist

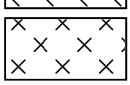

Gneiss

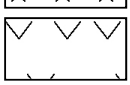

Quartzite

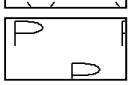
Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 2.54 AHD
EASTING: 386487.3
NORTHING: 6356251
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 102159.00
DATE: 12/10/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.2	FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, trace rootlets, fine to medium subangular gravels, moist		D	0.05	E	PID<1		
	0.35			D	0.3	E	PID<1		
		FILL / SILTY SAND (SP): Pale brown / grey / orange, with silt, trace fine to medium gravels, moist		D	0.5	E	PID<1		
	1.05	FILL / SILTY SAND (SP): Fine to medium grained, dark grey, with silt, moist		D	1.0	E	PID<1		
	1.2			D	1.1	E	PID<1		
		FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, moist		S	1.2		9,11,12 N = 23		
				D	1.5	E	PID<1		
		SAND (SP): Fine to medium grained, brown, moist, medium dense			1.65				
				D	2.0	E	PID<1	▼ 12-10-20	
				D	2.5	E	PID<1		
				S			4,3,3 N = 6		
				D	2.9	E	PID<1		
	3.0	Bore discontinued at 3.0m, limit of investigation			2.95				

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil

TYPE OF BORING: Push tube to 3.0m

WATER OBSERVATIONS: Free groundwater observed at 2.2m

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.65 AHD
EASTING: 386526.7
NORTHING: 6356257
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 102159.00
DATE: 12/10/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.15	SAND (SP): Fine to medium grained, brown, moist, medium dense		D	0.05	E	PID<1		
	0.65	FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, trace fine to coarse gravels, moist		D	0.5	E	PID<1		
		FILL / SANDY CLAY (SP): Low plasticity, grey mottled brown, trace ash, W>PL		D	1.0	E	PID<1		
				S			1,8,8 N = 16		
	1.4	FILL / SILTY SAND (SP): Fine to medium grained, dark grey, with silt, trace coal, ash, fine gravels, moist (possible hydrocarbon odour)		D	1.45 1.5	E	PID<1		
	2.1			D	2.0	E	PID<1		
	2.25	FILL / SAND (SP): Fine to medium grained, brown, trace fine to coarse subrounded gravels, moist		D	2.2	E	PID<1		
				D	2.3	E	PID<1		
	2.6	FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, trace fine to medium gravels, moist, dense		D	2.5	E	PID<1		
				S			19,25/110,- refusal		
	2.85			D	2.76	E		▼	
	3.0	FILL / SAND (SP): Fine to coarse grained, yellow, moist		D	2.8	E	PID<1	12-10-20	
				D	2.9		PID<1		
		FILL / SAND (SP): Fine to coarse grained, white / very pale grey, moist		D	3.2	E	PID<1		
	3.45	FILL / SAND (SP): Fine to medium grained, brown, trace coal , fine gravels, wet		D	3.5	E	PID<1		
	4.0	FILL / SANDY GRAVEL (GP): Fine to coarse grained, brown, with fine to medium grained sand, wet		D	4.0	E	PID<1		
				S			6,10,11 N = 21		
		FILL / SAND (SP): Fine to medium grained, brown, trace coal, wet, medium dense		D	4.45 4.5	E	PID<1		
	4.6	From 4.25m, trace fine to coarse gravels							
	5.0	SAND (SP): Fine to medium grained, brown, wet		D	5.0	E	PID<1		
		Bore discontinued at 5.0m, limit of investigation							

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 5.0m
WATER OBSERVATIONS: Free groundwater observed at 2.8m
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.87 AHD
EASTING: 386606.2
NORTHING: 6356282.3
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / SILTY SAND (SP): Fine to medium grained, brown / dark grey, trace fine to coarse subangular to subrounded gravels, ash, coal reject, rootlets, moist, very loose		D	0.05	E	PID<1		
				D	0.5	E	PID<1		
				D	1.0	E	PID<1		
				S			1,1,2 N = 3		
				D	1.45 1.5	E	PID<1		
				D	2.0	E	PID<1		
	2.1	SAND (SP): Fine to medium grained, pale brown, medium dense, moist, medium dense							
		From 2.6m, pale brown / orange			2.5				
				S			9,9,8 N = 17		
				D	2.95 3.0	E	PID<1	▼ 02-11-20	
				D	3.5	E	PID<1		
	4.0			D	4.0	E	PID<1		
		Bore discontinued at 4.0m, limit of investigation							

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 4.0m
WATER OBSERVATIONS: Free groundwater observed at 3.1m
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.94 AHD
EASTING: 386536.5
NORTHING: 6356229.8
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 102159.00
DATE: 12/10/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.2	FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, trace rootlets, fine to medium subangular gravels, moist		D	0.05	E	PID<1		
					0.2				
		FILL / SANDY C;AY (CL): Low plasticity, pale brown mottled orange / brown, with silt, fine to medium grained sand, trace brick, ash, fine to coarse gravels, coal, W<PL		D	0.5	E	PID<1 pp = 110-200		
	1.1			D	1.0	E	PID<1		
	1.3	FILL / SANDY GRAVEL (GP): Fine to coarse gravels, pale brown, with fine to medium grained sand, dry		D	1.1	E	PID<1		
				S	1.2 1.3		9,7,6 N = 13		
	1.6	FILL / SANDY CLAY (CL): Low plasticity, grey, with silt, fine to medium grained sand, moist		D	1.45	E	pp = 110-150		
	1.8			D	1.5	E	PID<1		
	1.95	FILL / SANDY CLAY (CL): Low plasticity, brown mottled orange, with fine to medium grained sand, trace fine to medium gravels, W<PL		D	1.6 1.7	E	PID<1		
				D	1.8	E	pp = 120-140		
					1.85		PID<1		
					2.0		PID<1		
		FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, moist		D	2.5	E	PID<1		
				S			6,6,10 N = 16		
		SAND (SP): Fine to medium grained, brown, moist, medium dense		D	2.95	E	PID<1		
					3.0				
				D	3.5	E	PID<1	12-10-20	
	4.0	Bore discontinued at 4.0m, limit of investigation		D	4.0	E	PID<1		
				S			1,1,3 N = 4		
					4.45				

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil

TYPE OF BORING: Push tube to 4.0m

WATER OBSERVATIONS: Free groundwater observed at 3.5m

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 4.26 AHD
EASTING: 386572.1
NORTHING: 6356232.4
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 102159.00
DATE: 12/10/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, trace rootlets, fine to medium subangular gravels, dry		D	0.05	E	PID<1		
	0.4			D	0.5	E	PID<1		
	0.65	FILL / SAND (SP): Fine to coarse, brown, trace ash, fine gravels, moist			0.65				
		FILL / CLAY (CI): Medium plasticity, intermixed grey / brown, trace fine to medium grained sand, coal reject, brick, possible granulated slag, coal, W>PL, soft		D	1.0	E	PID<1		
				S			pp = 80-150 1,1,2 N = 3		
				D	1.45 1.5	E	PID<1		
					1.8				
				D	2.0	E	PID<1 pp >400		
	2.4			D	2.4 2.5	E	PID<1		
	2.6	FILL / GRAVELLY SAND (SP): Fine to medium grained, dark grey, with silt, fine to coarse gravels, trace ash, coal, brick		S			10,10,11 N = 21		
		SAND (SP): Fine to medium grained, brown, moist, medium dense		D	2.95 3.0	E	PID<1		
				D	3.5	E	PID<1		
	4.0			D	4.0	E	PID<1	12-10-20	
		Bore discontinued at 4.0m, limit of investigation		S			3,10,18 N = 28		
					4.45				

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 4.0m
WATER OBSERVATIONS: Free groundwater observed at 3.9m
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 2.74 AHD
EASTING: 386609.3
NORTHING: 6356243.8
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / SILTY SAND (SP): Fine to medium grained, intermixed brown, dark grey, trace fine to medium subangular gravels (CNR), coal, ash, moist		D	0.05	E	PID<1		
				D	0.5	E	PID<1		
				D	1.0	E	PID<1		
	1.3	SAND (SP): Fine to medium grained, pale brown, moist		D	1.5	E	PID<1	02-11-20	
				D	2.0	E	PID<1		
				D	2.5	E	PID<1		
	3.0	Bore discontinued at 3.0m, limit of investigation		D	3.0	E	PID<1		

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 3.0m
WATER OBSERVATIONS: Free groundwater observed at 1.3m
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 4.28 AHD
EASTING: 386639.2
NORTHING: 6356236.6
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / SILTY SAND (SP): Fine to medium grained, brown, trace rootlets, fine to coarse subangular to subrounded gravels (CNR)		D	0.05	E	PID<1		
				D	0.5	E	PID<1		
	0.9	FILL / SANDY CLAY (CL): Low plasticity, brown, with silt, trace fine to medium subangular to subrounded gravels (CNR), ash, coal reject, ceramic, W>PL		D	1.0	E	pp = 90-110 PID<1		
				D	1.5	E	pp = 150 PID<1		
		From 1.7m, grey		D	2.0	E	pp = 200-220 PID<1		
	2.1	FILL / SAND (SP): Fine to medium grained, brown, with silt, trace ash fie to medium subangular to subrounded gravels, ash, coal reject, moist		D	2.5	E	PID<1		
				D	3.0	E	PID<1	▼ 02-11-20	
	3.2	FILL / SILTY SAND (SP): Fine to medium grained, intermixed brown, dark grey, trace fine to medium subangular gravels (CNR), coal, ash, moist		D	3.5	E	PID<1		
				D	4.0	E	PID<1		
	4.2	Bore discontinued at 4.2m, limit of investigation							

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 4.2m
WATER OBSERVATIONS: Free groundwater observed at 3.2m
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.41 AHD
EASTING: 386677.3
NORTHING: 6356245.9
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.25	FILL / SILTY SAND (SP): Fine to medium grained, brown, trace fine to medium subangular to subrounded gravels (CNR), rootlets, moist		D	0.05	E	PID<1		
		FILL / SANDY CLAY (CL): Low plasticity, brown, with fine to medium grained sand, trace fine to medium subangular gravels (CNR), coal reject, moist		D	0.5	E	pp = 300-350 PID<1		
				D	1.0	E	pp = 300-400 PID<1		
	1.5			D	1.5	E	pp = 350-400 PID<1		
	1.7	SANDY GRAVEL (GP): Fine to medium gravels, dark grey, with fine to medium grained sand, silt, trace coal reject		D	1.6	E			
		FILL / SILTY SAND (SP): Fine to medium grained, intermixed brown, dark grey, trace fine to medium subangular gravels (CNR), coal, ash, moist		D	2.0	E	PID<1	▼ 02-11-20	
				D	2.5	E	PID<1		
				D	3.0	E	PID<1		
	3.2	Bore discontinued at 3.2m, limit of investigation							

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil

TYPE OF BORING: Push tube to 3.2m

WATER OBSERVATIONS: Free groundwater observed at 2.2m

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.81 AHD
EASTING: 386714.1
NORTHING: 6356251.7
DIP/AZIMUTH: 90°/--

BORE No: 9
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / CLAY (CL): Low plasticity, brown, mottled pale brown / orange, with silt, trace fine to medium grained sand, fie to coarse subangular to subrounded gravels (CNR), coal reject, brick, W>PL		D	0.05	E	PID<1		
				D	0.1	E	pp = 180-210		
				D	0.5	E	pp = 200-250 PID<1		
				D	1.0	E	pp = 250-260 PID<1		
	1.2			S			2,4,8 N = 12		
		FILL / SAND (SP): Fine to medium grained, brown, with silt, moist, medium dense		D	1.45	E	PID<1		
	1.6	From 1.4m, dark grey, trace slag, fine gravels			1.5				
		FILL / SILTY SAND (SP): Fine to medium grained, intermixed brown, dark grey, trace fine to medium subangular gravels (CNR), coal, ash, moist, medium dense		D	2.0	E	PID<1	02-11-20	
				D	2.5	E	PID<1		
				S			1,5,7 N = 12		
	3.0	Bore discontinued at 3.0m, limit of investigation		D	2.95 3.0	E	PID<1		

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil

TYPE OF BORING: Push tube to 3.0m

WATER OBSERVATIONS: Free groundwater observed at 1.8m

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 2.81 AHD
EASTING: 386415.2
NORTHING: 63563018
DIP/AZIMUTH: 90°/--

BORE No: 10
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / SILTY SAND (SP): Fine to medium grained, brown, trace rootlets, moist		D	0.05	E	PID<1		
	0.35	FILL / SILTY SAND (SP): Fine to medium grained, dark grey, trace ash, coal reject, brick, slag, moist		D	0.5	E	PID<1		
				D	1.0	E	PID<1		
	1.2			S	1.27		11,25/115,- refusal		
		FILL / SANDY GRAVEL (GP): Fine to medium subangular gravels, intermixed pale brown / grey, with fine to medium grained sand, trace slag, moist		D	1.5	E	PID<1		
				D	2.0	E	PID<1		
				D	2.5	E	PID<1		
	2.6	Bore discontinued at 2.6m, machine refusal		S	2.63		25/125,-,- refusal		

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 2.6m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.01 AHD
EASTING: 386361.4
NORTHING: 6356288.1
DIP/AZIMUTH: 90°/--

BORE No: 11
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / SILTY SAND (SP): Fine to medium grained brown, trace rootlets, fine to medium subangular to subrounded gravels, moist		D	0.05	E	PID<1		
				D	0.5	E	PID<1		
	1	From 0.9m to 1.3m, dark grey, trace coal, ash, brick		D	1.0	E	PID<1		
				S			8,6,3 N = 9		
		From 1.3m to 1.9m, brown, trace clag, brick, fine to medium subangular gravels (CNR), coal reject		D	1.45 1.5	E	PID<1		
	1.9								
	2	FILL / SANDY GRAVEL (GP): Fine to medium subangular gravels (CNR), with fine to medium grained sand, brown, trace slag, brick, moist		D	2.0	E	PID<1		
				D	2.5	E	PID<1		
	2.6	Bore discontinued at 2.6m, machine refusal		S	2.55		25/50,-,- refusal		

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 2.6m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.64 AHD
EASTING: 386179.9
NORTHING: 6356273.4
DIP/AZIMUTH: 90°/--

BORE No: 12
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.35	FILL / SILTY SAND (SP): Fine to medium grained, brown, trace rootlets, fine to medium subrounded gravels (CNR), moist		D	0.05	E	PID<1		
		FILL / SANDY CLAY (CL): Low plasticity, brown, trace coal reject, slag, W<PL		D	0.5	E	PID<1		
	1.1			D	1.0	E	pp = 110-150 PID<1		
	1.3	FILL / SILTY CLAY (CL): Low plasticity, grey, trace fine subrounded to subangular gravels (CNR), W<PL		D	1.2	E	pp = 150 PID<1		
		FILL / CLAY (CH): High plasticity, brown, trace brick, coal reject, W>PL		S D	1.45 1.5	E	3,1,1 N = 2 pp = 210-250 PID<1		
	1.9	FILL / SANDY CLAY (CL): Low plasticity, pale brown, trace slag, fine to medium subrounded gravels (CNR), plastic, W>PL		D	2.0	E	pp = 180-190 PID<1		
				D S	2.5	E	pp = 180-190 PID<1 10,8,21/40 refusal		
	2.85	Bore discontinued at 2.85m, machine refusal			2.85				

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 2.85m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

Appendix B

Table B1 - Summary of Results of Soil Analysis – TRH, BTEX, PAH, Metals
Table B2: Summary of Results of Soil Analysis – OCP, OPP, PCB and Asbestos
Table B3: Summary of Results of Soil Analysis - Waste Classification Assessment
Table B4: Summary of Results of Soil Analysis – Water Leach Testing
Table B5: Summary of Results of Soil Analysis – Acid Sulfate Soils
Laboratory Report Sheets

Appendix B
Summary of Laboratory Results, Newcastle Foreshore Park Master Plan
Wharf Road, Newcastle East

B1.0 Introduction

Results of laboratory testing are summarised as follows:

- Table B1: Summary of Results of Soil Analysis – TRH, BTEX, PAH, Metals;
- Table B2: Summary of Results of Soil Analysis – OCP, OPP, PCB and Asbestos;
- Table B3: Summary of Results of Soil Analysis - Waste Classification Assessment;
- Table B4: Summary of Results of Soil Analysis – Water Leach Testing;
- Table B5: Results of Acid Sulfate Soil Testing.

Table B1: Summary of Laboratory Results – Metals, TRH, BTEX, PAH

			Metals									TRH						BTEX				PAH		
			Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Manganese	TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene [b]	Benzo(a)pyrene (BaP)	Benzo(a)pyrene TEQ
		PQL	4	0.4	1	1	1	0.1	1	1	1	25	50	25	50	100	100	0.2	0.5	1	1	1	0.05	0.5
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1/0.5	0 m	12/10/2020	**130** 300 100	**5.4** 90 NC	**11** 300 320	**150** 17000 160	**700** 600 1100	**0.3** 80 NC	**23** 1200 60	**1700** 30000 480	**430** 19000 NC	<25 NC NC	**69** NC 120	<25 NL 180	**69** NL 120	**550** NC 300	**270** NC 2800	**0.4** NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.5** NC 0.7	**0.8** 3 NC
2/2.0	0 m	12/10/2020	**23** 300 100	<0.4 90 NC	**4** 300 320	**120** 17000 160	**170** 600 1100	**0.5** 80 NC	**9** 1200 60	**79** 30000 480	**120** 19000 NC	<25 NC NC	**92** NC 120	<25 NL 180	**92** NL 120	**400** NC 300	**130** NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.1** NC 0.7	<0.5 3 NC
2/2.8	0 m	12/10/2020	<4 300 100	<0.4 90 NC	**6** 300 320	**1** 17000 160	**5** 600 1100	<0.1 80 NC	**1** 1200 60	**19** 30000 480	**50** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	<0.05 NC 0.7	<0.5 3 NC
4/0.5	0 m	12/10/2020	<4 300 100	<0.4 90 NC	**11** 300 320	**5** 17000 160	**8** 600 1100	<0.1 80 NC	**4** 1200 60	**18** 30000 480	**90** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	<0.05 NC 0.7	<0.5 3 NC
5/1.5	0 m	12/10/2020	**7** 300 100	<0.4 90 NC	**10** 300 320	**15** 17000 160	**110** 600 1100	**0.1** 80 NC	**5** 1200 60	**140** 30000 480	**130** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	**140** NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**3.1** NC 0.7	**4.7** 3 NC
5/4.0	0 m	12/10/2020	<4 300 100	<0.4 90 NC	**4** 300 320	<1 17000 160	<1 600 1100	<0.1 80 NC	<1 1200 60	**2** 30000 480	**5** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	<0.05 NC 0.7	<0.5 3 NC
3	0 - 1m	2/11/2020	**22** 300 100	<0.4 90 NC	**15** 300 320	**24** 17000 160	**87** 600 1100	<0.1 80 NC	**7** 1200 60	**140** 30000 480	**110** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.69** NC 0.7	**1** 3 NC
6	0 - 0.5 m	2/11/2020	**17** 300 100	**0.6** 90 NC	**6** 300 320	**29** 17000 160	**150** 600 1100	**0.5** 80 NC	**5** 1200 60	**210** 30000 480	**65** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.54** NC 0.7	**0.7** 3 NC
7	0 - 1.5 m	2/11/2020	**7** 300 100	<0.4 90 NC	**9** 300 320	**18** 17000 160	**96** 600 1100	**0.1** 80 NC	**6** 1200 60	**120** 30000 480	**110** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**1** NC 0.7	**1.4** 3 NC
8	0 - 0.05 m	2/11/2020	**4** 300 100	<0.4 90 NC	**8** 300 320	**14** 17000 160	**64** 600 1100	<0.1 80 NC	**5** 1200 60	**110** 30000 480	**99** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	**140** NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**5** NC 0.7	**7.2** 3 NC
9	0 - 1m	2/11/2020	**9** 300 100	<0.4 90 NC	**12** 300 320	**25** 17000 160	**95** 600 1100	**0.2** 80 NC	**8** 1200 60	**97** 30000 480	**230** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.5** NC 0.7	**0.7** 3 NC
D1/JRK	0 m	2/11/2020	**9** 300 100	<0.4 90 NC	**10** 300 320	**21** 17000 160	**89** 600 1100	**0.2** 80 NC	**6** 1200 60	**140** 30000 480	**130** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.3** NC 0.7	<0.5 3 NC
10	0 - 1m	2/11/2020	**9** 300 100	**4.6** 90 NC	**16** 300 320	**150** 17000 160	**360** 600 1100	**0.7** 80 NC	**14** 1200 60	**2000** 30000 480	**460** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	**100** NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**2.7** NC 0.7	**4.1** 3 NC
10	0 - 2 m	2/11/2020	<4 300 100	<0.4 90 NC	**2** 300 320	<1 17000 160	<1 600 1100	<0.1 80 NC	<1 1200 60	<1 30000 480	**1500** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	<0.05 NC 0.7	<0.5 3 NC
11	0 - 1m	2/11/2020	**7** 300 100	**0.6** 90 NC	**24** 300 320	**190** 17000 160	**190** 600 1100	**0.6** 80 NC	**9** 1200 60	**380** 30000 480	**350** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	**140** NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**3.4** NC 0.7	**4.8** 3 NC
11	0 - 2.5 m	2/11/2020	<4 300 100	<0.4 90 NC	**6** 300 320	**4** 17000 160	**9** 600 1100	<0.1 80 NC	<1 1200 60	**13** 30000 480	**1300** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.06** NC 0.7	<0.5 3 NC
12	0 - 1m	2/11/2020	**9** 300 100	**0.6** 90 NC	**12** 300 320	**32** 17000 160	**110** 600 1100	**0.2** 80 NC	**9** 1200 60	**260** 30000 480	**290** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	**160** NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**2** NC 0.7	**2.9** 3 NC
12	0 - 2.5 m	2/11/2020	**7** 300 100	<0.4 90 NC	**10** 300 320	**8** 17000 160	**44** 600 1100	<0.1 80 NC	**4** 1200 60	**70** 30000 480	**3000** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.1** NC 0.7	<0.5 3 NC

Lab result

HIL/HSL value EIL/ESL value

HIL/HSL exceedance | EIL/ESL exceedance | HIL/HSL and EIL/ESL exceedance | ML exceedance | ML and HIL/HSL or EIL/ESL exceedance

Blue = DC exceedance

Bold = Lab detections NT = Not tested NL = Non limiting NC = No criteria NA = Not applicable

Notes:

HIL/HSL/DC	NEPC, Schedule B1- HIL C (recreational), HSL C (recreational), DC HSL C (recreational)
EIL/ESL	NEPC, Schedule B1- EIL UR/POS (Recreational), ESL UR/POS (recreational)
ML	NEPC, Schedule B1- ML R/P/POS (recreational)
a	QA/QC replicate of sample listed directly below the primary sample
b	Reported naphthalene laboratory result obtained from BTEXN suite

Table B2: Summary of Laboratory Results – OCP, OPP, PCB, Asbestos

			OCP											OPP	PCB	Asbestos		
			DDT+DDE+DDD [c]	DDD	DDE	DDT	Aldrin & Dieldrin	Total Chlordane	Total Endosulfan	Endrin	Heptachlor	Hexachlorobenzene	Methoxychlor	Chlorpyriphos	Total PCB	Asbestos ID in soil >0.1g/kg	Trace Analysis	Asbestos (50 g)
		PQL	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-	-
1/0.5	0 m	12/10/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	**0.1** 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
2/2.0	0 m	12/10/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
2/2.8	0 m	12/10/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
4/0.5	0 m	12/10/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
5/15	0 m	12/10/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	**0.3** 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
5/4.0	0 m	12/10/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
3	0 - 1m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
6	0 - 0.5 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
7	0 - 15 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
8	0 - 0.05 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
9	0 - 1m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
10	0 - 1m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
10	0 - 2 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
11	0 - 1m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
11	0 - 2.5 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
12	0 - 1m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
12	0 - 2.5 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
D1/JRK	0 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	**0.3** 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
3 - [TRIPLICATE]	0 - 1m	2/11/2020	NT 400 NC	NT NC NC	NT NC NC	NT NC 180	NT 10 NC	NT 70 NC	NT 340 NC	NT 20 NC	NT 10 NC	NT 10 NC	NT 400 NC	NT 250 NC	NT 1 NC	NT	NT	NT
12 - [TRIPLICATE]	0 - 2.5 m	2/11/2020	NT 400 NC	NT NC NC	NT NC NC	NT NC 180	NT 10 NC	NT 70 NC	NT 340 NC	NT 20 NC	NT 10 NC	NT 10 NC	NT 400 NC	NT 250 NC	NT 1 NC	NT	NT	NT

Lab result

HIL/HSL value EIL/ESL value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab below the PQL, refer to the lab report

Bold = Lab detections NT = Not tested NC = No criteria NA = Not applicable NAD = No asbestos detected at the reporting limit

Notes:

HIL/HSL/DC	NEPC, Schedule B1- HIL C (recreational), HSL C (recreational), DC HSL C (recreational)
EIL/ESL	NEPC, Schedule B1- EIL UR/POS (recreational), ESL UR/POS (recreational)
ML	NEPC, Schedule B1- ML R/P/POS (recreational)
a	QA/QC replicate of sample listed directly below the primary sample
c	Criteria applies to DDT only

Table B3: Summary of Laboratory Results for Waste Classification – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, Asbestos

			Metals											TRH		BTEX						PAH															OCP		OPP	PCB	Asbestos		
			Arsenic	Arsenic TCLP	Cadmium	Total Chromium	Copper	Lead	Lead TCLP	Mercury (inorganic)	Nickel	Zinc	Manganese	TRH C6 - C9	C10-C36 (recoverable hydrocarbons	Benzene	Toluene	Ethylbenzene	m+p-Xylene	o-Xylene	Xylenes (total)	Benzo(a)pyrene (BaP)	Benzo(a)pyrene (BaP) TCLP	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(b,j+k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Total Endosulfan	Total Analysed OCP	Total Analysed OPP	Total PCB	Asbestos ID in soil >0.1g/kg	Trace Analysis	Total Asbestos
		PQL	4		0.4	1	1	1		0.1	1	1	1	25	50	0.2	0.5	1	2	1	3	0.05		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.1	0.1	0.1			
Sample ID	Depth	Sample Date	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-	-
1/0.5	0 m	12/10/2020	130	0.07	5.4	11	150	700	0.2	0.3	23	1700	430	<25	719	0.4	<0.5	<1	<2	<1	<3	0.5	NT	<0.1	<0.1	0.1	0.6	1	0.2	0.6	0.1	1	<0.1	0.2	<1	0.7	1	<0.1	0.1	<0.1	<0.1	NT	NT	NT
2/2.0	0 m	12/10/2020	23	NT	<0.4	4	120	170	NT	0.5	9	79	120	<25	540	<0.2	<0.5	<1	<2	<1	<3	0.1	NT	<0.1	<0.1	<0.1	0.3	0.4	<0.1	0.3	<0.1	0.4	<0.1	<0.1	<1	0.4	0.4	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
2/2.8	0 m	12/10/2020	<4	NT	<0.4	6	1	5	NT	<0.1	1	19	50	<25	<50	<0.2	<0.5	<1	<2	<1	<3	<0.05	NT	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
4/0.5	0 m	12/10/2020	<4	NT	<0.4	11	5	8	NT	<0.1	4	18	90	<25	<50	<0.2	<0.5	<1	<2	<1	<3	<0.05	NT	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
5/1.5	0 m	12/10/2020	7	NT	<0.4	10	15	110	0.08	0.1	5	140	130	<25	<50	<0.2	<0.5	<1	<2	<1	<3	3.1	NT	0.2	0.5	1.4	3.7	4.8	1.5	2.9	0.5	7.8	0.5	1.4	<1	5	7	<0.1	0.3	<0.1	<0.1	NAD	NAD	NAD
5/4.0	0 m	12/10/2020	<4	NT	<0.4	4	<1	<1	NT	<0.1	<1	2	5	<25	<50	<0.2	<0.5	<1	<2	<1	<3	<0.05	NT	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
3	0 - 1m	2/12/2020	22	NT	<0.4	15	24	87	NT	<0.1	7	140	110	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.69	NT	<0.1	<0.1	0.1	1	1	0.5	0.7	<0.1	1.4	<0.1	0.4	<1	0.5	1.4	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
6	0 - 0.5 m	2/12/2020	17	NT	0.6	6	29	150	NT	0.5	5	210	65	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.54	NT	<0.1	<0.1	0.2	0.6	0.9	0.4	0.5	<0.1	1	<0.1	0.3	<1	0.4	0.9	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
7	0 - 1.5 m	2/12/2020	7	NT	<0.4	9	18	96	NT	0.1	6	120	110	<25	<50	<0.2	<0.5	<1	<2	<1	<3	1	NT	<0.1	0.1	0.4	1.5	2	0.5	1	<0.1	2.2	0.1	0.4	<1	1	2	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
8	0 - 0.05 m	2/12/2020	4	NT	<0.4	8	14	64	NT	<0.1	5	110	99	<25	110	<0.2	<0.5	<1	<2	<1	<3	5	<0.001	0.4	0.2	1.5	4.5	9	5.1	4.1	0.5	12	1.2	3.1	<1	11	11	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
9	0 - 1m	2/12/2020	9	NT	<0.4	12	25	95	NT	0.2	8	97	230	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.5	NT	<0.1	0.1	0.2	0.7	0.9	0.2	0.6	<0.1	1.1	<0.1	0.2	<1	0.7	0.9	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
DUPJRK	0 m	2/12/2020	9	NT	<0.4	10	21	89	NT	0.2	6	140	130	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.3	NT	<0.1	<0.1	<0.1	0.4	0.5	0.2	0.3	<0.1	0.4	<0.1	0.2	<1	0.2	0.4	<0.1	0.3	<0.1	<0.1	NT	NT	NT
10	0 - 1m	2/12/2020	9	NT	4.6	16	150	360	NT	0.7	14	2000	460	<25	<50	<0.2	<0.5	<1	<2	<1	<3	2.7	NT	0.1	0.2	0.6	3.6	4.6	2.1	2.4	0.3	6.2	0.2	1.8	<1	2.6	6	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
10	0 - 2 m	2/12/2020	<4	NT	<0.4	2	<1	<1	NT	<0.1	<1	<1	1500	<25	<50	<0.2	<0.5	<1	<2	<1	<3	<0.05	NT	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
11	0 - 1m	2/12/2020	7	NT	0.6	24	190	190	0.1	0.6	9	380	350	<25	100	<0.2	<0.5	<1	<2	<1	<3	3.4	<0.01	0.4	0.2	1.2	4	5.2	2.4	3.2	0.3	8.6	0.2	1.7	<1	4.3	7.7	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
11	0 - 2.5 m	2/12/2020	<4	NT	<0.4	6	4	9	NT	<0.1	<1	13	1300	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.06	NT	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
12	0 - 1m	2/12/2020	9	NT	0.6	12	32	110	NT	0.2	9	260	290	<25	120	<0.2	<0.5	<1	<2	<1	<3	2	NT	0.2	0.2	0.7	2.6	3.2	1.4	1.9	0.2	4.9	0.2	1	<1	2.3	4.6	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
12	0 - 2.5 m	2/12/2020	7	NT	<0.4	10	8	44	NT	<0.1	4	70	3000	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.1	NT	<0.1	<0.1	<0.1	0.1	0.2	0.1	0.1	<0.1	0.2	<0.1	<0.1	<1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
Summary Statistics																																												
Min			4		0.4	2	1	1		0.1	1	1	5	25	50	0.2	0.5	1	2	1	3	0.05		0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-
Max			130		5.4	24	190	700		0.7	23	2000	3000	25	719	0.4	0.5	1	2	1	3	5		0.4	0.5	1.5	4.5	9	5.1	4.1	0.5	12	1.2	3.1	1	11	11	0.1	0.3	0.1	0.1	-	-	-
Mean			15		0.9	10	42	121		0.2	6	286	553	25	124	0.2	0.5	1	2	1	3	107		0.1	0.1	0.4	1.3	1.8	0.8	1	0.2	2.5	0.2	0.6	1	1.6	2.3	0.1	0.1	0.1	0.1	-	-	-
Waste Classification Criteria [f]																																											
CT1			100	NC	20	100	NC	100	NC	4	40	NC	NC	650	10000	10	288	600	NC	NC	1000	0.8	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	60	<50	4	<50	NC	NC	NC
SCC1			500	NC	100	1900	NC	1500	NC	50	1050	NC	NC	650	10000	18	518	1080	NC	NC	1800	10	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	108	<50	7.5	<50	NC	NC	NC
TCLP1			NC	5	1	5	NC	NC	5	0.2	2	NC	NC	NC	NC	0.5	14.4	30	NC	NC	50	NC	0.04	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	3	NC	0.2	NC	NC	NC	NC
CT2			400	NC	80	400	NC	400	NC	16	160	NC	NC	2600	40000	40	1152	2400	NC	NC	4000	3.2	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	240	<50	16	<50	NC	NC	NC
SCC2			2000	NC	400	7600	NC	6000	NC	200	4200	NC	NC	2600	40000	72	2073	4320	NC	NC	7200	23	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	432	<50	30	<50	NC	NC	NC
TCLP2			NC	20	4	20	NC	NC	20	0.8	8	NC	NC	NC	NC	2	57.6	120	NC	NC	200	NC	0.16	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	12	NC	0.8	NC	NC	NC	NC

CT1 exceedance | TCLP1 and/or SCC1 exceedance | CT2 exceedance | TCLP2 and/or SCC2 exceedance | Asbestos detection

NT = Not tested NL = Non limiting NC = No criteria NA = Not applicable NAD = No asbestos detected at the reporting limit

Notes:

a QA/QC replicate of sample listed directly below the primary sample

b Total chromium used as initial screen for chromium(VI).

c Total recoverable hydrocarbons (TRH) used as an initial screen for total petroleum hydrocarbons (TPH)

d Criteria for scheduled chemicals used as an initial screen

e Criteria for Chlorpyrifos used as initial screen

f All criteria are in the same units as the reported results

PQL Practical quantitation limit

CT1 NSW EPA, 2014, Waste Classification Guidelines Part 1: Classifying Waste, Maximum values of specific contaminant concentration (SCC) for classification without TCLP: General solid waste

SCC1 NSW EPA, 2014, Waste Classification Guidelines Part 1: Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste

TCLP1 NSW EPA, 2014, Waste Classification Guidelines Part 1: Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste

CT2 NSW EPA, 2014, Waste Classification Guidelines Part 1: Classifying Waste, Maximum values of specific contaminant concentration (SCC) for classification without TCLP: Restricted solid waste

SCC2 NSW EPA, 2014, Waste Classification Guidelines Part 1: Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

TCLP2 NSW EPA, 2014, Waste Classification Guidelines Part 1: Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

Table B4: Summary of Laboratory Results – Water Leach testing PAH and Lead

			Lead	Lead Water Leadch	Naphthalene	Naphthalene Water Leach	Benzo(a)pyrene (BaP)	Benzo(a)pyrene Water Leach
		PQL	1		1		0.05	0.5
Sample ID	Depth	Sample Date	mg/kg	ug/L	mg/kg	ug/L	mg/kg	ug/L
1/0.5	0 m	12/10/2020	**700**	**320**	-	NT	-	NT
5/15	0 m	12/10/2020	-	NT	<1	<0.1	**3.1**	<0.1
Aquatic Ecosystems Fresh Water			NA	3.4	NA	16	NA	0.1
Aquatic Ecosystems Marine Water			NA	4.4	NA	70	NA	0.1
Recreation/Drinking Water			NA	10	NA	NC	NA	0.01
Irrigation			NA	2000	NA	NC	NA	NC

exceedance of 95% level of protection - aquatic ecosystems

Table B5: Results of Acid Sulfate Soil Testing

Sample ID	Sample Depth [a] (m)	Sample level (AHD)	Sample Description	Screening Test Results				Laboratory Results							
				pH			Strength of Reaction [b]	pH_{KCL}	S_{KCL}	Scr %S	s-TAA %S	S_{NAS} %S	s-ANC_{BT} %S	Net Acidity[c] %S	Exisiting and Potential Acidity %S
				pH_F	pH_{FOX}	pH_F - pH_{FOX}									
1	1.1	1.439	Dark Borwn Silty Sand	6.9	6.8	0.0	1								
	1.5	1.039	Pale Brown Silty Sand	7.5	7.3	0.2	1								
	2	0.539	Pale Brown Silty Sand	7.7	7.8	-0.1	1								
	2.5	0.039	Pale Brown Silty Sand	8.0	8.0	0.0	1								
	2.9	-0.361	Pale Brown Silty Sand	8.7	7.9	0.8	1								
2	2.2	1.448	Brown Sand	8.8	8.3	0.5	1								
	2.3	1.348	Pale Brown Sand, Organics in Samples	8.8	7.1	**1.7**	1								
	2.5	1.148	Pale Brown Sand, Organics in Samples	8.3	4.7	**3.6**	1	6.8	<0.005	<0.005	<0.01	NT	0.18	<0.005	<0.005
	2.8	0.848	Pale Brown Sand	8.3	7.6	0.7	1								
	3.2	0.448	Pale Brown Sand	8.6	7.8	0.8	1								
	3.5	0.148	Pale Brown Sand	9.0	7.9	**1.1**	1								
	4	-0.352	Pale Brown Sand	8.8	7.6	**1.2**	1								
	4.5	-0.852	Pale Brown Sand	9.1	8.0	**1.1**	1								
	5	-1.352	Pale Brown Sand	9.2	8.1	**1.2**	1								
3	2.5	1.366	Pale Brown Sand	8.8	7.0	**1.8**	1								
	3.0	0.866	Pale Brown Sand	8.5	7.4	**1.0**	1								
	3.5	0.366	Pale Brown Sand	8.4	7.4	**1.1**	1								
	4	-0.134	Pale Brown Sand	8.6	7.5	**1.2**	1								
4	1.50	2.44	Dark Brown Sand	8.5	4.8	**3.8**	1	7.8	0.015	0.02	<0.01	NT	0.27	<0.005	0.016
	1.7	2.24	Dark Brown Sand	8.6	7.5	**1.1**	1								
	2	1.94	Dark Brown Sand	8.9	6.7	**2.2**	1								
	2.5	1.44	Dark Brown Sand	8.6	8.1	0.5	1								
	3.0	0.94	Dark Brown Sand	8.6	6.7	**1.9**	1								
	3.5	0.44	Dark Brown Sand	8.6	7.7	0.8	1								
	4	-0.06	Dark Brown Sand	8.2	8.2	0.0	1								
5	3	1.263	Dark Brown Sand	9.1	5.9	**3.2**	1	6.6	<0.005	<0.005	<0.01	NT	0.35	<0.005	<0.005
	3.5	0.763	Dark Brown Sand	8.4	6.5	**1.9**	1								
	4	0.263	Dark Brown Sand	8.4	6.4	**2.0**	1								
6	1.5	1.24	Dark Brown Sand	8.4	6.2	**2.2**	1								
	2	0.74	Dark Brown Sand	8.6	6.8	**1.7**	1								
	2.5	0.24	Dark Brown Sand	8.6	6.6	**2.0**	1	6.2	<0.005	<0.005	<0.01	NT	NT	<0.005	<0.005
	3	-0.26	Dark Brown Sand	8.5	7.0	**1.4**	1								
7	3.5	0.778	Dark Brown Sand	8.6	6.7	**1.9**	1								
	4	0.278	Dark Brown Sand	8.5	6.9	**1.6**	1								
8	2	1.411	Dark Brown Sand	8.6	7.3	**1.4**	1								
	2.5	0.911	Dark Brown Sand	8.7	7.0	**1.7**	1								
	3	0.411	Dark Brown Sand	8.9	8.0	0.8	1								
9	2	1.805	Dark Brown Sand	9.0	7.0	**2.0**	1	6.2	<0.005	<0.005	<0.01	NT	NT	<0.005	<0.005
	2.5	1.305	Dark Brown Sand	8.7	7.5	**1.2**	1								
	3	0.805	Dark Brown Sand	8.6	7.6	**1.1**	1								
10	1.5	1.314	Brown grey sandy gravel fill	10.4	10.1	0.2	4-H-F								
	2	0.814	Brown grey sandy gravel fill	10.6	10.4	0.2	4-H-F								
	2.5	0.314	Brown grey sandy gravel fill	10.3	10.2	0.2	4-H-F								
QASSIT Guideline			Coarse sands, poorly buffered	<4[d]	<3.5[e]	≥1[e]	-	Coarse sands, poorly buffered							0.01
			Coarse sands to loamy sands and peats					Coarse sands to loamy sands and peats							0.03
			Medium sandy loams to light clays					Medium sandy loams to light clays							0.06[f]/0.03[g]
			Fine medium to heavy clays & silty clays					Fine medium to heavy clays & silty clays							0.1[f]/0.03[g]
NASSG Guideline			Coarse and Peats: sands to loamy sands	-	-	-	-	Coarse and Peats: sands to loamy sands							≥0.03
			Medium: clayey sand to light clays					Medium: clayey sand to light clays							≥0.03[g]/≥0.06[f]
			Fine: light medium to heavy clays					Fine: light medium to heavy clays							≥0.03[g]/≥0.1[f]

Notes to Table B5:

a Depth below ground surface

b Strength of Reaction

1 denotes no or slight reaction

2 denotes moderate reaction

3 denotes high reaction

4 denotes very vigorous reaction

F denotes bubbling/frothy reaction indicative of organics

H denotes heat generated

c Calculated by the laboratory based on the ABA equation in ASS Laboratory Methods Guidelines (Ref ?)

d For actual acid sulphate soils (ASS)

e Indicative value only for Potential Acid Sulphate Soils (PASS)

f Action Criteria for disturbance of 1-1000 tonnes of material

g Action Criteria for disturbance of more than 1000 tonnes of material

Bold results indicative of ASS

Shaded results indicate an exceedence of QASSIT action criteria

pH_F - Soil pH Test (1:5 soil:distilled water)

pH_{FOX} - Soil Peroxide pH Test (1:4 soil:distilled water following oxidation of soil with 30% hydrogen peroxide (H_2O_2))

*Laboratory methods used to quantify ANC are likely to overestimate environmental effectiveness

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 253850

Client Details

Client	Douglas Partners Newcastle
Attention	[redacted]
Address	Box 324 Hunter Region Mail Centre, Newcastle, NSW, 2310

Sample Details

Your Reference	**102159, Newcastle**
Number of Samples	6 SOIL
Date samples received	21/10/2020
Date completed instructions received	21/10/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	28/10/2020
Date of Issue	28/10/2020

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Asbestos Approved By
Analysed by Asbestos Approved Identifier: [redacted]
Authorised by Asbestos Approved Signatory: [redacted]

Results Approved By
[redacted] Team Leader, Inorganics
[redacted], Senior Chemist
[redacted], Metals Supervisor
[redacted] Senior Chemist
[redacted] Asbestos Supervisor
[redacted] Chemist
[redacted], Senior Chemist

Authorised By
[redacted]

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	23/10/2020	23/10/2020	23/10/2020	23/10/2020	23/10/2020
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	0.4	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	112	104	129	124	105

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	22/10/2020
Date analysed	-	23/10/2020
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<3
Surrogate aaa-Trifluorotoluene	%	117

svTRH (C10-C40) in Soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	23/10/2020	23/10/2020	23/10/2020	23/10/2020	23/10/2020
TRH C_{10} - C_{14}	mg/kg	59	70	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	320	300	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	340	170	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	69	92	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	69	92	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	550	400	<100	<100	140
TRH >C_{34} -C_{40}	mg/kg	270	130	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	890	620	<50	<50	140
Surrogate o-Terphenyl	%	100	138	90	96	115

svTRH (C10-C40) in Soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	22/10/2020
Date analysed	-	23/10/2020
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	103

PAHs in Soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Naphthalene	mg/kg	0.2	<0.1	<0.1	<0.1	0.2
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.5
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.5
Phenanthrene	mg/kg	0.7	0.4	<0.1	<0.1	5.0
Anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	1.4
Fluoranthene	mg/kg	1.0	0.4	<0.1	<0.1	7.8
Pyrene	mg/kg	1	0.4	<0.1	<0.1	7.0
Benzo(a)anthracene	mg/kg	0.6	0.3	<0.1	<0.1	3.7
Chrysene	mg/kg	0.6	0.3	<0.1	<0.1	2.9
Benzo(b,j+k)fluoranthene	mg/kg	1	0.4	<0.2	<0.2	4.8
Benzo(a)pyrene	mg/kg	0.5	0.1	<0.05	<0.05	3.1
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	<0.1	<0.1	<0.1	1.4
Dibenzo(a,h)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	0.5
Benzo(g,h,i)perylene	mg/kg	0.2	<0.1	<0.1	<0.1	1.5
Total +ve PAH's	mg/kg	6.4	2.3	<0.05	<0.05	41
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.8	<0.5	<0.5	<0.5	4.7
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.8	<0.5	<0.5	<0.5	4.7
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.8	<0.5	<0.5	<0.5	4.7
Surrogate p-Terphenyl-d14	%	95	94	108	94	104

PAHs in Soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	22/10/2020
Date analysed	-	22/10/2020
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	99

Organochlorine Pesticides in soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	0.2
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	92	91	103	93	104

Organochlorine Pesticides in soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	22/10/2020
Date analysed	-	22/10/2020
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	95

Organophosphorus Pesticides in Soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	92	91	103	93	104

Organophosphorus Pesticides in Soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	22/10/2020
Date analysed	-	22/10/2020
Dichlorvos	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Parathion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Ethion	mg/kg	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1
Surrogate TCMX	%	95

PCBs in Soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	92	91	103	93	104

PCBs in Soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	22/10/2020
Date analysed	-	22/10/2020
Aroclor 1016	mg/kg	<0.1
Aroclor 1221	mg/kg	<0.1
Aroclor 1232	mg/kg	<0.1
Aroclor 1242	mg/kg	<0.1
Aroclor 1248	mg/kg	<0.1
Aroclor 1254	mg/kg	<0.1
Aroclor 1260	mg/kg	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1
Surrogate TCMX	%	95

Acid Extractable metals in soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Arsenic	mg/kg	130	23	<4	<4	7
Cadmium	mg/kg	5.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	11	4	6	11	10
Copper	mg/kg	150	120	1	5	15
Lead	mg/kg	700	170	5	8	110
Mercury	mg/kg	0.3	0.5	<0.1	<0.1	0.1
Nickel	mg/kg	23	9	1	4	5
Zinc	mg/kg	1,700	79	19	18	140
Iron	mg/kg	31,000	8,900	5,800	9,500	17,000
Manganese	mg/kg	430	120	50	90	130

Acid Extractable metals in soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date prepared	-	22/10/2020
Date analysed	-	22/10/2020
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	4
Copper	mg/kg	<1
Lead	mg/kg	<1
Mercury	mg/kg	<0.1
Nickel	mg/kg	<1
Zinc	mg/kg	2
Iron	mg/kg	1,000
Manganese	mg/kg	5

Moisture						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	23/10/2020	23/10/2020	23/10/2020	23/10/2020	23/10/2020
Moisture	%	14	7.3	6.0	8.5	15

Moisture		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date prepared	-	22/10/2020
Date analysed	-	23/10/2020
Moisture	%	14

Asbestos ID - soils			
Our Reference		253850-4	253850-5
Your Reference	UNITS	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020
Type of sample		SOIL	SOIL
Date analysed	-	28/10/2020	28/10/2020
Sample mass tested	g	Approx. 65g	Approx. 35g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected

Misc Inorg - Soil			
Our Reference		253850-2	253850-6
Your Reference	UNITS	2/2.0	5/4.0
Date Sampled		12/10/2020	12/10/2020
Type of sample		SOIL	SOIL
Date prepared	-	23/10/2020	23/10/2020
Date analysed	-	23/10/2020	23/10/2020
pH 1:5 soil:water	pH Units	6.8	7.3
Electrical Conductivity 1:5 soil:water	µS/cm	43	23

Coal Tar			
Our Reference		253850-2	253850-4
Your Reference	UNITS	2/2.0	4/0.5
Date Sampled		12/10/2020	12/10/2020
Type of sample		SOIL	SOIL
Date prepared	-	23/10/2020	23/10/2020
Date analysed	-	23/10/2020	23/10/2020
Presence of Coal Tar*	-	Absent	Absent

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.
RTA T542	Determination of Phenol in core samples as per RTA test method T542. This procedure gives and indication of whether a sample of asphalt has been made with coal tar. The coal tar method gives an approximate result with a high degree of uncertainty.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			23/10/2020	1	22/10/2020	22/10/2020		22/10/2020	[NT]
Date analysed	-			23/10/2020	1	23/10/2020	23/10/2020		23/10/2020	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	105	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	105	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	1	0.4	0.3	29	108	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	97	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	103	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	108	[NT]
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	104	[NT]
naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	88	1	112	84	29	103	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	[NT]
Date analysed	-			23/10/2020	[NT]	[NT]	[NT]	[NT]	23/10/2020	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	130	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	110	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	130	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	110	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
Surrogate o-Terphenyl	%		Org-020	90	[NT]	[NT]	[NT]	[NT]	118	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	253850-2
Date extracted	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Date analysed	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	95	90
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	87	99
Fluorene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	96	98
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	101	85
Anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	100	81
Pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	100	80
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	102	82
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	102	88
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	112	[NT]	[NT]	[NT]	[NT]	100	92

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	253850-2
Date extracted	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Date analysed	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	87
HCB	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	89	72
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	93	87
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	97	81
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	99	86
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	91
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	97	77
Endrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	89	88
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	92	79
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	99	76
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	103	[NT]	[NT]	[NT]	[NT]	95	92

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	253850-2
Date extracted	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Date analysed	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	100	124
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	96	88
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	93	101
Malathion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	120
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	99	97
Parathion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	78	94
Bromophos-ethyl	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	113	121
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	103	[NT]	[NT]	[NT]	[NT]	95	92

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	253850-2
Date extracted	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Date analysed	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	80	80
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-021	103	[NT]	[NT]	[NT]	[NT]	95	92

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date prepared	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	[NT]
Date analysed	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	106	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	109	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	115	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Iron	mg/kg	10	Metals-020	<10	[NT]	[NT]	[NT]	[NT]	117	[NT]
Manganese	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	108	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date prepared	-			23/10/2020	[NT]	[NT]	[NT]	[NT]	23/10/2020	[NT]
Date analysed	-			23/10/2020	[NT]	[NT]	[NT]	[NT]	23/10/2020	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

pH/EC
Samples were out of the recommended holding time for this analysis.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures.
We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples 253850-4,5 were sub-sampled from jars provided by the client.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 253850-A

Client Details

Client	Douglas Partners Newcastle
Attention	[redacted]
Address	Box 324 Hunter Region Mail Centre, Newcastle, NSW, 2310

Sample Details

Your Reference	**102159, Newcastle**
Number of Samples	6 SOIL
Date samples received	21/10/2020
Date completed instructions received	13/11/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	20/11/2020
Date of Issue	20/11/2020

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By

[redacted] Senior Chemist
[redacted], Senior Chemist
[redacted] Metals Supervisor

Authorised By

[redacted]
[redacted] Laboratory Manager

Metals in TCLP USEPA1311			
Our Reference		253850-A-1	253850-A-5
Your Reference	UNITS	1/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020
Type of sample		SOIL	SOIL
Date extracted	-	18/11/2020	18/11/2020
Date analysed	-	18/11/2020	18/11/2020
pH of soil for fluid# determ.	pH units	7.6	7.9
pH of soil TCLP (after HCl)	pH units	1.8	1.8
Extraction fluid used	-	1	1
pH of final Leachate	pH units	5.1	5.1
Arsenic in TCLP	mg/L	0.07	[NA]
Lead in TCLP	mg/L	0.2	0.08

PAHs in TCLP (USEPA 1311)		
Our Reference		253850-A-5
Your Reference	UNITS	5/1.5
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	17/11/2020
Date analysed	-	17/11/2020
Naphthalene in TCLP	mg/L	<0.001
Acenaphthylene in TCLP	mg/L	<0.001
Acenaphthene in TCLP	mg/L	<0.001
Fluorene in TCLP	mg/L	<0.001
Phenanthrene in TCLP	mg/L	<0.001
Anthracene in TCLP	mg/L	<0.001
Fluoranthene in TCLP	mg/L	<0.001
Pyrene in TCLP	mg/L	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001
Chrysene in TCLP	mg/L	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001
Total +ve PAH's	mg/L	NIL (+)VE
Surrogate p-Terphenyl-d14	%	78

Metals-ASLP Neutral (ICP-MS)			
Our Reference		253850-A-1	253850-A-5
Your Reference	UNITS	1/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020
Type of sample		SOIL	SOIL
Date extracted	-	20/11/2020	20/11/2020
Date analysed	-	20/11/2020	20/11/2020
pH of final Leachate	pH units	8.4	8.4
Lead in ASLP	µg/L	320	[NA]

PAHs in Water Leach - Low Level		
Our Reference		253850-A-5
Your Reference	UNITS	5/1.5
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	17/11/2020
Date analysed	-	17/11/2020
Naphthalene	µg/L	<0.1
Acenaphthylene	µg/L	<0.1
Acenaphthene	µg/L	<0.1
Fluorene	µg/L	<0.1
Phenanthrene	µg/L	<0.1
Anthracene	µg/L	<0.1
Fluoranthene	µg/L	<0.1
Pyrene	µg/L	<0.1
Benzo(a)anthracene	µg/L	<0.1
Chrysene	µg/L	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2
Benzo(a)pyrene	µg/L	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1
Surrogate p-Terphenyl-d14	%	90

Method ID	Methodology Summary
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction (zHE) using AS4439 and USEPA 1311.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004. Please note that the mass used may be scaled down from the default based on sample mass available.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS following leaching using neutralised deionised water by AS 4439.3 - 1997.
Org-022/025	Leachates are extracted with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-022/025 ASLP	ASLP Leachates are extracted with Dichloromethane and analysed by GC-MS/GC-MSMS.

QUALITY CONTROL: Metals in TCLP USEPA1311					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			18/11/2020	[NT]	[NT]	[NT]	[NT]	18/11/2020	[NT]
Date analysed	-			18/11/2020	[NT]	[NT]	[NT]	[NT]	18/11/2020	[NT]
Arsenic in TCLP	mg/L	0.05	Metals-020 ICP-AES	<0.05	[NT]	[NT]	[NT]	[NT]	114	[NT]
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	[NT]	[NT]	[NT]	[NT]	99	[NT]

QUALITY CONTROL: PAHs in TCLP (USEPA 1311)					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			17/11/2020	[NT]	[NT]	[NT]	[NT]	17/11/2020	[NT]
Date analysed	-			17/11/2020	[NT]	[NT]	[NT]	[NT]	17/11/2020	[NT]
Naphthalene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	106	[NT]
Acenaphthylene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	88	[NT]
Fluorene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	96	[NT]
Phenanthrene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	124	[NT]
Anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	114	[NT]
Pyrene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	114	[NT]
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	130	[NT]
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-022/025	<0.002	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	125	[NT]
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	95	[NT]	[NT]	[NT]	[NT]	71	[NT]

QUALITY CONTROL: Metals-ASLP Neutral (ICP-MS)					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			20/11/2020	[NT]	[NT]	[NT]	[NT]	20/11/2020	[NT]
Date analysed	-			20/11/2020	[NT]	[NT]	[NT]	[NT]	20/11/2020	[NT]
Lead in ASLP	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: PAHs in Water Leach - Low Level						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			17/11/2020	[NT]	[NT]	[NT]	[NT]	17/11/2020	[NT]
Date analysed	-			17/11/2020	[NT]	[NT]	[NT]	[NT]	17/11/2020	[NT]
Naphthalene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Fluorene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Phenanthrene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	124	[NT]
Anthracene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Pyrene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	130	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025 ASLP	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	125	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	95	[NT]	[NT]	[NT]	[NT]	71	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

PAH - out of recommended holding time

Appendix D1

Contamination Assessment

SESL

J003951 Contamination Assessment Foreshore Park Newcastle

Prepared for:

TCL LANDSCAPE CONSTRUCTIONS PTY LTD

JUNE 2022



Document Record

Client:	TLC LANDSCAPE CONSTRUCTIONS PTY LTD
Project:	Contamination Assessment
Document Title:	J003951 - Contamination Assessment - Foreshore Park Newcastle
Document Version:	1.0
Our Reference:	J003951
File Name:	J003951 - Contamination Assessment -Newcastle Foreshore Park - T.C.L
Last Saved:	29/06/2022 3:53 PM
Main Author:	[redacted]
Qualifications:	BEng (Env)
Technical Reviewer:	[redacted]
Qualifications:	BSc (Mar Biol), GradDip Env Mgmt, Prin Env Aud
Final Reviewer	[redacted]
Qualifications:	BSc (Mar Biol), GradDip Env Mgmt, Prin Env Aud

Revision	Reviewed By	Action	Issued To	Date	Release Approval
0.1	[redacted]	Initial draft	Internal		
1.0	[redacted]	Finalise report	Client	30/06/2022	[redacted]

TABLE OF CONTENTS

1 INTRODUCTION 6

1.1 OBJECTIVE 6
1.2 SCOPE OF WORKS 6
1.3 ENVIRONMENTAL GUIDELINES 7

2 SITE INFORMATION 9

2.1 SITE LOCATION AND OWNERSHIP 9
2.2 SITE IDENTIFICATION 9
2.3 SURROUNDING LAND USE 9

3 ENVIRONMENTAL SETTING 10

3.1 TOPOGRAPHY AND DRAINAGE 10
3.2 GEOLOGY 10
3.3 HYDROGEOLOGY 10
3.4 ACID SULFATE SOIL 10
3.5 PROXIMITY TO LOCAL SENSITIVE ENVIRONMENTS 10

4 PREVIOUS ENVIRONMENTAL INVESTIGATIONS 11

4.1 PRELIMINARY GEOTECHNICAL INVESTIGATION AND WASTE CLASSIFICATION, HARBOUR FORESHORE MASTERPLAN WHARF ROAD, NEWCASTLE., FEBRUARY 2021 (DOUGLAS PARTNERS PGI, 2021) 11

5 QUALITY ASSURANCE AND QUALITY CONTROL PLAN 12

5.1 DATA QUALITY OBJECTIVES 12
5.2 DATA QUALITY INDICATORS AND DATA EVALUATION 14
5.3 FIELD AND LABORATORY QUALITY ASSURANCE PROGRAM 15

6 RELEVANT GUIDELINES FOR CONTAMINATION ASSESSMENT AND MANAGEMENT 17

6.1 SOIL ASSESSMENT CRITERIA 17
6.2 HEALTH INVESTIGATION LEVELS (HILS) 17
6.3 HEALTH SCREENING LEVELS (HSLS) 19
6.4 ECOLOGICAL INVESTIGATION LEVELS (EILS) 20
6.5 ECOLOGICAL SCREENING LEVELS (ESLS) 21
6.6 ASBESTOS CRITERIA 22

7 SOIL SAMPLING, ANALYSIS PLAN AND SAMPLING METHODOLOGY 23

7.1 SAMPLING RATIONALE 23
7.2 SAMPLING TEAM 23

8 FIELD INVESTIGATION AND SOIL SAMPLING 25

8.1 SAMPLING REGIME – SOIL 25
8.2 GENERAL OBSERVATIONS 28

9 LABORATORY RESULTS 30

10 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) RESULTS 32

10.1 FIELD QA/QC 32
10.2 LABORATORY QA/QC 33
10.3 STATEMENT ON DATA QUALITY 33

11 DISCUSSION OF RESULTS 34

11.1 FIELD OBSERVATION 34
11.2 LABORATORY RESULTS 34

12 CONCEPTUAL SITE MODEL 36

12.1 SOURCES OF IMPACT 36
12.2 CONTAMINANTS OF CONCERN 36
12.3 POTENTIAL PATHWAYS 37
12.4 POTENTIAL SURROUNDING RECEPTORS 37
12.5 SUMMARY OF POTENTIALLY COMPLETE EXPOSURE PATHWAYS 37

13 CONCLUSIONS AND RECOMMENDATIONS 38

SUMMARY OF IN-TEXT TABLES

Table 1 – Site Identification 9
Table 2 – Health Investigation Levels for Soil Contaminants 18
Table 3 – Health Screening Level Fractions and Corresponding Equivalent Carbon Range 19
Table 4 – Soil Ecological Investigation Adopted Criteria (EILs) 20
Table 5 – Soil Ecological Investigation Adopted Criteria 21
Table 6 – Health Screening Levels for Asbestos Contamination in Soil 22
Table 7 –Sampling Program 23
Table 8– Sampling Team Personnel 24
Table 9– Sampling Collection Summary 25

APPENDICES:

A. Site Location:
   Figure 1 – Locality Map
   Figure 2 – Site Layout
   Figure 3 – Sampling Location Maps
   Figure 4 – Exceedance Map
B. Douglas Partners Report - Preliminary Geotechnical Investigation and Waste Classification
C. PID Calibration Certificate
D. Result Summary Analytical Tables
E. Certificates of Analysis
F. RPD Tables
G. Unexpected Finds Protocol
H. Geotechnical Investigation

ABBREVIATIONS

ASC NEPM 2013	National Environmental Protection Council (NEPC) (2013). National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended April 2013)
ACM	Asbestos containing materials
ACT	Australian Capital Territory
AEC	Areas of Environmental Concern
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AMG	Australian Map Grid
ASC	Assessment of Site Contamination
ASS	Acid Sulfate Soils
BaP	Benzo(a)pyrene
BGL	Below Ground Level
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
BTEXN	Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene
CEMP	Construction Environmental Management Plan
CLM	Contaminated Land Management Act
COC	Chain of Custody
COPC	Contaminants of Potential Concern
CPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbons
CRC CARE	Cooperative Research Centre for Contamination Assessment and Remediation or the Environment
CSM	Conceptual Site Model
DQO	Data Quality Objectives
DQI	Data Quality Indicator
DESA	Detailed Environmental Site Assessment
EILs	Ecological Investigation Levels.
EMP	Environmental Management Plan
EPA	ACT Office of Environmental Protection Authority
EPBC	*Environment Protection and Biodiversity Conservation Act 1999*
EPP	Environment Protection Policy
ESA	Environmental Site Assessment
ESLs	Ecological Screening Levels
HILs	Health Investigation Levels
HSLs	Health Screening Levels
LCS	Laboratory Control Samples
LOR	Limit of Reporting
mAHD	Metres Australian Height Datum (above mean sea level)
NATA	The National Association of Testing Authorities
NEHF	National Environment and Health Forum
	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health Medical Research Council
NSW	New South Wales
OCP	Organochlorine Pesticides

OEH	Office of Environment and Heritage
OPP	Organophosphate Pesticides
NSW	New South Wales
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
QA	Quality Assurance
QC	Quality Control
RAC	Remediation Acceptance Criteria
RPD	Relative Percent Difference
SESL	SESL Australia Pty Limited
TEQ	Toxic Equivalence Quotient
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbon

1 INTRODUCTION

SESL Australia Pty Ltd (SESL) was engaged by TLC Landscape Constructions Pty Ltd (the Client) to undertake a Contamination Assessment (CA) to assess the potential presence of contamination at the Foreshore Park, Newcastle East NSW 2300 (the site). The site is a part of the Newcastle Foreshore Park covering approximately 8,000 m^2 and will be known as Variety Livvi's Place Playspace. **(Appendix A**, Figure 1). The investigation is required by the City of Newcastle to assess the contamination of the Site as a larger play facility will be developed at the site as Council plans to reuse the majority of the material in the new development.

The site is currently a public recreational space, with a mix of grass, trees, and garden bed cover, and an amenity building. A preliminary geotechnical investigation and waste classification undertaken for the harbour foreshore masterplan at Wharf Road, Newcastle by Douglas Partners in 2021 (102159.00 - Report on Preliminary Geotechnical Investigation and Waste Classification) (Douglas Partners PGI, 2021) (refer to **Appendix B**). The report states that contamination may be present within the site as the site was previously used as a railway goods yard. An extra area east of the site will also be investigated due to the potential presence of contamination from a former diesel underground storage tank.

The present CA is based on nineteen (19) evenly distributed sampling locations across the site and one additional sampling location east of the site to target the former diesel tank.

1.1 OBJECTIVE

The overall objective of this assessment is to investigate the current conditions at the site with regards to potential contamination and to if the existing soils can be reused in the proposed new Variety Livvi's Place Play space.

The objectives of this CA also include to:

- Identify potential sources of contamination within fill as a result of past and present land use activities;
- Assess the nature and extent of potential contamination on site;
- Determine if the potential contamination being present on site can pose any risk to human and/or environment; and
- Assess if the soil across the site is suitable for reuse in the new proposed park development.

1.2 SCOPE OF WORKS

To achieve the objectives of this investigation, the scope of works for this investigation include the following:

- A review of available site history and background information to identify potential areas of environmental concern and associated contaminants of concern;
- The review of environmental settings including council records, EPA records, geology, acid sulphate soil (ASS), hydrology and salinity maps;
- Carry out an underground service location search (Dial Before You Dig) as part of the review to identify the presence of services that could potentially compromise the intrusive soil investigation;
- A detailed site inspection to confirm desktop findings;

- Construction of 19 boreholes to a maximum depth of 4m below ground level (bgl) based on an approximate area of 8,000m^2 evenly distributed across the site and one (1) extra targeted location to investigate unconfirmed diesel contamination to the east of the site;
- Collection of soil samples from various depths from fill and natural soil at each test pit/borehole to delineate vertically and horizontally the potential presence of contamination;
- Log each test pit in accordance with the Unifies Classification System (USCS);
- Implement decontamination and quality control procedures in accordance with industry standard;
- Undertake field screening of soil samples on the basis of PID (volatiles) readings and visual and olfactory observations;
- Deliver ninety (90) soil samples to a NATA accredited laboratory, with accompanying chain of custody documentation;
- Analysis of 2 samples per borehole plus four QA/QC for a total of 44 samples for the following analytes:
    - Heavy metals 8;
    - Total recoverable hydrocarbons (TRH);
    - Polyaromatic Hydrocarbons (PAHs);
    - Benzene/Toluene/Ethylbenzene/Xylene (BTEX);
    - Organochlorine Pesticides (OCPs);
    - Polychlorinated biphenyls (PCBs); and
    - Asbestos (presence/absence).
- Analysis of 1 sample per borehole for a total of 20 samples for chromium suite to assess potential presence of acid sulfate; and
- Preparation of a contamination report outlining the finding of the assessment and laboratory analysis results.

Soil samples analysis were carried out at NATA accredited laboratories (ALS NATA #855 and Eurofins NATA #1261), under chain of custody protocols.

1.3 ENVIRONMENTAL GUIDELINES

This report has been prepared based on the guidance provided in the following environmental guidelines and regulations:

- Western Australia Department of Health (2009). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia;
- ASTM (2000). Standard Practice D2488 90 Description and Identification of Soils (Visual-Manual Procedure). American Society for Testing and Materials;
- CRC CARE (2011). Technical Report No. 10. Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater;
- Enhealth (2012) Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards, Department of Health and Ageing and EnHealth Council, Commonwealth of Australia;
- National Environmental Protection Council (NEPC). National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended in April 2013);
- NSW DEC (2017) Guidelines for the NSW Site Auditor Scheme (3rd Ed.);
- NSW EPA (2015). Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997;

- NSW EPA (1995). Sampling Design Guidelines (1995);
- NSW EPA (1996). *Protection of the Environment Operations (Waste) Regulatio*n;
- and
- NSW EPA (2020). *Guidelines for Consultants Reporting on Contaminated Sites*. NSW Office of Environment and Heritage.

1.4 EXISTING SITE CONDITIONS AND PROPOSED CHANGES

At present, the majority of the site is an open grassed area with some mature trees located within landscaped areas along the footpath areas . Concrete footpaths bound the site along the south with an old building used as public toilets and potentially storage of material is located at the north- centre area of the site. There is an existing playground on the eastern part of the site covering approximately 1000m^2. Matured trees are mainly located within defined landscaping areas covered with mulch. The proposed play space to be constructed will reduce significantly the grass and vegetation coverage, which will be replaced mainly with playground furniture and facilities including:

- Water splash pad and sculptural maze;
- Shade elements;
- Small scale water play objects;
- Large swings set;
- Toddler / junior play area;
- Awabakal sculpture canoes;
- Tug Boat play elements;
- Flying foxes;
- Trampolines;
- Circuit paths, seating, decks, walls, gardens, lawns and interpretive fences;
- Iconic play structures, with multiple play features
- Amenities pavilion with associated decks, canopies, storage, potential pump room, toilets;
- Change facilities and small café provision; and
- Lighting, wayfinding and furnishings.

2 SITE INFORMATION

2.1 SITE LOCATION AND OWNERSHIP

The site is located at 7 Bond Street, Newcastle East NSW 2300. A map of the site in a regional context can be seen in **Appendix A**, Figure 1. The Site is in Northumberland County, within the City of Newcastle local government area (LGA). The Site's current occupant and owner is City of Newcastle.

2.2 SITE IDENTIFICATION

Information regarding the site is provided in Table 1.

Table 1 – Site Identification

Site Owner	City of Newcastle
Site Address	7 Bond Street, Newcastle East NSW 2300
Lot and DP Number	Lot 2,3 of DP720672; Lot 1,2 of DP729028
Local Government Area	City of Newcastle
Current Zoning	RE1 - Public Recreation
Assessment Site Area	0.8 hectares (ha)
Locality Map	**Appendix A**, Figure 1.
Site Layout	**Appendix A**, Figure 2.

2.3 SURROUNDING LAND USE

The City of Newcastle LEP defines the predominant land use as RE1 Public Recreation. The immediate surroundings of the site are also defined as RE1 Public Recreation. Site surroundings are summarised as follows:

- North: Foreshore Park carpark followed by Wharf Rd and Newcastle Harbour;
- South: Foreshore Park followed by Bond St and medium density residential area;
- East: Eastern Foreshore Park;
- West: Foreshore Park followed by Watt Street.

3 ENVIRONMENTAL SETTING

The following information pertaining to the environmental setting of the site has been summarised from the information in the Douglas Partners (2021) report and eSPADE.

3.1 TOPOGRAPHY AND DRAINAGE

The site is level to undulating, broad (to 5 km), well-drained sand plain with a common slope gradient of <2%. General elevation is up to 12 m, and local relief of <1 m. The site is generally flat with some artificially made mounds where most of the existing mature trees are present.

3.2 GEOLOGY

Based on the 1:100 000 Newcastle Coalfield Regional Geology map, and Douglas Partners (2021) report indicates that the majority of the site is underlain by quaternary alluvium generally comprising gravel, sand, silt and clay, with the exception of the south-eastern and southern extents of the site. This area is underlain by the Permian aged Lambton subgroup of the Newcastle Coal Measures. This subgroup is generally comprised of sandstone, siltstone, claystone, coal and tuff.

3.3 HYDROGEOLOGY

Douglas Partners PGI (2021) report states that "the regional groundwater flow regime is believed to be towards the Hunter River (Newcastle Harbour) located immediately adjacent to the north-western portion of the site and approximately 160 m northwest of the remainder of the site. This water body is considered to be the nearest sensitive receptor."

Based on site topography, the depth to groundwater may be located at a depth of approximately 2 m from the ground surface and depth may vary by climatic conditions and soil permeability and with time.

3.4 ACID SULFATE SOIL

Based on the Acid Sulfate Soil Risk Map for the site, the site is located within an area considered as having a high probability of occurrence of acid sulfate soils (ASS) at depths between 1 m and 3 m below the ground surface.

3.5 PROXIMITY TO LOCAL SENSITIVE ENVIRONMENTS

The primary sensitive environment observed during the field investigation is the Newcastle Harbor close proximity (<100m) to the site boundary.

4 Previous Environmental Investigations

A summary of the previous investigation carried out on site is outlined below:

4.1 Preliminary Geotechnical Investigation and Waste Classification, Harbour Foreshore Masterplan Wharf Road, Newcastle., February 2021 (Douglas Partners PGI, 2021)

Douglas Partners carried out a preliminary geotechnical investigation and waste classification of 14 hectares of Newcastle Foreshore, including Foreshore Park. The assessment identified the following:

- Historical potentially contaminating activities, including fill placement, former industrial land use (e.g. rail yards) and demolition of structures. The assessment specifically states that the Newcastle Foreshore Yard was used as railway goods yard;
- Initial works in 1991 indicated that possible diesel oil may have been present in the vicinity of the existing carriage shed. However, a management plan for the site does not provide details of presence, locations and extent of contamination within Newcastle Foreshore;
- The assessment also discussed about a groundwater assessment carried out by Advitech in 2003 within the Foreshore Park area. Laboratory results from the samples collected were compared against ANZECC 200 long term and short-term trigger values for irrigation where no of gross contamination was detected. A copy of the report was not sighted by SESL;
- A total of 12 boreholes were carried out within the study area, three of them within the site. Groundwater at these three borehole locations was detected between 2.2 to 3.1m below ground level (bgl) and the depth of fill ranged between 1.2m to 4.6m bgl. Traces of ash was detected in all three-sampling location;
- No asbestos containing material (ACM) was encountered during the assessment. However, due to the presence of uncontrolled fill within the site, ACM was recommended as part of the contaminants of concern;
- A total of 18 samples were selected for laboratory analysis of TRH, BTEX, PAH, PCBs, OCP/OPP, heavy metals (8) and asbestos identification. Additionally, forty-three (43) samples were analysed for potential and actual acidity while 5 of these samples were analysed for chromium suite;
- Laboratory results for the samples collected within the site showed lead concentrations exceeding the HIL -C criteria while arsenic, zinc and F3 exceeded the EIL/ESL – C in borehole 1. F3 also exceeded the ESL -C criteria in borehole 2; and
- Results for pH field following oxidation and chromium suite analysis showed that there is a marginal possibility of ASS be present on sandy soils within the investigation area.

No other contamination assessment for the site were provided to SESL.

5 QUALITY ASSURANCE AND QUALITY CONTROL PLAN

5.1 DATA QUALITY OBJECTIVES

The purpose of establishing data quality objectives (DQOs) is to ensure the field investigations and analysis are undertaken in a way that enables the collection and reporting of reliable data. The DQOs and the procedures designed to achieve these objectives are listed below.

In determining the type, quantity and quality of data needed to support decisions relating to the investigation, the seven-step DQO approach has been undertaken in accordance with Appendix IV of the NSW EPA Guidelines for the NSW Site Auditor Scheme (3rd Edition), 2017 and NEPM ASC. The DQOs are presented in detail in the following sections.

5.1.1 Step 1- State the Problem

Due to former industrial use of the site, contamination may be present at the site as per the Douglas Partners PGI (2021) . The primary contaminants of concern (CoC) are associated with:

- Fill materials of unknown origin;
- Soils that are potentially contaminated with rail motor refuelling and maintenance spills;
- Soils that may contain demolished building material in the fill material;
- Soils that may be impacted by contaminants associated with storage of chemicals and fuel equipment in the sheds; and
- Soils that may be impacted by diesel oil used to preserve timber fence posts.

5.1.2 Step 2 – Identify The Decision/Goal of The Study

The objective of this study was to assess the status and extend of potential contamination identified within the site by Douglas Partners PGI (2021) and assess if the material is suitable to be reused on site for the proposed park. The decisions to be made, based on the results of this assessment are as follows:

- Are concentrations of the potential contaminants of concern (PCoCs) in soils on site greater than the adopted human health and ecological investigation and screening levels?
- What is the nature and extent of concentrations of PCoCs both laterally and vertically, and has this sufficiently been determined?
- What is the stratigraphy of the soil, and does it influence the distribution of the contamination (if detected)?
- Have the PCoCs been adequately identified and addressed such that a statement on risk to receptors could be made?
- Has a detailed conceptual site model been developed to fully understand source, pathway and receptors and associated risks?
- Based on the outcomes of the above, is the soil suitable for on-site reuse?

5.1.3 Step 3 – Identify Information Inputs

The inputs required to make the above decisions for the project are as follows:

- Data gathered during the desktop review, including Douglas Partners PGI (2021);
- Selection and application of appropriate assessment criteria against which the analytical results of soil are to be assessed;
- Laboratory results of analysis of soil samples collected during the field investigation for the PCoCs;
- Quality Assurance/Quality Control (QA/QC) samples results;
- Assessment of the appropriateness of the limits of reporting (LOR) and aligning the LORs with the adopted assessment criteria;
- Borelog data form the field investigation; and
- The environmental guidance provided in the guidelines and environmental regulations listed in Section 1.

5.1.4 Step 4 – Define the Study Boundaries

The investigation area relates to the site outlined and sampling location identified on the figures attached in **Appendix A.** The investigation boundaries are outlined below:

- Soils across the 8,000 m^2 site area were collected through 19 evenly distributed boreholes;
- Soil from an additional borehole located north east of the site to assess the unconfirmed diesel contamination;
- Samples were collected from the surface material to 0.5m into natural material or maximum of 4 m depth; and
- Samples were collected at a 0.5 m depth increment or any stratigraphy changes.

5.1.5 Step 5 – Develop the Analytical Approach (Or Decision Rule)

Concentrations of contaminants in soils will be compared to the appropriate ASC NEPM criteria to assess the potential impacts to soil and to assess any need for further investigation or remediation. The assessment criteria adopted for this Contamination Assessment is:

- Soil Health Investigation Levels for Recreation for recreational land use(HIL_C);
- Health screening levels for petroleum compounds for recreational land use (HSL_C);
- Ecological Screening Levels for Urban residential Sites and Public Open Spaces (coarse soil) (ESL) and
- Ecological Investigation Levels for Urban residential Sites and Public Open Spaces (EIL).

It should be noted that the above decisions rules are preliminary and depending on the conditions identified at the site during the assessment program, the decision rules may be changed.

5.1.6 Step 6 – Specify the Performance or Acceptance Criteria

The acceptable limits on decision errors and the manner in which they will be addressed has been developed based on the DQIs of precision, accuracy, representativeness, comparability and completeness. These DQIs are presented in the QA/QC Section of this report (Section 10). The potential for significant decision errors is to be minimised by:

- Completing a QA/QC assessment of the field and laboratory data;

- Assessing the appropriateness of the sampling and analytical program for this Contamination Assessment; and
- Ensuring that the criteria set for the assessment works are appropriate for the proposed use of the site.

5.1.7 Step 7 – Optimise the Design for Obtaining Data

Samples must be obtained, based on a coherent and comprehensive sampling plan to sufficiently characterise the potentially contaminated materials identified in the site. Sampling must be representative, appropriate sampling methodologies must be observed and sampling must be undertaken by trained and experienced field personnel.

5.2 Data Quality Indicators and Data Evaluation

SESL has selected the following Data Quality Indicators (DQIs) to ensure that the data obtained from the assessment are of sufficient quality to be used to draw reliable and representative conclusion in an assessment of the environmental conditions of the investigation area.

5.2.1 Documentation and Data Completeness

The completeness of data is defined as the percentage of analytical results that are considered valid. Valid chemical data values that have been identified as acceptable or acceptable as qualified during the data validation process. The completeness is a comparison of the total number of samples accepted against the total number of samples, calculated as a percentage. The project goal for completeness is greater than 90%. QA/QC for completeness includes the following:

- Sample locations are evenly distributed;
- All required samples collected (i.e. surface, subsoil);
- Sampling team is well informed, qualified, and experienced;
- Correct and complete documentation;
- Appropriate analysis methods and PQLs;
- Compliance of sample holding times; and
- All data entries in the database are correct, properly entered, checked and that any typographical errors in the database are corrected and the data re-entered properly.

5.2.2 Data Comparability

Comparability expresses the confidence that the data may be considered equivalent for each sampling and analytical event and deemed suitable for comparison. To assess comparability, field procedures, laboratory sample preparation procedures, analytical procedures and reporting units must be known and similar to established protocols or standard operating procedures (SOP). Qualitatively, data subject to strict QA/QC procedures will be deemed more reliable, therefore more comparable, than other data.

5.2.3 Data Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of parameter variations at sample points or environmental conditions and obtaining suitable samples from these sites.

Sample selection and analysis was conducted to meet the specific objectives of this Contamination Assessment. Analysis for the PCoCs will be selectively conducted on samples as indicated in analytical summary tables.

5.2.4 Precision and Accuracy for Sampling and Analysis

Precision and accuracy for sampling and analysis expresses the quantitative measure of the variability and closeness of the data. This DQI is crucial to provide information to data users of the reliability, unreliability or qualitative value of the data representing each analyte in each environmental matrix. QA/QC includes:

- Correct and appropriate SOPs applied and complied with;
- Assessment of RPDs are satisfactory; and
- Independent review of QA/QC data satisfactory.

Four QA/QC samples were collected as part of this investigation. The QA/QC data is considered satisfactory.

5.3 Field and Laboratory Quality Assurance Program

Quality Assurance (QA) and Quality Control (QC) practices were applied to all stages of data gathering and subsequent sample handling procedures. These are designed to provide control over both field and laboratory operations. Additionally, the analytical laboratories will complete their own internal QA procedures (as required by NATA registration) during the analysis of samples. Details of the QA/QC program are described below.

5.3.1 Quality Assurance

The fieldwork followed the SESL field sampling procedures to ensure that all environmental samples were collected by a set of uniform and systematic methods as required by the QA system.

The SESL field procedure includes the following strategies:

- Decontamination procedures between sampling;
- Identification of samples with unique identifier codes and procedures;
- Completeness of borelog data;
- Chain of custody information requirements; and
- Field calibration requirements (if necessary).

5.3.2 Quality Control Results

The results of the field and laboratory quality control samples were assessed to determine:

- The quality of the data generated;
- If the data meets the objectives of the study; and
- If the data is acceptable for the intended use.

5.3.3 Field QC

The following data quality indicators were used for the investigation:

- All samples analysed were conducted using NATA registered methods in accordance with NEPC (2013) guidelines.;

- Maximum acceptable sample holding times was 14 days for organic and 6 months for metal analyses. Mercury (Hg) to be analysed within 28 days of sample collection;
- Samples were appropriately preserved and handled;
- Laboratory method blank analyses were required to be below the limits of reporting PQL;
- All compound concentrations were (if required) spiked at similar concentration to sample results;
- All PQLs must be less than the assessment criteria;
- The relative percent difference of duplicates was determined and compared to the following criteria for acceptability. The acceptance criteria are:
    - Less than 50% for field duplicates;
    - Less than 30% for inter laboratory duplicates;
    - 30% for laboratory duplicates where the detection is less than 10 times the PQL; and
    - Less than 20% for laboratory duplicates where the detection is greater than 10 the PQL.
- RPDs for control spike duplicates to be compared to an acceptable limit of 20%;
- RPDs for Matrix Spike Duplicates to be compared to an acceptable limit of 20%; and
- Percent recoveries of control spikes and matrix spikes to be compared to an acceptable range of 70-130%. In addition, percent recoveries of surrogates were also compared to the US EPA surrogate recovery limits.

5.3.4 Laboratory Quality Control

Chemical analysis for soil, sediment and water samples to be undertaken by an environmental laboratory with suitable (eg. NATA) accreditation to perform the analysis under COC procedures.

6 RELEVANT GUIDELINES FOR CONTAMINATION ASSESSMENT AND MANAGEMENT

Assessment criteria is based on guidelines made or approved by the NSW EPA under Section 105 of the Contaminated Land Management Act 1997 and NEPM ASC.

NEPM ASC incorporates a recommended general process for the assessment of site contamination and a set of nine (9) specific guidelines. The process and guidelines are closely based on previous documentation widely used for assessing site contamination (such as ANZG Australian and New Zealand Guidelines for Fresh and Marine Water Quality and the various National Environmental Health Forum monographs and proceedings). Assessment criteria have been drawn from other guidelines and information sources if not available in the above guidelines.

6.1 SOIL ASSESSMENT CRITERIA

National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013) (NEPC 2013, Canberra) (NEPM ASC) provides a national framework for conducting assessments of contaminated sites in Australia.

The purpose of the NEPM ASC is to establish a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices by the community which includes regulators, site assessors, environmental auditors, landowners, developers and industry.

NEPM ASC addresses assessment of contamination and does not provide specific guidance on prevention of site contamination. The desired environmental outcome for the NEPM is to provide adequate protection of human health and the environment, where site contamination has occurred, through the development of an efficient and effective national approach to the assessment of site contamination.

NEPM ASC provides a framework for the use of investigation and screening levels for the protection of human health, ecosystems, groundwater resources and aesthetics. The adopted investigation and screening levels for the site are as follows:

- Health Investigation Levels (HILs);
- Health Screening Levels (HSLs);
- Ecological Investigation Levels (EILs): and
- Ecological Screening Levels (ESLs).

6.2 HEALTH INVESTIGATION LEVELS (HILS)

HILs are scientifically based, generic assessment criteria designed to be used in the Tier 1 assessment for assessing human health risk via all relevant pathways of exposure. HILs are designed to be intentionally conservative and based on a reasonable worst-case scenario for the following generic land use settings:

- HIL-A: Residential with garden/accessible soil (home grown produce contributing less than 10% of vegetable and fruit intake; no poultry) this category includes children's day-care centres, pre-schools and primary schools.

- HIL-B: Residential with minimal opportunities for soil access, including dwellings with fully and permanently paved yard space such as high-rise apartments and flats.
- **HIL-C: Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. It does not include undeveloped public open space (such as urban bushland and reserves), which should be subject to a site-specific assessment where appropriate.**
- HIL-D: Commercial/industrial includes shops and offices as well as factories and industrial sites.

Given that the site is proposed to further developed its recreational land use, Health Investigation Levels for the site is HIL C – Public Open Space- Recreational.

NEPM ASC Schedule B7 defined the HILs as the concentration of a contaminant above, which further appropriate investigation and evaluation will be required. It is also stated "levels in excess of the HILs do not imply unacceptability or that a significant health risk is likely to be present".

NEPM ASC Schedule B7 states at the very least, the maximum and the 95% UCL of the arithmetic mean contaminant as well as localised elevated values must be compared to the HILs. Two additional (secondary) criteria should also be met, namely that the standard deviation of the results must be <50% of the relevant investigation level and that no single value exceeds 250% of the relevant investigation level.

NEPM ASC states that the HILs are not intended to be used as clean-up levels for contaminated sites. The requirement of clean-up should be based on site-specific assessment and risk management options.

The adopted HIL is shown in Table 2.

Table 2 – Health Investigation Levels for Soil Contaminants

Health-based investigation levels (mg/kg)				
Chemical	*Residential[1] A*	Residential[1] B	**Recreational[1] C**	Commercial/ Industrial[1] D
Metals and Inorganics				
Arsenic[2]	*100*	500	**300**	3,000
Beryllium	*60*	90	**90**	500
Boron	*4,500*	40,000	**20,000**	300,000
Cadmium	*20*	150	**90**	900
Chromium (VI)	*100*	500	**300**	3,600
Cobalt	*100*	600	**300**	4,000
Copper	*6,000*	30,000	**17,000**	240,000
Lead[3]	*300*	1,200	**600**	1,500
Manganese	*3800*	14,000	**19,000**	60,000
Mercury (Inorganic) [5]	*40*	120	**80**	730
Methyl Mercury[4]	*10*	30	**13**	180
Nickel	*400*	1,200	**1,200**	6,000
Selenium	*200*	1,400	**700**	10,000
Zinc	*7,400*	60,000	**30,000**	400,000
Cyanide	*250*	300	**240**	1,500
Polycyclic Aromatic Hydrocarbons (PAHs)				
Carcinogenic PAHs (as BaP TEQ)[6]	*3*	4	**3**	40
Total PAHs[7]	*300*	400	**300**	4000
Phenols				
Phenol	*3,000*	45,000	**40,000**	240,000
Pentachlorophenol	*100*	130	**120**	660
Cresols	*400*	4,700	**4,000**	25,000

Health-based investigation levels (mg/kg)				
Chemical	*Residential[1] A*	Residential[1] B	**Recreational[1] C**	Commercial/ Industrial[1] D
Organochlorine Pesticides				
DDT+DDE+DDD	*240*	600	**400**	3,600
Aldrin and Dieldrin	*6*	10	**10**	45
Chlordane	*50*	90	**70**	530
Endosulfan	*270*	400	**340**	2,000
Endrin	*10*	20	**20**	100
Heptachlor	*6*	10	**10**	50
HCB	*10*	15	**10**	80
Methoxychlor	*300*	500	**400**	2,500
Mirex	*10*	20	**20**	100
Toxaphene	*20*	30	**30**	160
Herbicides				
2,4,5-T	600	900	**800**	5,000
2,4-D	900	1,600	**1,300**	9,000
MCPA	600	900	**800**	5,000
MCPB	600	900	**800**	5,000
Mecoprop	600	900	**800**	5,000
Picloram	4,500	6,600	**5,700**	35,000
Other Pesticides				
Atrazine	320	470	**400**	2,500
Chlorpyrifos	160	340	**250**	2,000
Bifenthrin	600	840	**730**	4,500
Other Organics				
PCBs[8]	1	1	**1**	7
PBDE Flame Retardants (Br1-Br9)	1	2	**2**	10

6.3 HEALTH SCREENING LEVELS (HSLS)

NEPM ASC adopts the Health Screening Levels for various petroleum hydrocarbon compounds developed by the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE). Friebel and Nadebaum 2011 provide the methodology for assessing human health risk via the inhalation and direct contact pathways of selected petroleum compounds and fractions.

The HSLs apply to the same land use scenarios with additional consideration of soil texture and depth to determine the appropriate soil, groundwater and soil vapour criteria.

NEPM ASC provides HSL fractions and corresponding equivalent carbon range for petroleum hydrocarbon compounds. HSLs are given only for F1, F2 and BTEX as the heavier petroleum compounds of F3 and F4 are non-volatile and do not pose a concern for vapour intrusion. However, exposure can be via direct contact pathways (dermal contact, incidental oral ingestion and dust in halation). In Table 3 of the CRC Care Report No. 10, Friebel and Nadebaum 2011 provides the HSLs for direct contact, however for most site assessments, these levels are unlikely to trigger further investigation or site management as the values are substantially higher than most soil screening levels.

Table 3 – Health Screening Level Fractions and Corresponding Equivalent Carbon Range

Fraction Number	Equivalent Carbon Number Range
F1	*C6 – C10*
F2	*>C10 – C16*

F3	*>C16 – C34*
F4	*>C34 – C40*

HSLs for soil, groundwater and soil vapour have been developed based on soil texture. The HSLs assume a uniform soil profile and the highest proportion of the soil texture from the soil profile should be used selecting the appropriate HSLs. For Tier 1 soil assessment, the HSL classifications of sand, silt and clay may be broadly applied to soil texture classification in Table A1 of Australian Standard 1726 as follow:

i) Coarse grained soil: >50% of particles (by weight) <63mm and >0.075mm
- Sand: >50% of particles (by weight) <2.36mm; or
- Gravel: >50% of particles (by weight) >2.36mm.

ii) Fine-grained soil: >50% of particles (by weight) <0.075mm
- Silts and clays (liquid limit >50%);
- Silts and clays (liquid limit <50%); or
- Highly organic soils.

The Health Screening Levels adopted for the site is HSLs – Health Screening Levels for recreational land use and will depend on the type of soil found on the site.

6.4 ECOLOGICAL INVESTIGATION LEVELS (EILS)

NEPM outlines the Ecological Investigation Levels (Interim EILs) developed for selected metals and organic substances including Arsenic (As), chromium (CrIII), Copper (Cu), lead (Pb), nickel (Ni), zinc (Zn) and Naphthalene.

The EILs are applicable to generic land uses such as areas of ecological significance, urban residential areas and public open space for commercial/industrial land use. Depending on the specific soil physicochemical properties and land use scenario, EIL generally apply to the top 2 m of soil. For specific EILs determinations additional soil parameters are required such as pH and CEC and clay content to calculate EILs for chromium, copper, nickel, zinc and arsenic. The current land use of the site and the surrounding properties have been Public Open Space- Recreational land use. Table 4 below summarises the EILs adopted criteria for the site based on public open space-recreational land use.

Table 4 – Soil Ecological Investigation Adopted Criteria (EILs)

Chemical	EIL Public Open Space/Recreational (mg/kg)
Arsenic	100
Chromium	190
Copper	60
Lead	1,100
Nickel	30

Chemical	EIL Public Open Space/Recreational (mg/kg)
Zinc	70
Naphthalene	170

6.5 ECOLOGICAL SCREENING LEVELS (ESLS)

Ecological Screening Levels (ESLs) for Urban Residential land use setting for total petroleum hydrocarbons (TPH) fractions, BTEX and benzo(a)pyrene was adopted for assessing risk to terrestrial ecosystems. The soil textures across the site were identified as clay loams and loamy clays and as such the fine textured soils have been considered for ESL criteria selection. Note ESLs only apply to the top 2 m of soil.

The assessment criteria for compounds not provided by NSW EPA endorsed guidelines, including the ASC NEPM, overseas guidelines were adopted as per NEPM hierarchy (NEPC 2013).

Table 5 – Soil Ecological Investigation Adopted Criteria

Chemical	NEPM ESL C fine Public open space (mg/kg)	NEPM ESL C coarse Public open space (mg/kg)
Benzene	65	50
Toluene	105	85
Ethylbenzene	125	70
Total xylenes	45	105
TRH F1 (C6-C10 minus BTEX)	180	180
TRH F2 (C10-C16 minus naphthalene)	120	120
TRH C16-C34 (F3)	1,300	300
TRH C34-C40 (F40	5,600	2,800

6.6 ASBESTOS CRITERIA

ASC NEPM (2013) adopted the HSLs from the Western Australia Department of Health (WA DoH) Guidelines of Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia 2009. The HSLs are based on scenario-specific likely exposure levels, which include bonded and friable asbestos levels.

Asbestos only poses human health risk when asbestos fibres are made airborne and inhaled. Bonded asbestos is not readily made airborne except through substantial physical damage. NEPM 2013 states "the assessment and management of asbestos contamination should take into account the condition of the asbestos materials and the potential for damage and resulting release of asbestos fibres".

The HSLs are to be used for Tier 1 assessment, in the event of an exceedance that triggers the need for a Tier 2 site-specific assessment. Site-specific assessments of asbestos contaminated sites should be designed to describe the nature and quantity of asbestos present in the soil that can sufficiently develop a risk management plan for the current and proposed land use of the site.

Table 6 – Health Screening Levels for Asbestos Contamination in Soil

Health Screening Level (w/w)	
Form of asbestos	**Recreational C[1]**
Bonded ACM	0.02%
Fibrous Asbestos (FA) and Asbestos Fines (AF) [5] (Friable Asbestos)	0.001%
All forms of asbestos	No visible asbestos for surface soil

Note: This table is adapted from Table 7 in Schedule B1: Health Screening Levels of Asbestos Contamination in Soil, *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013* (NEPC 2013).

7 SOIL SAMPLING, ANALYSIS PLAN AND SAMPLING METHODOLOGY

7.1 SAMPLING RATIONALE

SESL developed a Sampling, Analysis and Quality Plan (SAQP) with respect to historical contamination data and the potential contamination identified in the Douglas Partners PGI (2021). The proposed sampling locations and their associated contaminants of concern (CoCs) outlined in Table 7 below:

Table 7 –Sampling Program

Foreshore Park, Newcastle	
Soil sampling and field work	• The area is approximately 8,000m^2 and the additional sampling location northeast of the site targeting potential diesel contamination . • Nineteen (19) boreholes evenly distributed to be constructed within the site boundary to investigate the status of the soil for presence of fill and acid sulphate soil (ASS) • One (1) addition borehole outside the north-eastern site boundary to be constructed to investigate the potential contamination of diesel ; • Boreholes to be constructed 0.5m into natural material to a maximum depth of 4m below ground level (bgl) or earlier refusal; • Samples to be collected at each borehole from nominal depths of 0.2m, 0.5m, 1.0m, 1.5, 2.0 and every meter thereafter or with significant stratigraphical changes; • At least two (2) samples per borehole to be submitted for laboratory analysis with the remaining samples placed on hold pending the initial laboratory results; • Four (4) quality assurance (QA/QC) samples to be collected; • Log each test pit in accordance with the Unifies Classification System (USCS); • Implement decontamination and quality control procedures in accordance with industry standard; and • Undertake field screening of soil samples on the basis of PID (volatiles) readings and visual and olfactory observations.
Analysis	• Analysis of soil samples for contaminants of potential concerns (TRH, BTEXN, PAH, PCBs, heavy metals 8 , OCPs and asbestos ((presence/absence). • Based on the site observations, 20 samples (one per borehole) to be selected for acid sulfate soils analysis (chromium suite).
QA/QC	• Two (2) duplicate and two triplicate samples to be collected and sent to the laboratory for inter-lab and intra-lab analysis.

7.2 SAMPLING TEAM

The details of the sampling team (see **Error! Reference source not found.**) and duties were as follows:

1. Sample Collection;

- Soil sample collection according to sampling regime;
- Described soil horizon features; and
- Responsible for decontamination between sampling.

2. Sample Logging
   - Identified testing location and depth of profiles;
   - Labeled sample containers;
   - Recorded field conditions current at sampling into the sample log;
   - Recorded soil profile information;
   - Nominated field duplicates at the nominated ratio;
   - Recorded analytes to be tested for each sample; and
   - Recorded sample PID (volatiles) readings.

Table 8– Sampling Team Personnel

Personnel	Position	Qualifications	Project Task
[redacted]	Principal Environmental Scientist	BSC (Mar Biol), Grad Dip Env Mgmt , Prin Env Aud Work in NSW (White Card)	- Conduct site inspection - Conduct field sampling - Conduct interview with the occupant - Supervision of QA/QC, decontamination and chain of custody protocols. – Recording of soil borelog data
[redacted]	Environmental Scientist	BEng Env. Workcover Construction Work (White Card), First Aid Certificate	- Conduct site inspection - Conduct field sampling - Conduct interview with the occupant - Supervision of QA/QC, decontamination and chain of custody protocols. – Recording of soil borelog data

8 FIELD INVESTIGATION AND SOIL SAMPLING

8.1 SAMPLING REGIME – SOIL

The fieldwork for the assessment was devised to identified potential for contamination at the site and its materials' reusability. The sampling objective was to gather information regarding the type, location, level and extent (vertically and laterally) of potential contamination due to the historical industrial land uses for the site. A geotechnical investigation was carried out concurrently with the contamination investigation and the geotechnical report is attached in **Appendix H**. Borehole logs for the investigation are attached in Appendix B of the Geotechnical report in **Appendix H**.

Soil sampling was also required to characterise the soil stratigraphy for the purpose of identifying the soil horizons in which contaminants may have accumulated (within the effluent application area for example) and or the potential limitations of the soil physics and soil chemistry which may impact the dewatering of the onsite dams.

This process has provided sufficient supporting data (according the DQO's) to allow recommendations to be made on whether the contamination is within the acceptable limits for the proposed development and recreational land use; or whether the materials are suitable for the purpose of future on-site landscaping reuse.

For this assessment, nineteen (19) sampling locations were evenly distributed across the site plus a targeted location east of the site . The sampling details at each location have been summarised in Table 9: Sampling Collection Summary below.

Table 9– Sampling Collection Summary

Sampling Location	Date	Sample collected and justifications	PID	Samples collected
BH01	30/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Nominated depth • 1.5m bgl : Natural material reached	0.6 0.5 0.4 0.4	4
BH02	30/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Nominated depth • 1.5m bgl : Natural material reached	0.4 0.8 0.3 1.1	4
BH03	30/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 0.9m bgl : Natural material reached	0.5 0.5 0.8	3
BH04	30/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Nominated depth • 1.5m bgl : Natural material reached	0.6 0.3 0.4 0.3	4
BH05	30/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Nominated depth • 2.0m bgl : Nominated depth	0.3 0.2 0.3 0.4	5

		• 3.5m bgl : Natural material reached	0.6	
BH06	30/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 0.8m bgl : Change in stratigraphy • 1.4m bgl : Change in stratigraphy • 1.7m bgl : Change in stratigraphy • 2.0m bgl : Natural material reached	0.6 1.5 0.7 1.2 1.7 0.6	6
BH07	30/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Natural material reached	0.7 0.7 0.5	3
BH08	30/05/2022	• 0.2m bgl : Nominated depth • 0.4m bgl : Nominated depth • 0.8m bgl : Change in stratigraphy • 1.2m bgl : Change in stratigraphy • 1.7m bgl : Natural material reached	0.7 0.7 1.7 1.1 1.0	5
BH09	30/05/2022	• 0.2m bgl : Nominated depth • 0.4m bgl : Nominated depth • 1.0m bgl : Nominated depth • 1.6m bgl : Natural material reached and	1.1 1.2 1.3 1.9	4
BH10	30/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Nominated depth • 1.5m bgl : Natural material reached	0.5 1.1 0.2 0.8	4
BH11	31/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Nominated depth • 1.5m bgl : Change in stratigraphy • 2.0m bgl : Natural material reached	0.3 0.5 0.4 0.6 0.5	5
BH12	31/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Nominated depth • 2.0m bgl : Nominated depth • 2.5m bgl : Natural material reached	0.3 0.4 0.3 0.8 0.5	5
BH13	31/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Nominated depth • 2.0m bgl : Nominated depth • 3.5m bgl : Natural Material Reached	0.9 1.6 0.8 1.6 0.4	5
BH14	31/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth	0.8 0.5	5

		• 1.0m bgl : Nominated depth • 1.5m bgl : Change in stratigraphy • 2.0m bgl : Natural material reached	0.6 0.7 0.3	
QA/QC 1	31/05/2022	• 0.2m bgl : Fill material at surface	0.8	2
BH15	31/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.2m bgl : Nominated depth • 1.7m bgl : Natural material reached	0.5 0.4 0.6 0.5	4
BH16	31/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Nominated depth • 2.0m bgl : Nominated depth • 2.6m bgl : Natural material reached	0.4 0.3 0.3 0.3 0.5	5
BH17	31/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Nominated depth • 1.5m bgl : Change in stratigraphy • 2.0m bgl : Natural material reached	0.5 0.8 0.6 0.4 0.5	5
BH18	31/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Nominated depth • 1.5m bgl : Change in stratigraphy • 2.2m bgl : Natural material reached	0.5 0.6 0.6 0.7 0.3	5
BH19	31/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Nominated depth • 1.5m bgl : Natural material reached	0.6 0.6 0.6 0.4	4
QA/QC 2	31/05/2022	• 1.0m bgl : Fill material at deep depth	0.6	2
BH20	30/05/2022	• 0.2m bgl : Nominated depth • 0.5m bgl : Nominated depth • 1.0m bgl : Nominated depth • 2.0m bgl : Natural material reached	1.1 0.4 0.7 0.3	4

8.2 GENERAL OBSERVATIONS

SESL environmental scientist attended the site on 30th and 31st May 2022 to conduct the site investigation at Foreshore Park, Newcastle. Prior to any intrusive works, SESL conducted a site walkover with the park staff personnel to verify sampling locations across the area of assessment ensure that the proposed locations of boreholes were cleared from subsurface utilities as follow:

- Dial-Before-You-Dig service were used to confirm locations of underground services and that borehole locations are clear of subsurface utilities;
- A professional service locator was used to clear the area of investigation; and
- Site irrigation system and power and internal power plan were acquired from the City of Newcastle prior to drilling.

SESL used a hand-held GPS to increase the accuracy of each borehole location. GPS coordinates from every sampling location. SESL also conducted a visual assessment of the sites surface to identify any signs of potential surface contamination including presence of any asbestos, odour or any oil staining and allocate each sampling point.

The site was generally covered with grass with some areas developed for landscaping purposes with mulch and matured trees. A large playground covering approximately 1000m2 is located east of the site while a large dwelling used as public toilets is located along the northern part of the site. No potential asbestos containing material (ACM) was noted on the surface across the assessment area. No oil staining or odours was detected during the site walkover.

Site inductions from the park ranger and sub-surface utilities clearance walkover were carried out on the first day of field work. A total of 20 boreholes were drilled used a ute mounted drill rig to a maximum depth of 4m bgl. The geotechnical field investigation was carried out concurrently with the contamination assessment. Nineteen boreholes were carried out evenly distributed across the site while BH20 was drilled northeast of the site (refer to Figure 3 **in Appendix A**). . The borehole logs for the works are attached in Appendix B of the Geotechnical Investigation. In general , the subsurface profile for the soils encountered during field work is outlined below:

- Topsoil: Encountered from surface to a depth ranging from 0.3 to 0.4m bgl across the site. Comprised of mainly brown silty sand or sandy clay, small grain size, low plasticity, with no odours or stains noted. No foreign material encountered;
- Fill: Encountered between 0.3-0.4m bgl to 2.6m bgl and is comprised of light brown gravelly sand, small grain size and medium gravelly size. Dark ash/slag was detected in various boreholes at depths ranging from 0.4 to 1.3m bgl. Foreign material such as bricks were detected in BH8. No ACM or odours was identified in any of the boreholes. Stain was detected in boreholes with the presence of slag including BH3, BH6, BH8, BH9, BH10 and BH12; and
- Natural: Encountered at minimum depths ranging from 0.9m to 2.6m bgl. The material consisted of light brown/ yellow sand, medium grain size, no odours or staining. No signs of ASS.

Limited amount of foreign material was detected across the site and no ACM detected in any of the boreholes. No stains or odours were detected across the site with the exception of some slag/ash detected in the fill material ranging between 0.4 to 1.1m bgl.

Samples were collected from the drill rig auger by hand protected by nitrile gloves. New nitrile gloves are to be used for the collection of each sample. The soil samples plus QA/QC samples were immediately transferred into jars supplied by the laboratory and immediately stored on ice in a secured esky and submitted directly into a NATA accredited laboratory under a

Chain of Custody (COC) procedures. A total of 90 samples were collected and submitted to ALS Newcastle (NATA No. 825). Triplicate samples were sent to Eurofins for analysis.

SESL screened all samples collected for volatile organic compounds using a Photoionization detector (PID). Each soil sample was divided into two sub samples. The extra sub samples were place into a separate plastic zip lock bag and used to be tested for field PID screening. After waiting approximately five minutes for the sample and the headspace to equilibrate, the headspace in the bagged samples were analysed by a calibrated (100 ± 3 parts per million (ppm) isobutylene) photo-ionisation detector (PID) with a 10.6 eV lamp to measure the presence of total VOCs.

PID results were all below 2.0 ppm (range = 0.3 to 1.8 ppm). All sample PID readings are summarised in **Table 9**. A Calibration certificate from the PID is provided in **Appendix C.**

During field work, groundwater was encountered at depths greater than 3.5m bgl.

9 LABORATORY RESULTS

A total of ninety (90) samples were collected from twenty (20) boreholes, and forty-four (44) of the samples (including 4 QA/QC sample) were submitted to the laboratory for the analysis of heavy metals 8 (As, Cd, Cr, Cu, Ni, Pb, Zn and Hg), TRH, BTEX, PAHs, OCPs, PCBs and asbestos (presence/absence). One sample per borehole was also selected for chromium suite analysis.

The primary and duplicate samples collected were submitted to ALS laboratory for analysis. Triplicate samples were submitted to a secondary NATA accredited laboratory (Eurofins) for inter lab duplicate comparison, which was conducted as part of Quality Assurance/Quality Control (QA/QC) protocols (refer to Figure 4 **in Appendix A**).

Laboratory results were compared to the adopted assessment criteria listed in Section 6 of this report. A summary of the laboratory results compared against the adopted criteria is outlined below:

- All of the results for BTEX and TRH (F1 and F2), Naphthalene were below the HSL-C criteria for the site;
- Total PAHs results met the adopted criteria for the site;
- All of the results for benzo(a)pyrene (as TEQ) were below the adopted criteria for HIL C recreational/open space land use with the exception of:
    - BH01_1.0 with concentrations of 4.2mg/kg;
    - BH07_0.2 with concentrations of 4.2mg/kg;
    - BH12_0.5 with concentrations of 10mg/kg This sample is considered a hotspot;
    - BH14_0.5 with concentrations of 5.6mg/kg;
    - BH15_0.5 with concentrations of 4.6mg/kg;
    - BH16_0.2 with concentrations of 6.0mg/kg; and
    - BH19_0.2 with concentrations of 4.0mg/kg.
- All of the results for benzo(a)pyrene were below the adopted criteria for ESL C recreational/open space land use with the exception of:
    - BH01_0. with concentrations of 1.3mg/kg;
    - BH01_1.0 with concentrations of 2.9mg/kg;
    - BH05_0.2 with concentrations of 0.9mg/kg;
    - BH6_1. with concentrations of 0.8mg/kg;
    - BH7_0.2 with concentrations of 2.9mg/kg;
    - BH7_0.5 with concentrations of 1.6mg/kg;
    - BH8_1.2 with concentrations of 1.7mg/kg; and
    - BH11_0.2 with concentrations of 1.0mg/kg;
    - BH12_0.5 with concentrations of 7.1mg/kg;
    - BH13_0.5 with concentrations of 1.7mg/kg;
    - BH14_0.5 with concentrations of 3.9mg/kg;
    - BH15_0.5 with concentrations of 3.2mg/kg;
    - BH16_0.2 with concentrations of 4.2mg/kg;
    - BH16_1.0 with concentrations of 1.2mg/kg;
    - BH18_0.5 e with concentrations of 1.9mg/kg; and
    - BH19_0.2 with concentrations of 2.7mg/kg.
- All of the heavy metals results met the adopted criteria for HIL C recreational/open space land use with the exception of:

  - BH01_1.0 exceeded lead with concentrations of 1.370mg/kg;
  - BH03_0.5 exceeded lead with concentrations of679mg/kg;
  - BH04_0.5 exceeded lead with concentrations of 901mg/kg ;
  - BH8-1.2: exceeded arsenic and lead with concentrations of 364mg/kg and 1,200mg/kg respectively;
  - BH11_1.0 exceeded lead with concentrations of 1,610mg/kg. This sample is considered a hotspot;
  - BH08_1.2: exceeded arsenic and Lead criteria HIL C;
- All of the heavy metals results met the adopted criteria for EIL C recreational/open space land use with the exception of:
  - BH01_1.0 exceeded arsenic with concentrations of 280mg/kg; and
  - BH011_1.0 exceeded arsenic with concentrations of 108mg/kg.
- Asbestos was not present in any of the samples analysed. No ACM fragments were observed within the site;
- PCBs and OCPs results met the adopted criteria for EIL C recreational/open space land use; and
- TRH F3 exceeded the ESL criteria at BH_1-1.0, BH4-0.5, BH5_1.0, BH8_0.2, BH11_1.0, BH12_0.5, BH14_1.5 and BH15_1.2. Exceedance in BH08_0.2 and BH11_1.0 are considered as hotspots.

The QA/QC blind duplicates, triplicates and the parent samples are as follows:

- Duplicate 1 and Triplicate 1 collected from BH_14_0.2; and
- Duplicate2 and Triplicate 2 collected from BH_19_1.0.

The primary and duplicate samples collected were submitted to ALS laboratory for analysis. Triplicate samples were submitted to a secondary NATA accredited laboratory (Eurofins) for inter lab duplicate comparison, which was conducted as part of Quality Assurance/Quality Control (QA/QC) protocols.

A summary table of laboratory analysis has been included in **Appendix D** . The certificates of analysis can be viewed in **Appendix E**. A summary of the laboratory results compared against the adopted criteria in **Section 6** is outlined below:

No ASS soils were detected in any of the samples analysed. This was also confirmed by the Geotechnical investigation who also carried out ASS analysis with pH and pH fox and SPOCAS.

10 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) RESULTS

Data quality assurance and quality controls have been established in accordance with the Schedule B (1): Guidelines on Investigation Levels for Soil and Groundwater (ASC NEPM 2013). The sections below outline the performance of fieldwork, sampling and analysis against DQI's as a qualitative and quantitative assessment of the validity and usability of data collected at the site during this assessment.

10.1 FIELD QA/QC

Duplicate and triplicate samples were collected during the fieldwork, for comparison against the results of primary samples. These duplicates and triplicates were collected simultaneously and identically to the corresponding primary samples, with no reference to its corresponding sample marked on the sample containers. The two (2) duplicate samples and their primary parent samples were analysed at ALS Laboratory while the two (2) triplicate samples were analysed at Eurofins for inter-lab comparison.

Relative Percentage Difference (RPD) is a measure of the consistency of laboratory results. It is derived by comparing the analyte concentrations for the primary against the analyte concentrations for the replicate (duplicate) samples and calculating the percentage difference between the concentrations for each analyte. Generally, a RPD of ± 50% is considered acceptable.

- RPDs were within the recommended control limits with the exception of the following sample;
- RPDs > 50% were identified in sample Duplicate 2 (a duplicate sample of BH19_1.0) for arsenic (123%), cadmium (66%), nickel (62%), zinc (84%), C10-C36 Fraction (Sum)(137%),and benzo(a)pyrene (66%);
- RPDs > 50% were identified in sample Triplicate 1 (an inter-lab duplicate sample of BH14_0.2) for arsenic (100%), lead (58%); and
- RPDs > 50% were identified in sample Triplicate 2 (an inter-lab duplicate sample of BH19_1.0) for arsenic (123%), cadmium (66%), chromium (III+VI)(90%), nickel (62%), zinc (84%), C10-C36 Fraction (Sum)(137%), benzene (126%), and toluene (120%) .

Given that the majority of RPDs for the remaining analytes were <50%, the data set was considered to be within acceptable range of precision. RPDs above 50% encountered can be attributed to the heterogenous nature of the soil or low concentrations present rather than the analytical methods or procedures.

Laboratory certificates are provided in **Appendix E.** The analytical results for soil samples are summarised in **Appendix D**, and RPD calculations are provided in **Appendix F**. A summary of the field and analytical components of this project are as follows:

- Sample integrity and container requirements are acceptable (refer to sample receipt notification at **Appendix E**);
- Holding time compliances are acceptable. All samples were received by the laboratory within the relevant holding times (refer to sample receipt notifications in **Appendix E**);
- Samples requiring volatile organic compound analysis received in airtight containers; and
- The primary (ALS) and secondary (Eurofins) laboratories were NATA registered at the time of analysis and NATA accredited for all analyses performed.

10.2 LABORATORY QA/QC

Laboratory QC analytical results for the soil investigation were generally reported within acceptable limits.

10.3 STATEMENT ON DATA QUALITY

Overall, the data quality objectives were met during the investigation, as demonstrated throughout this report. Documentation was maintained, and complete, sufficient data was collected to characterise the site in accordance with statutory requirements. The data has been shown to be comparable and representative of the site, and precision and accuracy has been demonstrated in the field and laboratory QA/QC programs. RPDs of > 50% was identified in three duplicate samples collected for heavy metals, TRH, BTEX, PAH and OCP. Given that all other RPDs for the remaining analytes were less than 50%, the data set is adequately precise. Field duplicates were obtained and analysed at a ratio of 1:20.

The overall data quality performance against DQIS indicates that the analytical data is representative of site conditions at the time of the investigation and sufficient to enable valid assessment of the site.

11 DISCUSSION OF RESULTS

11.1 FIELD OBSERVATION

A total of twenty (20) boreholes were constructed across the area of assessment. Topsoil was encountered between surface to 0.3/0.4m bgl with no foreign material. Fill material was encountered in all boreholes at a depth ranging between 0.4 m bgl to 2.6 bgl at with the larger amount of fill encountered within the area of BH06, BH12 and BH16. The fill material was mainly comprised of light brown gravelly sand, small grain size and medium gravelly size with presence of ash in various sampling locations BH3, BH6, BH8, BH9, BH10, BH11 and BH12, which coincide with the majority of the chemical exceedances. Natural was comprised of brown/ yellow sand , mid grain size material.

No oil staining and/or no odour was detected within the borehole locations undertaken across the site except for BH16 detecting sewage odour. Foreign material including brick and glasses were found within a limited number of boreholes including BH05 and BH13 located in the raised landscape area with deeper layer of fill material. Slag and dark ash material were identified in fill materials at 0.5m to 1.0m bgl across number of boreholes. No ACM fragment was found during the investigation.

11.2 LABORATORY RESULTS

The laboratory results were compared against the adopted site criteria. No exceedances were detected above the adopted criteria with the exception for lead, arsenic, benzo(a) pyrene, benzo(a) pyrene TEQ and TRH F3 at various locations. The majority of the exceedances were detected in samples collected from soil profiles deeper than 0.5m bgl with the exception of BH5, BH7, BH8, BH16 and BH19 with exceedances in benzo(a) pyrene, benzo(a) pyrene TEQ and TRH F3. However, the majority of the exceedances at shallow depths relate ESL for benzo(a) pyrene.

Lead exceeded the HIIL -C criteria at 0.5m depth in locations BH3 and BH4, while it was exceeded at deeper samples collected from 1m bgl in BH1, BH8 and BH11. This shows that lead contamination is not present in the topsoil material, but in deeper fill and may be related to the presence of ash.

Deeper samples collected from the natural material showed low concentrations of contaminants below the adopted criteria for the site.

Results show that there are three hotspots (more than 2.5 times the criteria for the site), two of them identified in samples collected deeper than 0.5m bgl and one at 0.2m bgl. The hotspots identified are:

- BH11_1.0 with concentration of lead of 1,610mg/kg compared with the 600mg/kg HIL – C criteria for the site and concentration of TRH F3 of 1,730mg/kg compared with 300mg/kg ESL - criteria for the site;
- BH12_0.5 with concentration of benzo(a)pyrene TEQ of 10 mg/kg compared with the 10mg/kg HIL -C criteria for the site; and
- BH8_0.2 with concentration of TRH F3of 830 mg/kg compared with the 300mg/kg ESL - criteria for the site.

Hotspots BH11 and BH12 were collected from the fill material comprised of light brown gravelly sand, small grain size and medium gravelly size.

No diesel contamination was detected at borehole BH20 located north east of the site.

The NEPM ASC Schedule B7 states at the very least, the maximum and the 95% UCL of the arithmetic mean contaminant as well as localised elevated values must be compared to the HILs. Two additional (secondary) criteria should also be met, namely that the standard deviation of the results must be <50% of the relevant investigation level and that no single value exceeds 250% of the relevant investigation level.

Excluding the three hotspots discussed above, none of the samples analysed exceeded the adopted criteria for the site after applying 95% UCL arithmetic mean contaminant. The three locations identified as hotspots area and were excluded from the calculation of the 95% UCL. Since the depth of the hotspots are relatively deep (0.5m to 1m bgl), the materials in the hotspot locations may remain on-site unless it is exposed. However, an environmental management plan (EMP) may be required to manage contamination of these three hotspots if material is to remain onsite. SESL understands that the majority of the site will be covered with hardstand minimising the potential exposure of site users to contaminants.

Based on the NEPC (2013) Schedule B7 guidance 17 notes, plants have a limited uptake of anthropogenic PAHs. ESL exceedances for benzo(a) pyrene is therefore it is not considered a limitation for the use of the tested soils on site as it does not represent an unacceptable risk.

The laboratory results of chromium suite (ASS) analysis were compared against the National Acid Sulfate Soils Identification and Laboratory Methods Manual (Water Quality Australia 2018). None of the samples exceed the action criteria of the manual.

Based on the above, the soils across the site can remain and reused to be used for the proposed land use as a recreational park, pending the preparation of the EMP to manage the hotspots identified and excluding material from those hotspots. Due to the presence of slag/ash in fill material within the site, the unexpected finds protocol attached in **Appendix G** should be implemented during excavation.

12 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) was developed based on the information obtained during the investigation process to allow assessment of potential sources of impact, chemicals of concern, transport mechanism and receptors.

Potential exposure pathways are evaluated for completeness based on the existence of:

- An identified source of impact;
- A mechanism for release of contaminants from identified sources (e.g. leachate migrating to groundwater) and the presence of a transport medium (e.g. groundwater flow); and
- Potential sensitive receptors in the vicinity of the site.

Whenever one or more of the above elements is missing, the exposure pathway is incomplete. An exposure pathway can be both “direct”, where the receptor comes into direct contact with the affected environmental media (e.g., soil ingestion) and “indirect”, where exposure occurs at a different location or in a different medium than the source (e.g., soil vapours volatilising to ambient air).

12.1 SOURCES OF IMPACT

Based on Douglas Partners PGI (2021) report, the following sources of impact were identified.

- Historical industrial land use (rail yard), which may include chemical storage, machinery/plant use and servicing, train servicing, fuel storage, adjacent former gas works;
    - COC include metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), coal tar;
- Fill materials across majority of the site, likely to be associated with historical land use and fill importation;
    - COC include metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), organochlorine pesticides (OCP) and asbestos;
- Demolished Structures – former railway goods yard;
    - COPC include asbestos, synthetic mineral fibres (SMF), lead (in paint), metals

12.2 CONTAMINANTS OF CONCERN

Based on the potential sources and the findings of the current investigation, the contaminants of concerns include the following:

- Total Recoverable Hydrocarbons ;
- Benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN);
- Polycyclic Aromatic Hydrocarbon (Carcinogenic and Total);
- Organochlorine Pesticides;
- Polychlorinated Biphenyls;
- Heavy Metals; and
- Asbestos.

12.3 Potential Pathways

Based on the potential sources and the findings of the current investigation, the following potential pathways have been identified:

- Ingestion and direct contact with exposed contaminated soil;
- Inhalation of dust and/or vapours during excavation;
- Leaching of contaminants and vertical migration into groundwater; and
- Lateral migration of groundwater providing base flow to water bodies.

12.4 Potential Surrounding Receptors

The following site surrounding receptors have been identified:

- Current users such as park rangers, park users (recreational land use);
- Future users such as children using the proposed play facilities;
- Construction and maintenance workers;
- Adjacent site users (transportation land use);
- Surface water;
- Groundwater; and
- Terrestrial ecology.

12.5 Summary of Potentially Complete Exposure Pathways

Laboratory results showed that contaminants of concern were below the adopted criteria for the site, with the exception of three hotspots for benzo(a)pyrene TEQ, lead and TRH F3. Two of the hotspots exceeding the HIL-C criteria were identified in samples collected depths greater than 0.4m bgl, and therefore there is an incomplete pathway to potential receptors. Unless exposed, impacted soils are not considered to pose a risk to current and future site users. TRH F3 hotspot exceeded the ESL criteria and therefore may pose risk to terrestrial ecology only.

13 CONCLUSIONS AND RECOMMENDATIONS

SESL Australia Pty Ltd (SESL) was engaged by TLC LANDSCAPE CONSTRUCTIONS PTY LTD (the client) to undertake a contamination assessment of potential contamination and the reusability of the materials at a site located at Foreshore Park, Newcastle NSW 2300. (**Appendix A: Figure 1**) The area related to site covers a total area of approximate 8,000 $m^{2.}$

The intrusive site contamination assessment carried out showed the presence of 0.3-0.4m of topsoil followed by fill material ranging between 0.4 to 2.6m bgl. Fill material was comprised of light brown gravelly sand, small grain size and medium gravelly size with presence of ash in various sampling locations BH3, BH6, BH8, BH9, BH10, BH11 and BH12, which coincide with the majority of the chemical exceedances. Limited amount of foreign material was detected within the fill and no fragments of ACM were detected. No asbestos fibres were detected in any of the samples analysed for the site.

Chemical analysis of samples showed that the contaminants of concern present on site were below the adopted criteria after applying 95% UCL with the exception three hotspots identified as:

- BH11_1.0 exceeded in 250% the concentration of lead for HIL C and TRH F3 ESL criteria;
- BH12_0.5 exceeded in 250% the concentration of benzo(a)pyrene (TEQ) HIL C. criteria; and
- BH8_0.2 exceeded in 250% the concentration of TRH F3 ESL criteria.

No signs of ASS and PASS presence in the natural materials base on laboratory analysis and site observations.

As the hotspots identified exceeding the HIL-C criteria for the site were collected at depths greater than 0.4m bgl, the risk of a complete pathway at these locations is considered to be low, unless the material is disturbed. Based on the above, SESL considers that the risk for current site users from contamination perspective is low. However, impacted soils identified in the hotspots may require to be remediated or managed with the implementation of an environmental management plan (EMP).

SESL considers that, with the exception of soils from the three hotspots identified, soils are suitable to remain on site. The soils across the site can remain and reused to be used for the proposed land use as a recreational park, pending the preparation of the EMP to manage the hotspots identified and excluding material from those hotspots.

Although a significant number of boreholes were undertaken to investigate the site and the presence of slag/ash in fill material within the site , SESL cannot rule out the possibility of additional contamination present on site and therefore recommends applying the unexpected finds protocol outlines in **Appendix G** during any future excavation works within the site.

REFERENCES

- Agriculture and Resource Management Council of Australia and New Zealand, and the Australian and New Zealand Environment and Conservation Council (1997) National Water Quality Management Australian Guidelines for Sewerage Systems: Effluent Management.
- Agriculture and Resource Management Council of Australia and New Zealand, and the Australian and New Zealand Environment and Conservation Council (2000) Guidelines for Fresh and marine Water Quality.
- AS4482.1 (2005) Guide to the Sampling and Investigation of Potentially Contaminated Soil (Part 1 & 2).
- CRC CARE (2011). Part 2: Application document. Technical Report No 10. Health screening levels for petroleum hydrocarbons in soil and groundwater.
- Department of Environment and Conservation (2006) Technical Notes: Assessment and Management of Odour from Stationary Sources in NSW.
- Department of Climate Change and Water (2010) Effluent Reuse Management.
- Douglas Partners (2021) preliminary Geotechnical Investigation and Waste classification , harbour Foreshore Wharf Road, Newcastle. (Project 102159.00)
- Environmental Planning and Assessment Act 1979.
- Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land – Department of Urban Affairs and Planning NSW EPA 1998.
- National Environment Protection Council (2013) Revised National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013). Canberra.
- NSW EPA (1995) Contaminated Sites: Sampling Design Guidelines.
- NSW EPA (2015) Contaminated Sites: Guidelines on Duty to Report Contamination under Contaminated Lands Management Act 1997.
- NSW EPA (2017) Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme (3rd edition).
- NSW OEH (2020) Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites.
- Protection of the Environment Operations Act 1997.
- Soil Series No. 1, 2nd Edition, 1998 and 3rd Edition, (1999) Health-Based Soil Investigation Levels, National Environmental Health Forum monographs.
- Soil Series No. 2 2nd Edition, (1998) Exposure Scenarios and Exposure Settings, National Environmental Health Forum monographs.

Limitations of This Report:

SESL has performed an investigation and consulting services for this project as outlined in our discussions and in accordance with current professional and industry standards for environmental site assessment. The findings of this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of this site and do not represent the actual state of the site at all points. Should materials or conditions be encountered other than those which have been described these will require additional assessment.

SESL assessment is based on the result of the site investigations undertaken as specified in this report. SESL cannot provide unqualified warranties nor assume any liability for site conditions not observed, accessible during the time of the investigations.

Despite all reasonable care and diligence, the ground conditions encountered, and the concentrations of contaminants measured may not be representative of conditions between the locations samples and investigated. In addition, site characteristics may change as a result of soil heterogeneity, chemical reactions and other events. These changes may occur subsequent to SESL investigation and assessment.

This report and associated documentation and the information herein have been prepared solely for the use of the client and any relevant authority. Any reliance assumed by third parties on this report shall be at such party's own risk. Any ensuing liability resulting from use of the report by third parties cannot be transferred to SESL.

COPYRIGHT: *The concepts, information and design ideas contained in this document are the property of SESL Australia Pty Ltd (ABN 70106 810 708). Use or copying of this document in whole or in part without the written permission of SESL Australia constitutes an infringement of copyright.*

Appendix A



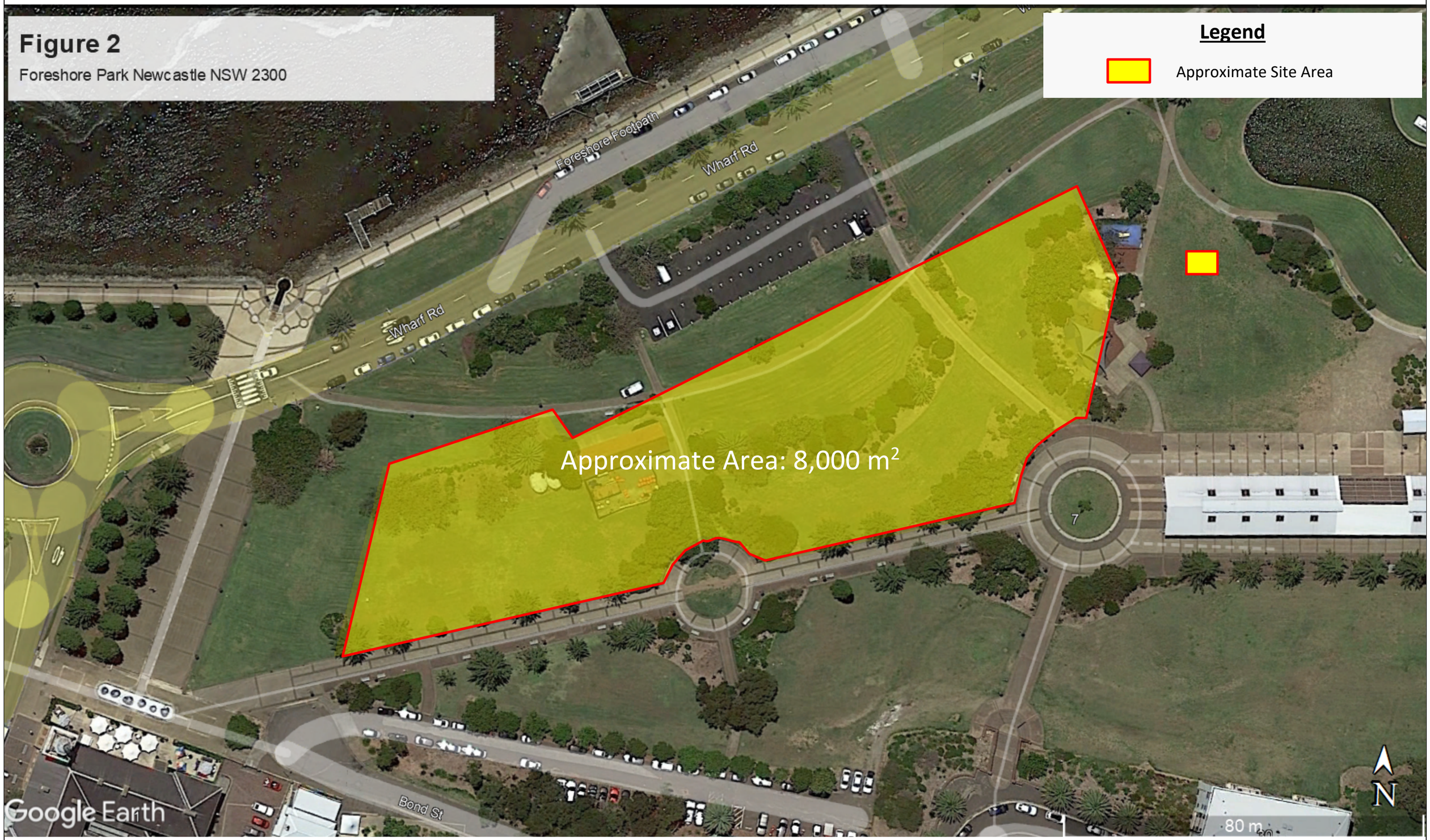
Legend

Site Location

SESL AUSTRALIA Environment & Soil Sciences	16 Chilvers Rd Thornleigh, NSW, 2120	T: 1300304080 Info@sesl.com.au www.sesl.com.au	**Ref:** J003951 Foreshore Park, Newcastle NSW 2300 Contamination Assessment	**Appendix A: Figure 1** Locality Map	29 June 2022	N	Prepared: LH 29/6/2022 Checked: AG 29/6/2022

Figure 2

Foreshore Park Newcastle NSW 2300



SESL AUSTRALIA Environment & Soil Sciences	16 Chilvers Rd Thornleigh, NSW, 2120	T: 1300304080 Info@sesl.com.au www.sesl.com.au	**Ref:** J003951 Foreshore Park, Newcastle NSW 2300 Contamination Assessment	**Appendix A: Figure 2** Site Layout	29 June 2022	Prepared: LH 29/6/2022 Checked: AG 29/6/2022

Figure 3

Foreshore Park Newcastle NSW 2300



SESL AUSTRALIA Environment & Soil Sciences	16 Chilvers Rd Thornleigh, NSW, 2120	T: 1300304080 Info@sesl.com.au www.sesl.com.au	**Ref:** J003951 Foreshore Park, Newcastle NSW 2300 Contamination Assessment	**Appendix A: Figure 3** Sampling location maps	29 June 2022	N	Prepared: LH 29/6/2022 Checked: AG 29/6/2022

Figure 4

Foreshore Park, Newcastle NSW 2300

Soil Exceedance mg/kg	Arsenic	Lead	Benzo(a) pyrene	Benzo(a)pyrene TEQ (LOR)
NEPM 2013 Table 1A(1) HILs Rec C Soil	300	600	N/A	3
NEPM 2013 Table 1B(5) EIL - Urban Res & Public Open Space	100	N/A	N/A	N/A
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil	N/A	N/A	0.7	N/A



SESL AUSTRALIA Environment & Soil Sciences	16 Chilvers Rd Thornleigh, NSW, 2120	T: 1300304080 Info@sesl.com.au www.sesl.com.au	**Ref:** J003951 Foreshore Park, Newcastle NSW 2300 Contamination Assessment	**Appendix A: Figure 4** Exceedance Map	29 June 2022	N	Prepared: LH 29/6/2022 Checked: AG 29/6/2022

SESL AUSTRALIA
Environment & Soil Sciences

Appendix B

Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Preliminary Geotechnical Investigation and Waste Classification

Harbour Foreshore Masterplan
Wharf Road, Newcastle

Prepared for
City of Newcastle

Project 102159.00
February 2021



Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	102159.00	Document No.	001.Rev0.docx
Document title	Report on Preliminary Geotechnical Investigation and Waste Classification Harbour Foreshore Masterplan		
Site address	Wharf Road, Newcastle		
Report prepared for	City of Newcastle		
File name	102159.R.001.Rev0.docx		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Revision 0	[redacted]	[redacted]i	15 February 2021

Distribution of copies

Status	Electronic	Paper	Issued to
Revision 0	1	0	[redacted], City of Newcastle

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

		Date
Author	[redacted]	15 February 2021
Reviewer	[redacted]	15 February 2021

bsi. ISO 9001 Quality Management
FS 604853

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au
15 Callistemon Close
Warabrook NSW 2304
PO Box 324
Hunter Region Mail Centre NSW 2310
Phone (02) 4960 9600

Table of Contents

Page

1. Introduction 1
2. Proposed Development 2
3. Site Description 2
4. Published Data 3
   4.1 Geology 3
   4.2 Hydrogeology 3
   4.3 Acid Sulfate Soils 3
5. Review of Existing Documentation and Information 3
   5.1 Introduction 3
   5.2 Annexure 1 - Contamination Management Plan (CN, 2006) 4
   5.3 Annexure 2 – Water Harvesting and Reuse Project 5
   5.4 Annexure 3 – RCA August 200 – Honeysuckle 5
   5.5 Annexure 4 – Remediation Action Plan, former Fisherman's Co-op Newcastle (RCA, 2000) 6
   5.6 Annexure 5 – Additional Groundwater Contamination Assessment (DP, 1997) 6
   5.7 Annexure 6 –Geotechnical and Contamination Assessment (DP, 1996) 7
   5.8 Targeted Site Investigation, Surplus Rail Lands (DP, 2016) 7
   5.9 Discussions with Council Staff 8
6. Site Walkover 8
7. Preliminary Conceptual Site Model 13
8. Sampling and Analysis Quality Plan 15
   8.1 Data Quality Objectives 15
   8.2 Soil Sampling Rationale 15
9. Field Work 16
   9.1 Field Work Methods 16
   9.2 Field Work Results 16
   9.3 Quality Assurance / Quality Control 17
      9.3.1 Field QA / QC 17
      9.3.2 Laboratory QA/QC 17
10. Laboratory Testing 18
   10.1 Contamination 18
   10.2 Acid Sulfate Soils 18

11. Discussion - Contamination 19
11.1 Soils 19
11.2 Waste Classification 20
11.3 Acid Sulfate Soils 20
11.4 Data Quality Assurance and Quality Control 20
12. Discussion - Geotechnical 21
13. Conclusions and Recommendations 21
14. References 22
15. Limitations 23

Appendix A: About This Report
Sampling Methods
Soil Descriptions
Symbols and Abbreviations
Borehole Logs – Bores 1 to 12
Appendix B: Table B1 - Summary of Results of Soil Analysis – TRH, BTEX, PAH, Metals
Table B2: Summary of Results of Soil Analysis – OCP, OPP, PCB and Asbestos
Table B3: Summary of Results of Soil Analysis - Waste Classification Assessment
Table B4: Summary of Results of Soil Analysis – Water Leach Testing
Table B5: Summary of Results of Soil Analysis – Acid Sulfate Soils
Laboratory Report Sheets
Appendix C: Field Work Methods
Data Quality Report
Data Quality Objectives
Site Assessment Criteria
Chain of Custody (Field and Despatch)
Sample Receipt
Appendix D: Drawing 1 – Test Location Plan;

Report on Preliminary Geotechnical Investigation and Waste Classification
Harbour Foreshore Masterplan
Wharf Road, Newcastle

1. Introduction

This report presents the results of a preliminary geotechnical investigation and waste classification undertaken for the harbour foreshore masterplan at Wharf Road, Newcastle. The investigation was commissioned via letter of agreement 2021/044Q dated 18 September 2020 from City of Newcastle (CN) and was undertaken with reference to Douglas Partners Pty Ltd (DP) proposal NCL200384 dated 10 July 2020.

It is understood that the proposed development of the site includes renewal of public infrastructure and parklands to Wharf Road and Argyle Street, Newcastle.

The aim of the investigation was to assess the subsurface soil and groundwater conditions at locations nominated by the client in order to provide:

- An understanding of geotechnical properties of mounding at the nominated locations;
- Preliminary waste classification of fill soils with reference to NSW EPA (2014a);
- An understanding of groundwater levels;
- Recommendations for reuse of fill/soils;
- Preliminary advice on remediation options, if required.

The investigation included the following scope of work:

- Brief review of the previous investigation reports supplied by CN;
- Review of the previous investigation reports undertaken by DP within and in the vicinity of the proposed investigation area;
- Site inspection to identify areas of potential contamination and assess current site condition;
- Professional service locating of underground utility services in the vicinity of the proposed borehole locations;
- Drilling of twelve boreholes at locations nominated by CN.;
- Laboratory analysis of selected soil samples for preliminary assessment of contamination conditions and waste classification;
- Acid Sulfate Soil (ASS) screening tests and detailed chromium suite testing of selected soil samples to provide a preliminary assessment of ASS conditions within the proposed development area;
- Preparation of this report presenting the results of the assessment including comments on those points listed above.

2. Proposed Development

The proposed development includes the renewal of public infrastructure and parklands at Wharf Road and Argyle Street, Newcastle, including:

- Urban renewal to Wharf Road including shared pathway;
- Potential public utilities adjustments, but retention of overhead powerlines;
- New trees, landscape and streetscape features, public open space and street furniture – existing trees to be retained where practicable;
- Parkland renewal including a regional playspace;
- A cycleway connecting the broader cycleway network plan;
- New drainage infrastructure including water-sensitive urban design;
- Lighting upgrade and smart city upgrades.

3. Site Description

The overall site extent, as provided by CN, is presented in Figure 1 below.



Figure 1: Harbour Foreshore Masterplan site area (in red)

Table 1 presents site identification details.

Table 1: Site Identification

Item	Details
Allotment Identification	Various
Street Address	Wharf Road and Argyle Street
Locality	Newcastle, NSW
Site Area	14 ha approx.
Local Government Area	Newcastle
Zoning	RE1 Public Recreation
Planning Instrument(s)	Newcastle City Council Local Environment Plan
Current Landuse	Recreational, open space, road reserve
Current Owner	City of Newcastle

Subsurface investigation for the current assessment was limited to the Foreshore Park area and the Foreshore Footpath area east of the Queens Wharf Hotel as nominated by CN (refer to Drawing 1 in Appendix D.

4. Published Data

4.1 Geology

Reference to the 1:100 000 Newcastle Coalfield Regional Geology map indicates that the majority of the site is underlain by quaternary alluvium generally comprising gravel, sand, silt and clay. The exception to this is the south-eastern and southern extents of the site within Foreshore park, which is underlain by the Permian aged Lambton subgroup of the Newcastle Coal Measures, which generally comprises sandstone, siltstone, claystone, coal and tuff.

4.2 Hydrogeology

The regional groundwater flow regime is believed to be towards the Hunter River (Newcastle Harbour) located immediately adjacent to the north-western portion of the site and approximately 160 m north-west of the remainder of the site. This water body is considered to be the nearest sensitive receptor. Based on site topography the depth to groundwater is likely to be within approximately 2 m depth from the ground surface. It should be noted that groundwater levels are affected by climatic conditions and soil permeability and will therefore vary spatially, and with time.

4.3 Acid Sulfate Soils

Reference to the Acid Sulfate Soil Risk Map for the site indicates that the site is within an area mapped as having a high probability of occurrence of acid sulfate soils (ASS) at depths between 1 m and 3 m below the ground surface.

5. Review of Existing Documentation and Information

5.1 Introduction

CN provided the following documents for review for the project:

- Annexure 1. ECM_1475231_v1 Contamination Management Plan (May 2006) Newcastle Foreshore Park, Newcastle East, Produced by Health and Environment Services Unit May 2006;
- Annexure 2. Advitech (2003). Water Harvesting and Reuse Project, Prepared for Newcastle City Council, Advitech Pty Limited, ECM 1464692;
- Annexure 3. RCA (2000a), Unreferenced Laboratory testing reports: Honeysuckle Development;
- Annexure 4. RCA (2000b), Remediation Action Plan, Former Fishermans Co-op, Newcastle, prepared for Patterson Britton and Partners, Ref JN 1832;

- Annexure 5. ECM132364_Report_Douglas Partners Pty. Ltd. February 1997, Additional Groundwater Contamination Assessment, Proposed Newcastle Station Interchange CNR Wharf Road and Watt Street Newcastle;
- Annexure 6. ECM_131623_v1_Report Douglas and Partners Pty Ltd December 1996, Geotechnical Investigation and Contamination Assessment Proposed Newcastle Station Interchange _ CNR Wharf Road and Watt Street Newcastle.

The approximate location of the subject area for the above reports, as provided by CN, is shown in Figure 2 below.

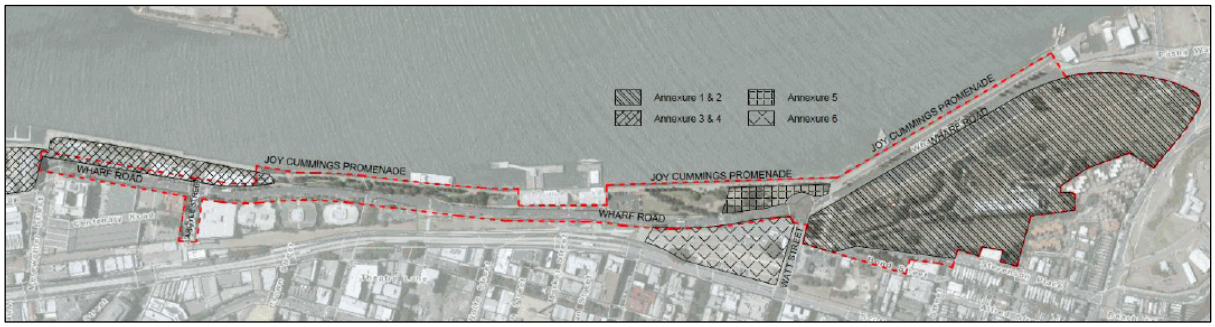


Figure 2: Subject area of annexures (as provided by CN)

5.2 Annexure 1 - Contamination Management Plan (CN, 2006)

CN holds a contamination management plan (CN, 2006) for the foreshore park area. The approximate extent of the foreshore park area is provided in Figure 3 below.



Figure 3: Approximate extent of Foreshore Park, as provided in Annexure 1

CN (2006) notes the following with regards to contamination at the Newcastle Foreshore Park site:

- Areas of the Newcastle Foreshore Park site were previously used as a railway goods yard;
- As a result of the previous site use, there are some identified areas of soil and groundwater contamination within the foreshore park area;
- Following transfer of the foreshore park area to CN in July 1991, initial works indicated the presence of possibly diesel oil in soil in the vicinity of the existing carriage sheds;
- Subsequent investigation identified that the site was used as a rail motor refuelling and maintenance area and that contamination of the soil and possibly groundwater had been identified;
- Investigation suggested that the site had possibly been filled in the past;
- The management plan states that a qualified consultant should be engaged to assess the potential impacts associated with the site for landuse changes or significant development;
- The management plan provides procedures for intrusive works at the site for work health and safety and environmental impacts.

It is noted that the management plan does not provide details of the presence, concentration, location or extent of contamination or any management undertaken (if any) within the Newcastle Foreshore Park.

5.3 Annexure 2 – Water Harvesting and Reuse Project

Newcastle City Council commissioned a report (Advitech, 2003) assessing potential water harvesting options for three sites within the Council area, including Newcastle Foreshore Park.

The report included assessment of the potential for stormwater use for irrigation as an alternative to the existing reticulated irrigation supply.

Activities conducted in Advitech (2003) relevant to the current project comprised installation of boreholes/spearpoints within Newcastle Foreshore Park to assess groundwater quality and hydrogeological factors.

Limited chemical analysis was conducted on samples collected from installed groundwater bores within the Foreshore Park area. The results of analysis were compared to ANZECC (2000) long-term and short-term trigger values for selected contaminants (hydrocarbons, metals) for irrigation and suggested the absence of gross contamination in the samples tested for the targeted analytes. It is noted that the well construction details and groundwater sampling methodology was not provided in Advitech (2003).

5.4 Annexure 3 – RCA August 200 – Honeysuckle

Some appendices have been provided by the client for a report (RCA, 2000) prepared for the honeysuckle area (Merewether Wharf) including results of groundwater analysis and hydrocarbon fingerprinting to assess the likely type of hydrocarbon found in groundwater.

The results suggested the presence of hydrocarbon impact in groundwater at some tested locations. It is noted, however, that the location of groundwater monitoring wells is not clear in the information provided. The investigation area is also located to the west of the Foreshore Park site area and was located between Merewether Street and Argyle Street Newcastle.

5.5 Annexure 4 – Remediation Action Plan, former Fisherman's Co-op Newcastle (RCA, 2000)

A remediation action plan (RAP) was prepared for the former fisherman's co-op building on Wharf Road, which outlined the remediation procedures for identified petroleum hydrocarbon and polycyclic aromatic hydrocarbons contamination in soil and groundwater.

The address of the property was not provided, however it is understood from the current project brief that the former fisherman's coop was located on Wharf Road Newcastle between Merewether Street and Argyle Street Newcastle.

The remediation strategy proposed included excavation and landfill disposal of impacted soils, removal of free hydrocarbon product from groundwater and pump and treat of groundwater to remove dissolved phase contamination.

Information has not been provided as to the extent or success of remediation conducted at the former fisherman's co-op site.

5.6 Annexure 5 – Additional Groundwater Contamination Assessment (DP, 1997)

Additional groundwater assessment was undertaken at the former gasworks site on the corner of Wharf Road and Watt Street Newcastle by DP in 1997. The assessment was conducted following initial investigation by DP as presented in Annexure 6 below.

The assessment comprised additional drilling and well installation to further assess the identified heavy metal and hydrocarbon contamination and to assess the potential for off-site migration of contamination.

The additional investigation indicated the following:

- Limited off-site migration of PAH and TRH was encountered;
- Groundwater assessment results suggesting that the off-site migration of organic contamination was not reaching the nearest water body (Newcastle Harbour to the north);
- Inorganic contamination may have been reaching the harbour, however other sources of contamination were likely;
- Additional remediation works were not warranted, subject to the following:
    - use of the site would be for commercial purposes;
    - Groundwater from the site was not utilised; and
    - The assessed impact on Newcastle Harbour was minimal.

5.7 Annexure 6 –Geotechnical and Contamination Assessment (DP, 1996)

Assessment was conducted by DP in 1996 on the corner of Wharf Road and Scott Street (as in Annexure 5 above), comprising assessment of site history, drilling, well installation, soil and groundwater sampling and testing and an assessment of site contamination.

It is note that the work conducted by DP as presented in Annexure 5 was conducted following the works conducted in Annexure 6.

The results of assessment indicated that the former site use included a gasworks. The subsurface investigation and testing indicated presence of organic contaminant (TRH and PAH) impacts in soil across the site, and also in groundwater as a result of soil impact below the groundwater table and possible leaks from former gasworks infrastructure.

5.8 Targeted Site Investigation, Surplus Rail Lands (DP, 2016)

DP conducted a targeted site investigation for contamination within surplus rail lands between worth place and Watt Street. The investigation included subsurface investigation, groundwater well installation, soil and groundwater testing and report preparation.

The investigation area included the former bus interchange on the corner of Wharf Road and Watt Street (i.e. the subject site of Annexure 5 and 6 above), plus the area of the current subject site immediately north of Watt Street.

The results of the investigation indicated similar conditions to those encountered in Annexure 5 and 6, i.e. organic contamination (TRH and PAH) impacts in soil and groundwater. Assessment of groundwater within the current site area (see Figure 4 below for approximate test locations) suggested the absence of gross impacts in groundwater. The report suggested management/remediation of the identified contamination.

Subsequent to the work conducted by DP, it is understood that the former gasworks area is subject to ongoing on-site management.

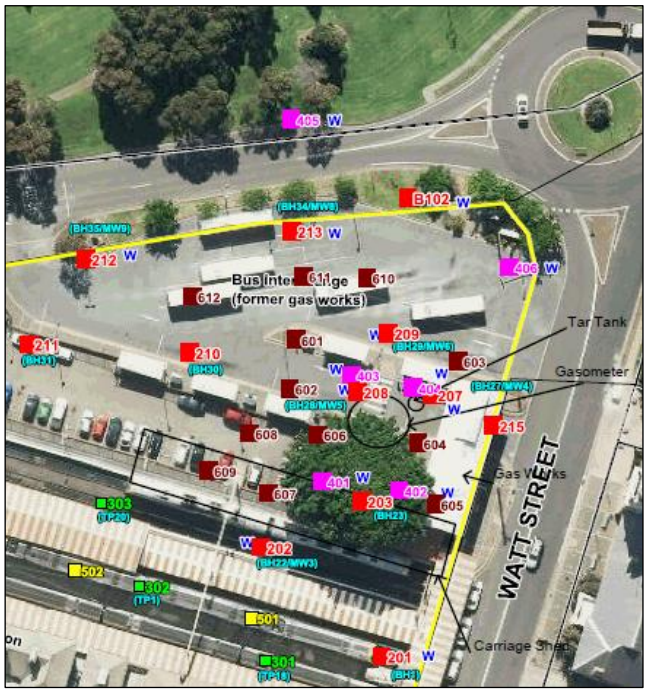


Figure 4: DP investigation within former gasworks and within the subject site (DP, 2016)

5.9 Discussions with Council Staff

Informal discussions with CN staff indicated that the mounds within the subject site area were initially formed during construction of the park. It is also understood that some building materials from demolition following the 1989 Newcastle earthquake may have been brought to the site.

Anecdotal evidence from DP staff and review of borehole information from Annexure 6 and DP (2016) indicated the presence of large inclusions in fill at the test locations to the north of Watt Street, suggesting imported fill, containing cobbles/boulders/building materials, are present.

6. Site Walkover

A site walkover was undertaken by a senior environmental engineer on 30 September 2020. At the time of the walkover, the site generally comprised grassed park areas. Grassed soil mounds, between approximately 0.5 m and 3 m in height above surrounding surface levels, were observed across the majority of the investigation area, as shown in Figures 5 to 12.

Some areas of localised exposed soils were observed across the site, generally comprising sand fill with some intermixed carbonaceous materials (i.e. coal), possible slag, glass and brick (Figure 13). Generally there was no indication of gross contamination impact at the surface (e.g staining, odours, distressed vegetation).



Figure 5: Site condition in the vicinity of Bore 1, looking north



Figure 6: Site condition in the vicinity of Bore 2, looking east



Figure 7: Site condition in the vicinity of Bore 3, looking south-east



Figure 8: Site condition in the vicinity of Bores 4, 5 and 6, looking west



Figure 9: Site condition in the vicinity of Bores 7, 8 and 9, looking east



Figure 10: Site condition in the vicinity of Bore10, looking south-east



Figure 11: Site condition in the vicinity of Bore 11, looking south



Figure 12: Site condition in the vicinity of Bore 12, looking east



Figure 13: Exposed fill/soil on mound in the central eastern portion of the investigation area (in the vicinity of Bore 9) containing carbonaceous materials (i.e. coal), possible slag, glass and brick.

7. Preliminary Conceptual Site Model

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or the future i.e.: it enables an assessment of the potential source – pathway – receptor linkages (complete pathways).

Potential Sources

The current investigation has included a brief review of existing reports for the site and a site walkover. An assessment of site history has not been conducted for the investigation area. The review and walkover have, however, identified the following potential sources of contamination and associated contaminants of potential concern (COPC).

- S1: Demolished Structures – former railway goods yard;
    - o COPC include asbestos, synthetic mineral fibres (SMF), lead (in paint), metals and polychlorinated biphenyls (PCB).

- S2: Fill: fill across majority of the site, likely to be associated with historical landuse and fill importation;
  - COPC include metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), organochlorine pesticides (OCP) and asbestos (depending on the source).
- S3: Former industrial landuse (rail yard), which may include chemical storage, machinery/plant use and servicing, train servicing, fuel storage, adjacent former gas works;
  - COPC include metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), VOCs, coal tar.

Potential Receptors

The following potential human receptors have been identified:

- R1: Current users (recreational land use);
- R2: Future users (likely recreational land use);
- R3: Construction and maintenance workers;
- R4: Adjacent site users (residential land use).

The following potential environmental receptors have been identified:

- R5: Surface water;
- R6: Groundwater; and
- R7: Terrestrial ecology.

Potential Pathways

The following potential pathways have been identified:

- P1: Ingestion and dermal contact;
- P2: Inhalation of dust and/or vapours;
- P3: Surface water run-off;
- P4: Lateral migration of groundwater providing base flow to water bodies;
- P5: Leaching of contaminants and vertical migration into groundwater; and
- P6: Contact with terrestrial ecology.

Summary of Potentially Complete Exposure Pathways

A ‘source–pathway–receptor’ approach has been used to assess the potential risks of harm being caused to human or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways (potential complete pathways). The possible pathways between the above sources (S1 to S3) and receptors (R1 to R7) are provided in below Table 2.

Table 2: Summary of Potentially Complete Exposure Pathways

Source and COPC	Transport Pathway	Receptor	Risk Management Action
S1: Demolished structures, asbestos, SMF, metals and polychlorinated biphenyls (PCB). S2: Imported fill, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols and asbestos. S3: Industrial Landuse, TRH, BTEX, PAH.	P1: Ingestion and dermal contact. P2: Inhalation of dust and/or vapours. P3: Surface water run-off. P4: Lateral migration of groundwater providing base flow to water bodies. P5: Leaching of contaminants and vertical migration into groundwater. P6: Contact with terrestrial ecology.	R1: Current users (recreational land use). R2: Future users (likely recreational land use). R3: Construction and maintenance workers. R4: Adjacent site users (residential and recreational land use). R5: Surface water. R6: Groundwater. R7: Terrestrial ecology.	An intrusive investigation and surface inspection are recommended to assess possible contamination including testing of the soils.

8. Sampling and Analysis Quality Plan

8.1 Data Quality Objectives

The contamination testing scope conducted as part of this assessment was devised with reference to the seven-step data quality objective process which is provided in Appendix B Schedule B2, NEPC (2013). The DQO process is outlined in Appendix C.

8.2 Soil Sampling Rationale

The client nominated test locations generally corresponding to raised/filled areas within the site.

Borehole depths included assessment of the fill mound, plus preliminary assessment of underlying fill and natural soils and groundwater (where encountered).

Soil samples were collected from each borehole at regular depth intervals, and changes in lithology or signs of contamination.

The general sampling methods are described in the field work methodology, included in Appendix C.

9. Field Work

9.1 Field Work Methods

The general sampling methods are described in the field work methodology, included in Appendix C.

9.2 Field Work Results

The borehole logs for this assessment are included in Appendix A. The logs recorded the following general sub-surface profile:

- Fill: encountered in all boreholes to depths of between 1.2 m and 4.6 m below ground level (bgl), generally comprising sand/silty sand fill with gravel, trace coal, slag, ash and brick;
- Sand (natural): encountered in Bores 1 to 9, generally comprising brown medium dense sand.

A summary of encountered subsurface conditions is presented in Table 3 below.

Table 3: Summary of subsurface conditions

Bore	Fill Depth (m bgl)	Groundwater Depth (m bgl)	Potential Contaminant observations
1	1.2	2.2	Trace ash, coal
2	4.6	2.8	Trace coal
3	2.1	3.1	Trace ash, coal
4	1.95	3.5	Trace brick, ash, coal
5	2.6	3.9	Trace ash, coal, brick, granulated slag, coal
6	1.3	1.3	Trace ash, coal
7	2.2	3.2	Trace ash, coal, ceramic
8	1.7	2.2	Trace coal
9	1.6	1.8	Trace coal, brick, slag
10	>2.6 (refusal on obstruction)	Not encountered	Trace ash, coal, brick, slag
11	>2.6 (refusal on obstruction)	Not encountered	Trace coal, ash, brick, slag
12	>2.85 (refusal on obstruction)	Not encountered	Trace coal, slag, brick, plastic

With the exception of the above-mentioned inclusions/contaminant observations, there were no other apparent visual or olfactory evidence (e.g.: staining, odours, free phase product) to suggest the presence of gross contamination within the soils or groundwater observed at the test locations during the investigation.

Although asbestos containing materials (ACM) were not observed within the test locations, there is a risk that ACM and other Hazardous Building Materials (HBM) are present within the site due to the presence of extensive uncontrolled fill across the site, possible presence of historical demolition waste and the observed anthropogenic inclusions in fill.
The PID screening indicated the general absence of VOC in the tested samples with all recorded values of less than 1 ppm.

Free groundwater was observed whilst drilling at the locations and depths provided in Table 3 above. It should be noted that groundwater levels are affected by climatic conditions, soil permeability and tidal influence at this site, and will therefore vary with time.

9.3 Quality Assurance / Quality Control

9.3.1 Field QA / QC

Quality assurance (QA) and quality control (QC) procedures were adopted throughout the field sampling programme and comprised the following:

- Following DP standard operating procedures;
- Collection of replicate samples;
- Storage of samples under secure, temperature-controlled conditions; and
- Use of COC documentation for the handling, transport and delivery of samples to the selected laboratory.

9.3.2 Laboratory QA/QC

The NATA accredited chemical laboratories undertook in-house QA/QC procedures involving the routine testing of:

- Reagent blanks;
- Spike recovery analysis;
- Laboratory duplicate analysis;
- Analysis of control standards;
- Calibration standards and blanks; and
- Statistical analysis of QC data.

10. Laboratory Testing

10.1 Contamination

Laboratory testing for the assessment of soils was undertaken by Envirolab Services Pty Ltd, a NATA registered laboratory. Analytical methods used are shown in the laboratory sheets attached.

A total of 18 soil samples, including one QA/QC soil samples (replicates D1/JRK), were selected as part of the current assessment of soil conditions.

The soil samples were analysed for the following potential contaminants:

- Metals: Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Zinc (Zn), Mercury (Hg), Nickel (Ni), Manganese (Mg) and Iron (Fe);
- Total Recoverable Hydrocarbons (TRH);
- Benzene, Toluene, Ethyl Benzene, Xylene (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Polychlorinated Biphenyls (PCB);
- Organochlorine and Organophosphorus Pesticides (OCP/OPP).

Furthermore, testing for the presence of asbestos materials was undertaken by Envirolab, a NATA-registered laboratory. A total of eight samples were analysed for asbestos identification in soil.

Following receipt of initial testing results (i.e. total contaminant concentrations in soil), an additional eight samples were selected for toxicity characteristic leaching procedure (TCLP – acid leach) testing or Australian Standard Leaching Procedure (ASLP – water leach), to assess leachability characteristics of the soil for further assessment for possible off-site disposal to an appropriately licensed landfill or for retention on site.

The results of laboratory analysis are summarised in the following tables in Appendix B:

- Table B1: Summary of Results of Soil Analysis – TRH, BTEX, PAH, Metals;
- Table B2: Summary of Results of Soil Analysis – OCP, OPP, PCB and Asbestos;
- Table B3: Summary of Results of Soil Analysis - Waste Classification Assessment;
- Table B4: Summary of Results of Soil Analysis – Water Leach Testing.

The laboratory certificate(s) of analysis are provided in Appendix B. The chain of custody and sample receipt information are provided in Appendix C.

10.2 Acid Sulfate Soils

Acid sulfate soil (ASS) testing for the assessment comprised the following:

- 43 ASS screening tests on soils collected from the boreholes to provide a preliminary assessment of potential and actual acidity in the samples;

- Five detailed ASS laboratory tests (chromium suite) to confirm the ASS status of the soils.

The results of screening tests and detailed testing are summarised in Table B5, Appendix B. ASS Laboratory report sheets are provided in Appendix B.

11. Discussion - Contamination

11.1 Soils

The analytical results for the samples tested were below the SAC with the exception of:

- B(a)P TEQ in samples Bore 5/1.5, Bore 8/0.0-0.05, Bore 10/1.0 and Bore 11/1.0 which exceeded the HIL-C of 3 mg/kg and the EIL of 0.7 mg/kg. The B(a)P EIL was also exceeded for Bore 7/1.5 and Bore 12/1.0 in addition to the above samples;
- Lead in sample Bore 1/0.5 which exceeded the HIL-C of 600 mg/kg;
- EIL/ESL were exceeded in Bore 1/0.5 for arsenic, zinc and F3;
- ESL was exceeded in Bore 2/2.0 for F3;
- EIL was exceeded in Bore 10/1.0 for zinc;
- EIL was exceeded in Bore 11/1.0 for copper;

In the current investigation, six samples had a concentration of B(a)P that exceeded the ESL of 0.7 mg/kg. It is noted that the B(a)P ESL is a low reliability value. Higher reliability screening levels have been published in CRC CARE *Risk-based Management and Remediation Guidance for Benzo(a)pyrene* (CRC CARE, 2017). The high reliability value of 33 mg/kg (or ranging from 21 mg/kg to 135 mg/kg) for fresh B(a)P suggests that the concentrations of B(a)P detected at the site are unlikely to pose an unacceptable risk to terrestrial ecology and therefore the B(a)P ESL exceedances are not considered to be of concern.

The results of testing indicated the absence of asbestos in soil (40 g sample) at the locations and depths tested.

The results of water leach testing on selected samples with elevated PAH and lead concentrations indicated the following:

- The general absence of leachable PAH concentrations in the samples tested;
- Moderate propensity of lead to leach in the sample tested.

It is noted that the ASLP test includes tumbling the contaminated soil sample in water for 18 hours, followed by analysis of the leachant. This testing methodology is considered to provide a conservative assessment of the propensity to leach contamination in water.

11.2 Waste Classification

The concentrations of lead and benzo(a)pyrene in several soil samples exceeded 'General Solid Waste' (total concentration CT1) criteria. Leachability (TCLP) testing was conducted on selected samples to further assess the waste classification status of the tested soils

On the basis of total (SCC1) and leachable (TCLP1) concentrations, the selected samples tested were within the NSW EPA criteria (NSW EPA, 2014) for classification as "General Solid Waste" for chemical contaminants.

11.3 Acid Sulfate Soils

(Dear, et al., 2014) suggest that a soil pH<4 in water (pH_F) is an indicator of actual ASS. The results of screening tests therefore suggest the absence of actual ASS at the locations and depths tested.

(Dear, et al., 2014) guidelines also suggest that indicators of potential acid sulfate soils (PASS) include the following:

- Soil pH <3.5 in H_2O_2 (i.e. pH_{FOX});
- Drop of 1 pH unit or more between pH_F and pH_{FOX}.

Twenty-eight (28) of the forty-three (43) tested samples exhibited a drop in pH greater than one. No samples exhibited a soil pH following oxidation (pH_{FOX}) of less than 3.5.

It is noted that the above test method is a qualitative method only and gives an indication of the intensity of total acidification (pH). (Stone, Ahern, & Blunden, 1998) indicate that peroxide may also oxidise organic matter (in addition to pyrite) to produce acids which are unlikely to form under natural conditions, thus giving falsely high indication of acid sulfate potential.

The results of the detailed chromium suite testing indicate that the existing and potential acidity from one of the upper topsoil samples tested exceed the QASSIT action criteria (i.e. Bore 4/1.5).

Based on the results of chromium suite laboratory testing and the geological formations present, it is considered that marginal ASS conditions may be present within the sandy soils encountered on the site to the depth of investigation.

Additional ASS investigation is recommended to further assess the potential for ASS at the site, particularly in areas of possible future excavation and/or dewatering.

11.4 Data Quality Assurance and Quality Control

The data quality assurance and quality control (QA/QC) results are included in Appendix C. Based on the results of the field QA and field and laboratory QC, and evaluation against the data quality indicators (DQI), it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.

12. Discussion - Geotechnical

The results of subsurface investigation at the nominated mound locations indicate that the mounds generally comprise uncontrolled granular (sand) fill with inclusions from various industrial sources (slag, ash, coal reject), underlain by sand fill and sand to the depth of investigation.

The observed fill is uncontrolled and generally not suitable for the support of structural loads or as pavement subgrade without further assessment, re-shaping, compaction and testing to confirm relative strength/density of reworked material.

It is noted that obstructions were encountered during drilling of Bores 10, 11 and 12 in the western portion of the site. the potential for obstructions during excavation, service installation, footing excavation etc. across the site cannot be discounted.

Additional geotechnical investigation is recommended for pavement thickness design and foundation support. Additional investigation could include specific geotechnical investigation during detailed design for assessment of relative soil strength/density, subgrade strength for pavement design, settlement estimation (including underlying compressible fine-grained layers), depth to rock (if required) and earthworks/site preparation measures.

13. Conclusions and Recommendations

Review of previous investigations at the site and surrounds indicated the presence of several potentially contaminating activities, including fill placement, former industrial landuse (e.g. rail yards) and demolition of structures. The preliminary conceptual site model for the site is presented in Section 7.

Borehole locations were nominated by the client to target selected soil mounds within the site.

The results of subsurface investigation indicated the presence of fill at the test locations, containing ash, slag, coal reject and some building rubble (brick, glass), likely to be sourced from industrial activities and/or imported fill and demolition wastes.

Observations made during subsurface investigation indicated the general absence of gross contamination in fill, underlying natural soil and groundwater (i.e. general absence of visual or olfactory evidence of gross contamination at the test locations).

Generally minor exceedances of human-health and ecological criteria were found in soils at some test locations, generally associated with the fill in the investigated mounds. The lateral extent of this fill across the site has not been assessed.

Lead in soil was shown to have a moderate propensity to leach in water in the tested sample.

Asbestos was not detected either by visual identification or by laboratory testing in the samples analysed. It is noted that the method of investigation (i.e. drilling/geoprobe sampling/solid flight auger) provides a relatively small total sample volume and does not allow for observation of an excavated soil profile. The presence of building rubble and the demolition of former structures at the site suggests that

asbestos in soil is possible/likely at the site. Additional investigation is recommended to further assess the fill materials on the site for the presence of Hazardous Building Materials including asbestos.

On the basis of site observations and the results of laboratory testing, the fill materials tested are are considered to be suitable to remain on the site from a contamination perspective, provided that remediation/management is implemented to manage the observed and potential contamination risks.

Remediation/management of the site could comprise the following:

- Removal/off-site disposal of impacted fill/soils to an appropriately licensed facility to remove the identified and potential human health and ecological impacts;
- On-site management of the impacted soils to manage the identified and potential human health and ecological impacts, comprising management of impacted soils beneath capping (pavements, building slabs, clean soils).

Remediation/management of identified and potential contamination would require the preparation of a site specific Remediation Action Plan (RAP with reference to NSW EPA (2020)), outlining the procedures, methodology, remediation acceptance criteria and contingency measures for management of contamination.

It is noted that the current assessment is considered to be preliminary. Additional assessment is recommended prior to remediation / management to further assess source of potential contamination, including targeted assessment of areas of former industrial use, fill placement and demolition as well as systematic assessment across the site.

Groundwater investigation is recommended to assess the potential for impacts from previous site uses, including rail yard and fill placement. Groundwater assessment could also be conducted to assess the potential for leaching of contaminants from the fill/soil profile.

Additional ASS investigation is also recommended in areas of possible future excavation and/or dewatering. Specific geotechnical investigation will also be required for pavement thickness design and foundation support.

14. References

Advitech (2003). Water Harvesting and Reuse Project, Prepared for Newcastle City Council, Advitech Pty Limited, ECM 1464692.CRC CARE. (2017). *Risk-based Management and Remediation Guidance for Benzo(a)pyrene.* Technical Report no. 39: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

Dear, S., Ahern, C., O'Brien, L., Dobos, S., McElnea, A., Moore, N., & Watling, K. (2014). *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines.* Brisbane: Department of Science: Department of Science, Information, Technology, Innovation and the Arts, Queensland Government.

NSW EPA. (1995). *Contaminated Sites, Sampling Design Guidelines.* NSW Environment Protection Authority.

NSW EPA. (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* NSW Environment Protection Authority.

Stone, Y., Ahern, C. R., & Blunden, B. (1998). *Acid Sulfate Soil Manual.* Acid Sulfate Soil Management Committee (ASSMAC).

NSW EPA. (2020). Guidelines for Consultants Reporting on Contaminated Land. Contaminated Land Guidelines: NSW Environment Protection Authority.

RCA (2000a), Unreferenced Laboratory testing reports.

RCA (2000b), Remediation Action Plan, Former Fishermans Co-op, Newcastle, prepared for Patterson Britton and Partners, Ref JN 1832.

Stone, Y., Ahern, C. R., & Blunden, B. (1998). Acid Sulfate Soil Manual. Acid Sulfate Soil Management Committee (ASSMAC).

15. Limitations

Douglas Partners (DP) has prepared this report for this project at Newcastle Foreshore Park with reference to DP's proposal NCL200384 dated 10 July 2020. The work was carried out under City of Newcastle contract No 2021/044Q and the letter of agreement dated 18 September 2020. This report is provided for the exclusive use of the City of Newcastle for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected*d by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical / environmental components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Asbestos has not been detected by observation or by laboratory analysis, either on the surface of the site, or in filling materials at the test locations sampled and analysed. Building demolition materials, such as brick and glass, were, however, located in below-ground filling, and these are considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to undetected variations in ground conditions or to budget constraints (as discussed above), or to parts of the site being inaccessible and not available for inspection/sampling, or to vegetation preventing visual inspection and reasonable access. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

Douglas Partners Pty Ltd

Appendix A

About This Report
Sampling Methods
Soil Descriptions
Symbols and Abbreviations
Borehole Logs – Bores 1 to 12

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Soil Descriptions

Douglas Partners

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

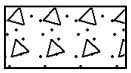
Symbols & Abbreviations

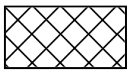
Graphic Symbols for Soil and Rock

General

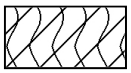

Asphalt

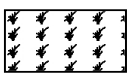

Road base

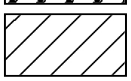

Concrete


Filling

Soils


Topsoil

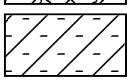

Peat


Clay


Silty clay

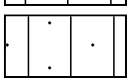

Sandy clay

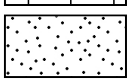

Gravelly clay

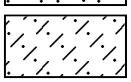

Shaly clay

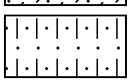

Silt


Clayey silt


Sandy silt

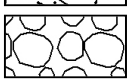

Sand


Clayey sand


Silty sand


Gravel

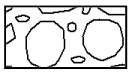

Sandy gravel


Cobbles, boulders

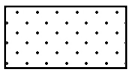

Talus

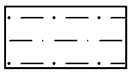
Sedimentary Rocks

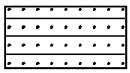

Boulder conglomerate

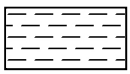

Conglomerate


Conglomeratic sandstone

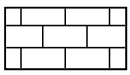

Sandstone


Siltstone

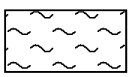

Laminite

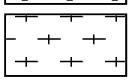

Mudstone, claystone, shale

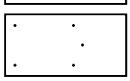

Coal


Limestone

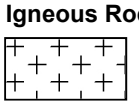
Metamorphic Rocks

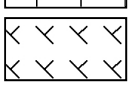

Slate, phyllite, schist

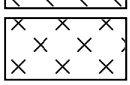

Gneiss

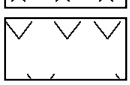

Quartzite

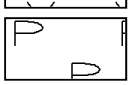
Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 2.54 AHD
EASTING: 386487.3
NORTHING: 6356251
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 102159.00
DATE: 12/10/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.2	FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, trace rootlets, fine to medium subangular gravels, moist		D	0.05	E	PID<1		
	0.35			D	0.3	E	PID<1		
		FILL / SILTY SAND (SP): Pale brown / grey / orange, with silt, trace fine to medium gravels, moist		D	0.5	E	PID<1		
	1.05	FILL / SILTY SAND (SP): Fine to medium grained, dark grey, with silt, moist		D	1.0	E	PID<1		
	1.2			D	1.1	E	PID<1		
		FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, moist		S	1.2		9,11,12 N = 23		
				D	1.5	E	PID<1		
		SAND (SP): Fine to medium grained, brown, moist, medium dense			1.65				
				D	2.0	E	PID<1	▼ 12-10-20	
				D	2.5	E	PID<1		
				S			4,3,3 N = 6		
				D	2.9	E	PID<1		
	3.0	Bore discontinued at 3.0m, limit of investigation			2.95				

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil

TYPE OF BORING: Push tube to 3.0m

WATER OBSERVATIONS: Free groundwater observed at 2.2m

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.65 AHD
EASTING: 386526.7
NORTHING: 6356257
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 102159.00
DATE: 12/10/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.15	SAND (SP): Fine to medium grained, brown, moist, medium dense		D	0.05	E	PID<1		
	0.65	FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, trace fine to coarse gravels, moist		D	0.5	E	PID<1		
		FILL / SANDY CLAY (SP): Low plasticity, grey mottled brown, trace ash, W>PL		D	1.0	E	PID<1		
				S			1,8,8 N = 16		
	1.4	FILL / SILTY SAND (SP): Fine to medium grained, dark grey, with silt, trace coal, ash, fine gravels, moist (possible hydrocarbon odour)		D	1.45 1.5	E	PID<1		
	2.1			D	2.0	E	PID<1		
	2.25	FILL / SAND (SP): Fine to medium grained, brown, trace fine to coarse subrounded gravels, moist		D	2.2	E	PID<1		
				D	2.3	E	PID<1		
	2.6	FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, trace fine to medium gravels, moist, dense		D	2.5	E	PID<1		
				S			19,25/110,- refusal		
	2.85			D	2.76	E		▼	
	3.0	FILL / SAND (SP): Fine to coarse grained, yellow, moist		D	2.8	E	PID<1	12-10-20	
				D	2.9		PID<1		
		FILL / SAND (SP): Fine to coarse grained, white / very pale grey, moist		D	3.2	E	PID<1		
	3.45	FILL / SAND (SP): Fine to medium grained, brown, trace coal , fine gravels, wet		D	3.5	E	PID<1		
	4.0	FILL / SANDY GRAVEL (GP): Fine to coarse grained, brown, with fine to medium grained sand, wet		D	4.0	E	PID<1		
				S			6,10,11 N = 21		
		FILL / SAND (SP): Fine to medium grained, brown, trace coal, wet, medium dense		D	4.45 4.5	E	PID<1		
	4.6	From 4.25m, trace fine to coarse gravels							
	5.0	SAND (SP): Fine to medium grained, brown, wet		D	5.0	E	PID<1		
		Bore discontinued at 5.0m, limit of investigation							

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 5.0m
WATER OBSERVATIONS: Free groundwater observed at 2.8m
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.87 AHD
EASTING: 386606.2
NORTHING: 6356282.3
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / SILTY SAND (SP): Fine to medium grained, brown / dark grey, trace fine to coarse subangular to subrounded gravels, ash, coal reject, rootlets, moist, very loose		D	0.05	E	PID<1		
				D	0.5	E	PID<1		
				D	1.0	E	PID<1		
				S			1,1,2 N = 3		
				D	1.45 1.5	E	PID<1		
				D	2.0	E	PID<1		
	2.1	SAND (SP): Fine to medium grained, pale brown, medium dense, moist, medium dense							
		From 2.6m, pale brown / orange			2.5				
				S			9,9,8 N = 17		
				D	2.95 3.0	E	PID<1	▼ 02-11-20	
				D	3.5	E	PID<1		
	4.0			D	4.0	E	PID<1		
		Bore discontinued at 4.0m, limit of investigation							

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 4.0m
WATER OBSERVATIONS: Free groundwater observed at 3.1m
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.94 AHD
EASTING: 386536.5
NORTHING: 6356229.8
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 102159.00
DATE: 12/10/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.2	FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, trace rootlets, fine to medium subangular gravels, moist		D	0.05	E	PID<1		
					0.2				
		FILL / SANDY C;AY (CL): Low plasticity, pale brown mottled orange / brown, with silt, fine to medium grained sand, trace brick, ash, fine to coarse gravels, coal, W<PL		D	0.5	E	PID<1 pp = 110-200		
	1.1			D	1.0	E	PID<1		
	1.3	FILL / SANDY GRAVEL (GP): Fine to coarse gravels, pale brown, with fine to medium grained sand, dry		D	1.1	E	PID<1		
				S	1.2 1.3		9,7,6 N = 13		
	1.6	FILL / SANDY CLAY (CL): Low plasticity, grey, with silt, fine to medium grained sand, moist		D	1.45	E	pp = 110-150		
	1.8			D	1.5	E	PID<1		
	1.95	FILL / SANDY CLAY (CL): Low plasticity, brown mottled orange, with fine to medium grained sand, trace fine to medium gravels, W<PL		D	1.6 1.7	E	PID<1		
				D	1.8	E	pp = 120-140		
					1.85		PID<1		
					2.0		PID<1		
		FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, moist		D	2.5	E	PID<1		
				S			6,6,10 N = 16		
		SAND (SP): Fine to medium grained, brown, moist, medium dense		D	2.95	E	PID<1		
					3.0				
				D	3.5	E	PID<1	12-10-20	
	4.0	Bore discontinued at 4.0m, limit of investigation		D	4.0	E	PID<1		
				S			1,1,3 N = 4		
					4.45				

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil

TYPE OF BORING: Push tube to 4.0m

WATER OBSERVATIONS: Free groundwater observed at 3.5m

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 4.26 AHD
EASTING: 386572.1
NORTHING: 6356232.4
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 102159.00
DATE: 12/10/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / SILTY SAND (SP): Fine to medium grained, brown, with silt, trace rootlets, fine to medium subangular gravels, dry		D	0.05	E	PID<1		
	0.4			D	0.5	E	PID<1		
	0.65	FILL / SAND (SP): Fine to coarse, brown, trace ash, fine gravels, moist			0.65				
		FILL / CLAY (CI): Medium plasticity, intermixed grey / brown, trace fine to medium grained sand, coal reject, brick, possible granulated slag, coal, W>PL, soft		D	1.0	E	PID<1		
				S			pp = 80-150 1,1,2 N = 3		
				D	1.45 1.5	E	PID<1		
					1.8				
				D	2.0	E	PID<1 pp >400		
	2.4			D	2.4 2.5	E	PID<1		
	2.6	FILL / GRAVELLY SAND (SP): Fine to medium grained, dark grey, with silt, fine to coarse gravels, trace ash, coal, brick		S			10,10,11 N = 21		
		SAND (SP): Fine to medium grained, brown, moist, medium dense		D	2.95 3.0	E	PID<1		
				D	3.5	E	PID<1		
	4.0			D	4.0	E	PID<1	12-10-20	
		Bore discontinued at 4.0m, limit of investigation		S			3,10,18 N = 28		
					4.45				

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 4.0m
WATER OBSERVATIONS: Free groundwater observed at 3.9m
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 2.74 AHD
EASTING: 386609.3
NORTHING: 6356243.8
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / SILTY SAND (SP): Fine to medium grained, intermixed brown, dark grey, trace fine to medium subangular gravels (CNR), coal, ash, moist		D	0.05	E	PID<1		
				D	0.5	E	PID<1		
				D	1.0	E	PID<1		
	1.3	SAND (SP): Fine to medium grained, pale brown, moist		D	1.5	E	PID<1	02-11-20	
				D	2.0	E	PID<1		
				D	2.5	E	PID<1		
	3.0	Bore discontinued at 3.0m, limit of investigation		D	3.0	E	PID<1		

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 3.0m
WATER OBSERVATIONS: Free groundwater observed at 1.3m
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 4.28 AHD
EASTING: 386639.2
NORTHING: 6356236.6
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / SILTY SAND (SP): Fine to medium grained, brown, trace rootlets, fine to coarse subangular to subrounded gravels (CNR)		D	0.05	E	PID<1		
				D	0.5	E	PID<1		
	0.9	FILL / SANDY CLAY (CL): Low plasticity, brown, with silt, trace fine to medium subangular to subrounded gravels (CNR), ash, coal reject, ceramic, W>PL		D	1.0	E	pp = 90-110 PID<1		
				D	1.5	E	pp = 150 PID<1		
		From 1.7m, grey		D	2.0	E	pp = 200-220 PID<1		
	2.1	FILL / SAND (SP): Fine to medium grained, brown, with silt, trace ash fie to medium subangular to subrounded gravels, ash, coal reject, moist		D	2.5	E	PID<1		
				D	3.0	E	PID<1	▼ 02-11-20	
	3.2	FILL / SILTY SAND (SP): Fine to medium grained, intermixed brown, dark grey, trace fine to medium subangular gravels (CNR), coal, ash, moist		D	3.5	E	PID<1		
				D	4.0	E	PID<1		
	4.2	Bore discontinued at 4.2m, limit of investigation							

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 4.2m
WATER OBSERVATIONS: Free groundwater observed at 3.2m
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.41 AHD
EASTING: 386677.3
NORTHING: 6356245.9
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.25	FILL / SILTY SAND (SP): Fine to medium grained, brown, trace fine to medium subangular to subrounded gravels (CNR), rootlets, moist		D	0.05	E	PID<1		
		FILL / SANDY CLAY (CL): Low plasticity, brown, with fine to medium grained sand, trace fine to medium subangular gravels (CNR), coal reject, moist		D	0.5	E	pp = 300-350 PID<1		
				D	1.0	E	pp = 300-400 PID<1		
	1.5			D	1.5	E	pp = 350-400 PID<1		
	1.7	SANDY GRAVEL (GP): Fine to medium gravels, dark grey, with fine to medium grained sand, silt, trace coal reject		D	1.6	E			
		FILL / SILTY SAND (SP): Fine to medium grained, intermixed brown, dark grey, trace fine to medium subangular gravels (CNR), coal, ash, moist		D	2.0	E	PID<1	▼ 02-11-20	
				D	2.5	E	PID<1		
				D	3.0	E	PID<1		
	3.2	Bore discontinued at 3.2m, limit of investigation							

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 3.2m
WATER OBSERVATIONS: Free groundwater observed at 2.2m
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.81 AHD
EASTING: 386714.1
NORTHING: 6356251.7
DIP/AZIMUTH: 90°/--

BORE No: 9
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / CLAY (CL): Low plasticity, brown, mottled pale brown / orange, with silt, trace fine to medium grained sand, fie to coarse subangular to subrounded gravels (CNR), coal reject, brick, W>PL		D	0.05	E	PID<1		
				D	0.1	E	pp = 180-210		
				D	0.5	E	pp = 200-250 PID<1		
				D	1.0	E	pp = 250-260 PID<1		
	1.2			S			2,4,8 N = 12		
		FILL / SAND (SP): Fine to medium grained, brown, with silt, moist, medium dense		D	1.45	E	PID<1		
	1.6	From 1.4m, dark grey, trace slag, fine gravels			1.5				
		FILL / SILTY SAND (SP): Fine to medium grained, intermixed brown, dark grey, trace fine to medium subangular gravels (CNR), coal, ash, moist, medium dense		D	2.0	E	PID<1	02-11-20	
				D	2.5	E	PID<1		
				S			1,5,7 N = 12		
	3.0	Bore discontinued at 3.0m, limit of investigation		D	2.95 3.0	E	PID<1		

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil

TYPE OF BORING: Push tube to 3.0m

WATER OBSERVATIONS: Free groundwater observed at 1.8m

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 2.81 AHD
EASTING: 386415.2
NORTHING: 63563018
DIP/AZIMUTH: 90°/--

BORE No: 10
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / SILTY SAND (SP): Fine to medium grained, brown, trace rootlets, moist		D	0.05	E	PID<1		
	0.35	FILL / SILTY SAND (SP): Fine to medium grained, dark grey, trace ash, coal reject, brick, slag, moist		D	0.5	E	PID<1		
				D	1.0	E	PID<1		
	1.2			S	1.27		11,25/115,- refusal		
		FILL / SANDY GRAVEL (GP): Fine to medium subangular gravels, intermixed pale brown / grey, with fine to medium grained sand, trace slag, moist		D	1.5	E	PID<1		
				D	2.0	E	PID<1		
				D	2.5	E	PID<1		
	2.6	Bore discontinued at 2.6m, machine refusal		S	2.63		25/125,-,- refusal		

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 2.6m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.01 AHD
EASTING: 386361.4
NORTHING: 6356288.1
DIP/AZIMUTH: 90°/--

BORE No: 11
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILL / SILTY SAND (SP): Fine to medium grained brown, trace rootlets, fine to medium subangular to subrounded gravels, moist		D	0.05	E	PID<1		
				D	0.5	E	PID<1		
	1	From 0.9m to 1.3m, dark grey, trace coal, ash, brick		D	1.0	E	PID<1		
				S			8,6,3 N = 9		
		From 1.3m to 1.9m, brown, trace clag, brick, fine to medium subangular gravels (CNR), coal reject		D	1.45 1.5	E	PID<1		
	1.9								
	2	FILL / SANDY GRAVEL (GP): Fine to medium subangular gravels (CNR), with fine to medium grained sand, brown, trace slag, brick, moist		D	2.0	E	PID<1		
				D	2.5	E	PID<1		
	2.6	Bore discontinued at 2.6m, machine refusal		S	2.55		25/50,-,- refusal		

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 2.6m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: City of Newcastle
PROJECT: Harbour Foreshore Geotech & Waste Class
LOCATION: Wharf Road, Newcastle East

SURFACE LEVEL: 3.64 AHD
EASTING: 386179.9
NORTHING: 6356273.4
DIP/AZIMUTH: 90°/--

BORE No: 12
PROJECT No: 102159.00
DATE: 2/11/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.35	FILL / SILTY SAND (SP): Fine to medium grained, brown, trace rootlets, fine to medium subrounded gravels (CNR), moist		D	0.05	E	PID<1		
		FILL / SANDY CLAY (CL): Low plasticity, brown, trace coal reject, slag, W<PL		D	0.5	E	PID<1		
	1.1			D	1.0	E	pp = 110-150 PID<1		
	1.3	FILL / SILTY CLAY (CL): Low plasticity, grey, trace fine subrounded to subangular gravels (CNR), W<PL		D	1.2	E	pp = 150 PID<1		
		FILL / CLAY (CH): High plasticity, brown, trace brick, coal reject, W>PL		S D	1.45 1.5	E	3,1,1 N = 2 pp = 210-250 PID<1		
	1.9	FILL / SANDY CLAY (CL): Low plasticity, pale brown, trace slag, fine to medium subrounded gravels (CNR), plastic, W>PL		D	2.0	E	pp = 180-190 PID<1		
				D S	2.5	E	pp = 180-190 PID<1 10,8,21/40 refusal		
	2.85	Bore discontinued at 2.85m, machine refusal			2.85				

RIG: Geoprobe 7822 DT **DRILLER:** [redacted] **LOGGED:** [redacted] **CASING:** Nil
TYPE OF BORING: Push tube to 2.85m
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

Appendix B

Table B1 - Summary of Results of Soil Analysis – TRH, BTEX, PAH, Metals
Table B2: Summary of Results of Soil Analysis – OCP, OPP, PCB and Asbestos
Table B3: Summary of Results of Soil Analysis - Waste Classification Assessment
Table B4: Summary of Results of Soil Analysis – Water Leach Testing
Table B5: Summary of Results of Soil Analysis – Acid Sulfate Soils
Laboratory Report Sheets

Appendix B
Summary of Laboratory Results, Newcastle Foreshore Park Master Plan
Wharf Road, Newcastle East

B1.0 Introduction

Results of laboratory testing are summarised as follows:

- Table B1: Summary of Results of Soil Analysis – TRH, BTEX, PAH, Metals;
- Table B2: Summary of Results of Soil Analysis – OCP, OPP, PCB and Asbestos;
- Table B3: Summary of Results of Soil Analysis - Waste Classification Assessment;
- Table B4: Summary of Results of Soil Analysis – Water Leach Testing;
- Table B5: Results of Acid Sulfate Soil Testing.

Table B1: Summary of Laboratory Results – Metals, TRH, BTEX, PAH

			Metals									TRH						BTEX				PAH		
			Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Manganese	TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene [b]	Benzo(a)pyrene (BaP)	Benzo(a)pyrene TEQ
		PQL	4	0.4	1	1	1	0.1	1	1	1	25	50	25	50	100	100	0.2	0.5	1	1	1	0.05	0.5
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1/0.5	0 m	12/10/2020	**130** 300 100	**5.4** 90 NC	**11** 300 320	**150** 17000 160	**700** 600 1100	**0.3** 80 NC	**23** 1200 60	**1700** 30000 480	**430** 19000 NC	<25 NC NC	**69** NC 120	<25 NL 180	**69** NL 120	**550** NC 300	**270** NC 2800	**0.4** NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.5** NC 0.7	**0.8** 3 NC
2/2.0	0 m	12/10/2020	**23** 300 100	<0.4 90 NC	**4** 300 320	**120** 17000 160	**170** 600 1100	**0.5** 80 NC	**9** 1200 60	**79** 30000 480	**120** 19000 NC	<25 NC NC	**92** NC 120	<25 NL 180	**92** NL 120	**400** NC 300	**130** NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.1** NC 0.7	<0.5 3 NC
2/2.8	0 m	12/10/2020	<4 300 100	<0.4 90 NC	**6** 300 320	**1** 17000 160	**5** 600 1100	<0.1 80 NC	**1** 1200 60	**19** 30000 480	**50** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	<0.05 NC 0.7	<0.5 3 NC
4/0.5	0 m	12/10/2020	<4 300 100	<0.4 90 NC	**11** 300 320	**5** 17000 160	**8** 600 1100	<0.1 80 NC	**4** 1200 60	**18** 30000 480	**90** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	<0.05 NC 0.7	<0.5 3 NC
5/1.5	0 m	12/10/2020	**7** 300 100	<0.4 90 NC	**10** 300 320	**15** 17000 160	**110** 600 1100	**0.1** 80 NC	**5** 1200 60	**140** 30000 480	**130** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	**140** NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**3.1** NC 0.7	**4.7** 3 NC
5/4.0	0 m	12/10/2020	<4 300 100	<0.4 90 NC	**4** 300 320	<1 17000 160	<1 600 1100	<0.1 80 NC	<1 1200 60	**2** 30000 480	**5** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	<0.05 NC 0.7	<0.5 3 NC
3	0 - 1m	2/11/2020	**22** 300 100	<0.4 90 NC	**15** 300 320	**24** 17000 160	**87** 600 1100	<0.1 80 NC	**7** 1200 60	**140** 30000 480	**110** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.69** NC 0.7	**1** 3 NC
6	0 - 0.5 m	2/11/2020	**17** 300 100	**0.6** 90 NC	**6** 300 320	**29** 17000 160	**150** 600 1100	**0.5** 80 NC	**5** 1200 60	**210** 30000 480	**65** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.54** NC 0.7	**0.7** 3 NC
7	0 - 1.5 m	2/11/2020	**7** 300 100	<0.4 90 NC	**9** 300 320	**18** 17000 160	**96** 600 1100	**0.1** 80 NC	**6** 1200 60	**120** 30000 480	**110** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**1** NC 0.7	**1.4** 3 NC
8	0 - 0.05 m	2/11/2020	**4** 300 100	<0.4 90 NC	**8** 300 320	**14** 17000 160	**64** 600 1100	<0.1 80 NC	**5** 1200 60	**110** 30000 480	**99** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	**140** NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**5** NC 0.7	**7.2** 3 NC
9	0 - 1m	2/11/2020	**9** 300 100	<0.4 90 NC	**12** 300 320	**25** 17000 160	**95** 600 1100	**0.2** 80 NC	**8** 1200 60	**97** 30000 480	**230** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.5** NC 0.7	**0.7** 3 NC
D1/JRK	0 m	2/11/2020	**9** 300 100	<0.4 90 NC	**10** 300 320	**21** 17000 160	**89** 600 1100	**0.2** 80 NC	**6** 1200 60	**140** 30000 480	**130** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.3** NC 0.7	<0.5 3 NC
10	0 - 1m	2/11/2020	**9** 300 100	**4.6** 90 NC	**16** 300 320	**150** 17000 160	**360** 600 1100	**0.7** 80 NC	**14** 1200 60	**2000** 30000 480	**460** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	**100** NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**2.7** NC 0.7	**4.1** 3 NC
10	0 - 2 m	2/11/2020	<4 300 100	<0.4 90 NC	**2** 300 320	<1 17000 160	<1 600 1100	<0.1 80 NC	<1 1200 60	<1 30000 480	**1500** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	<0.05 NC 0.7	<0.5 3 NC
11	0 - 1m	2/11/2020	**7** 300 100	**0.6** 90 NC	**24** 300 320	**190** 17000 160	**190** 600 1100	**0.6** 80 NC	**9** 1200 60	**380** 30000 480	**350** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	**140** NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**3.4** NC 0.7	**4.8** 3 NC
11	0 - 2.5 m	2/11/2020	<4 300 100	<0.4 90 NC	**6** 300 320	**4** 17000 160	**9** 600 1100	<0.1 80 NC	<1 1200 60	**13** 30000 480	**1300** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.06** NC 0.7	<0.5 3 NC
12	0 - 1m	2/11/2020	**9** 300 100	**0.6** 90 NC	**12** 300 320	**32** 17000 160	**110** 600 1100	**0.2** 80 NC	**9** 1200 60	**260** 30000 480	**290** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	**160** NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**2** NC 0.7	**2.9** 3 NC
12	0 - 2.5 m	2/11/2020	**7** 300 100	<0.4 90 NC	**10** 300 320	**8** 17000 160	**44** 600 1100	<0.1 80 NC	**4** 1200 60	**70** 30000 480	**3000** 19000 NC	<25 NC NC	<50 NC 120	<25 NL 180	<50 NL 120	<100 NC 300	<100 NC 2800	<0.2 NL 50	<0.5 NL 85	<1 NL 70	<1 NL 105	<1 NL 170	**0.1** NC 0.7	<0.5 3 NC

Lab result

HIL/HSL value EIL/ESL value

HIL/HSL exceedance | EIL/ESL exceedance | HIL/HSL and EIL/ESL exceedance | ML exceedance | ML and HIL/HSL or EIL/ESL exceedance

Blue = DC exceedance

Bold = Lab detections NT = Not tested NL = Non limiting NC = No criteria NA = Not applicable

Notes:

HIL/HSL/DC	NEPC, Schedule B1- HIL C (recreational), HSL C (recreational), DC HSL C (recreational)
EIL/ESL	NEPC, Schedule B1- EIL UR/POS (Recreational), ESL UR/POS (recreational)
ML	NEPC, Schedule B1- ML R/P/POS (recreational)
a	QA/QC replicate of sample listed directly below the primary sample
b	Reported naphthalene laboratory result obtained from BTEXN suite

Table B2: Summary of Laboratory Results – OCP, OPP, PCB, Asbestos

			OCP											OPP	PCB	Asbestos		
			DDT+DDE+DDD [c]	DDD	DDE	DDT	Aldrin & Dieldrin	Total Chlordane	Total Endosulfan	Endrin	Heptachlor	Hexachlorobenzene	Methoxychlor	Chlorpyriphos	Total PCB	Asbestos ID in soil >0.1g/kg	Trace Analysis	Asbestos (50 g)
		PQL	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-	-
1/0.5	0 m	12/10/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	**0.1** 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
2/2.0	0 m	12/10/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
2/2.8	0 m	12/10/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
4/0.5	0 m	12/10/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
5/15	0 m	12/10/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	**0.3** 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
5/4.0	0 m	12/10/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
3	0 - 1m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
6	0 - 0.5 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
7	0 - 15 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
8	0 - 0.05 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
9	0 - 1m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
10	0 - 1m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
10	0 - 2 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
11	0 - 1m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
11	0 - 2.5 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NAD	NAD	NAD
12	0 - 1m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
12	0 - 2.5 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	<0.1 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
D1/JRK	0 m	2/11/2020	<0.1 400 NC	<0.1 NC NC	<0.1 NC NC	<0.1 NC 180	**0.3** 10 NC	<0.1 70 NC	<0.1 340 NC	<0.1 20 NC	<0.1 10 NC	<0.1 10 NC	<0.1 400 NC	<0.1 250 NC	<0.1 1 NC	NT	NT	NT
3 - [TRIPLICATE]	0 - 1m	2/11/2020	NT 400 NC	NT NC NC	NT NC NC	NT NC 180	NT 10 NC	NT 70 NC	NT 340 NC	NT 20 NC	NT 10 NC	NT 10 NC	NT 400 NC	NT 250 NC	NT 1 NC	NT	NT	NT
12 - [TRIPLICATE]	0 - 2.5 m	2/11/2020	NT 400 NC	NT NC NC	NT NC NC	NT NC 180	NT 10 NC	NT 70 NC	NT 340 NC	NT 20 NC	NT 10 NC	NT 10 NC	NT 400 NC	NT 250 NC	NT 1 NC	NT	NT	NT

Lab result

HIL/HSL value EIL/ESL value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab below the PQL, refer to the lab report

Bold = Lab detections NT = Not tested NC = No criteria NA = Not applicable NAD = No asbestos detected at the reporting limit

Notes:

HIL/HSL/DC	NEPC, Schedule B1- HIL C (recreational), HSL C (recreational), DC HSL C (recreational)
EIL/ESL	NEPC, Schedule B1- EIL UR/POS (recreational), ESL UR/POS (recreational)
ML	NEPC, Schedule B1- ML R/P/POS (recreational)
a	QA/QC replicate of sample listed directly below the primary sample
c	Criteria applies to DDT only

Table B3: Summary of Laboratory Results for Waste Classification – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, Asbestos

			Metals											TRH		BTEX						PAH															OCP		OPP	PCB	Asbestos		
			Arsenic	Arsenic TCLP	Cadmium	Total Chromium	Copper	Lead	Lead TCLP	Mercury (inorganic)	Nickel	Zinc	Manganese	TRH C6 - C9	C10-C36 (recoverable hydrocarbons	Benzene	Toluene	Ethylbenzene	m+p-Xylene	o-Xylene	Xylenes (total)	Benzo(a)pyrene (BaP)	Benzo(a)pyrene (BaP) TCLP	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(b,j+k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Total Endosulfan	Total Analysed OCP	Total Analysed OPP	Total PCB	Asbestos ID in soil >0.1g/kg	Trace Analysis	Total Asbestos
		PQL	4		0.4	1	1	1		0.1	1	1	1	25	50	0.2	0.5	1	2	1	3	0.05		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.1	0.1	0.1			
Sample ID	Depth	Sample Date	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-	-
1/0.5	0 m	12/10/2020	130	0.07	5.4	11	150	700	0.2	0.3	23	1700	430	<25	719	0.4	<0.5	<1	<2	<1	<3	0.5	NT	<0.1	<0.1	0.1	0.6	1	0.2	0.6	0.1	1	<0.1	0.2	<1	0.7	1	<0.1	0.1	<0.1	<0.1	NT	NT	NT
2/2.0	0 m	12/10/2020	23	NT	<0.4	4	120	170	NT	0.5	9	79	120	<25	540	<0.2	<0.5	<1	<2	<1	<3	0.1	NT	<0.1	<0.1	<0.1	0.3	0.4	<0.1	0.3	<0.1	0.4	<0.1	<0.1	<1	0.4	0.4	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
2/2.8	0 m	12/10/2020	<4	NT	<0.4	6	1	5	NT	<0.1	1	19	50	<25	<50	<0.2	<0.5	<1	<2	<1	<3	<0.05	NT	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
4/0.5	0 m	12/10/2020	<4	NT	<0.4	11	5	8	NT	<0.1	4	18	90	<25	<50	<0.2	<0.5	<1	<2	<1	<3	<0.05	NT	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
5/1.5	0 m	12/10/2020	7	NT	<0.4	10	15	110	0.08	0.1	5	140	130	<25	<50	<0.2	<0.5	<1	<2	<1	<3	3.1	NT	0.2	0.5	1.4	3.7	4.8	1.5	2.9	0.5	7.8	0.5	1.4	<1	5	7	<0.1	0.3	<0.1	<0.1	NAD	NAD	NAD
5/4.0	0 m	12/10/2020	<4	NT	<0.4	4	<1	<1	NT	<0.1	<1	2	5	<25	<50	<0.2	<0.5	<1	<2	<1	<3	<0.05	NT	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
3	0 - 1m	2/12/2020	22	NT	<0.4	15	24	87	NT	<0.1	7	140	110	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.69	NT	<0.1	<0.1	0.1	1	1	0.5	0.7	<0.1	1.4	<0.1	0.4	<1	0.5	1.4	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
6	0 - 0.5 m	2/12/2020	17	NT	0.6	6	29	150	NT	0.5	5	210	65	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.54	NT	<0.1	<0.1	0.2	0.6	0.9	0.4	0.5	<0.1	1	<0.1	0.3	<1	0.4	0.9	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
7	0 - 1.5 m	2/12/2020	7	NT	<0.4	9	18	96	NT	0.1	6	120	110	<25	<50	<0.2	<0.5	<1	<2	<1	<3	1	NT	<0.1	0.1	0.4	1.5	2	0.5	1	<0.1	2.2	0.1	0.4	<1	1	2	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
8	0 - 0.05 m	2/12/2020	4	NT	<0.4	8	14	64	NT	<0.1	5	110	99	<25	110	<0.2	<0.5	<1	<2	<1	<3	5	<0.001	0.4	0.2	1.5	4.5	9	5.1	4.1	0.5	12	1.2	3.1	<1	11	11	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
9	0 - 1m	2/12/2020	9	NT	<0.4	12	25	95	NT	0.2	8	97	230	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.5	NT	<0.1	0.1	0.2	0.7	0.9	0.2	0.6	<0.1	1.1	<0.1	0.2	<1	0.7	0.9	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
DUPJRK	0 m	2/12/2020	9	NT	<0.4	10	21	89	NT	0.2	6	140	130	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.3	NT	<0.1	<0.1	<0.1	0.4	0.5	0.2	0.3	<0.1	0.4	<0.1	0.2	<1	0.2	0.4	<0.1	0.3	<0.1	<0.1	NT	NT	NT
10	0 - 1m	2/12/2020	9	NT	4.6	16	150	360	NT	0.7	14	2000	460	<25	<50	<0.2	<0.5	<1	<2	<1	<3	2.7	NT	0.1	0.2	0.6	3.6	4.6	2.1	2.4	0.3	6.2	0.2	1.8	<1	2.6	6	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
10	0 - 2 m	2/12/2020	<4	NT	<0.4	2	<1	<1	NT	<0.1	<1	<1	1500	<25	<50	<0.2	<0.5	<1	<2	<1	<3	<0.05	NT	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
11	0 - 1m	2/12/2020	7	NT	0.6	24	190	190	0.1	0.6	9	380	350	<25	100	<0.2	<0.5	<1	<2	<1	<3	3.4	<0.01	0.4	0.2	1.2	4	5.2	2.4	3.2	0.3	8.6	0.2	1.7	<1	4.3	7.7	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
11	0 - 2.5 m	2/12/2020	<4	NT	<0.4	6	4	9	NT	<0.1	<1	13	1300	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.06	NT	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	NAD	NAD	NAD
12	0 - 1m	2/12/2020	9	NT	0.6	12	32	110	NT	0.2	9	260	290	<25	120	<0.2	<0.5	<1	<2	<1	<3	2	NT	0.2	0.2	0.7	2.6	3.2	1.4	1.9	0.2	4.9	0.2	1	<1	2.3	4.6	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
12	0 - 2.5 m	2/12/2020	7	NT	<0.4	10	8	44	NT	<0.1	4	70	3000	<25	<50	<0.2	<0.5	<1	<2	<1	<3	0.1	NT	<0.1	<0.1	<0.1	0.1	0.2	0.1	0.1	<0.1	0.2	<0.1	<0.1	<1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	NT	NT	NT
Summary Statistics																																												
Min			4		0.4	2	1	1		0.1	1	1	5	25	50	0.2	0.5	1	2	1	3	0.05		0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-
Max			130		5.4	24	190	700		0.7	23	2000	3000	25	719	0.4	0.5	1	2	1	3	5		0.4	0.5	1.5	4.5	9	5.1	4.1	0.5	12	1.2	3.1	1	11	11	0.1	0.3	0.1	0.1	-	-	-
Mean			15		0.9	10	42	121		0.2	6	286	553	25	124	0.2	0.5	1	2	1	3	107		0.1	0.1	0.4	1.3	1.8	0.8	1	0.2	2.5	0.2	0.6	1	1.6	2.3	0.1	0.1	0.1	0.1	-	-	-
Waste Classification Criteria [f]																																											
CT1			100	NC	20	100	NC	100	NC	4	40	NC	NC	650	10000	10	288	600	NC	NC	1000	0.8	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	60	<50	4	<50	NC	NC	NC
SCC1			500	NC	100	1900	NC	1500	NC	50	1050	NC	NC	650	10000	18	518	1080	NC	NC	1800	10	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	108	<50	7.5	<50	NC	NC	NC
TCLP1			NC	5	1	5	NC	NC	5	0.2	2	NC	NC	NC	NC	0.5	14.4	30	NC	NC	50	NC	0.04	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	3	NC	0.2	NC	NC	NC	NC
CT2			400	NC	80	400	NC	400	NC	16	160	NC	NC	2600	40000	40	1152	2400	NC	NC	4000	3.2	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	240	<50	16	<50	NC	NC	NC
SCC2			2000	NC	400	7600	NC	6000	NC	200	4200	NC	NC	2600	40000	72	2073	4320	NC	NC	7200	23	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	432	<50	30	<50	NC	NC	NC
TCLP2			NC	20	4	20	NC	NC	20	0.8	8	NC	NC	NC	NC	2	57.6	120	NC	NC	200	NC	0.16	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	12	NC	0.8	NC	NC	NC	NC

CT1 exceedance | TCLP1 and/or SCC1 exceedance | CT2 exceedance | TCLP2 and/or SCC2 exceedance | Asbestos detection

NT = Not tested NL = Non limiting NC = No criteria NA = Not applicable NAD = No asbestos detected at the reporting limit

Notes:

a QA/QC replicate of sample listed directly below the primary sample

b Total chromium used as initial screen for chromium(VI).

c Total recoverable hydrocarbons (TRH) used as an initial screen for total petroleum hydrocarbons (TPH)

d Criteria for scheduled chemicals used as an initial screen

e Criteria for Chlorpyrifos used as initial screen

f All criteria are in the same units as the reported results

PQL Practical quantitation limit

CT1 NSW EPA, 2014, Waste Classification Guidelines Part 1: Classifying Waste, Maximum values of specific contaminant concentration (SCC) for classification without TCLP: General solid waste

SCC1 NSW EPA, 2014, Waste Classification Guidelines Part 1: Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste

TCLP1 NSW EPA, 2014, Waste Classification Guidelines Part 1: Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste

CT2 NSW EPA, 2014, Waste Classification Guidelines Part 1: Classifying Waste, Maximum values of specific contaminant concentration (SCC) for classification without TCLP: Restricted solid waste

SCC2 NSW EPA, 2014, Waste Classification Guidelines Part 1: Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

TCLP2 NSW EPA, 2014, Waste Classification Guidelines Part 1: Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

Table B4: Summary of Laboratory Results – Water Leach testing PAH and Lead

			Lead	Lead Water Leadch	Naphthalene	Naphthalene Water Leach	Benzo(a)pyrene (BaP)	Benzo(a)pyrene Water Leach
		PQL	1		1		0.05	0.5
Sample ID	Depth	Sample Date	mg/kg	ug/L	mg/kg	ug/L	mg/kg	ug/L
1/0.5	0 m	12/10/2020	**700**	**320**	-	NT	-	NT
5/15	0 m	12/10/2020	-	NT	<1	<0.1	**3.1**	<0.1
Aquatic Ecosystems Fresh Water			NA	3.4	NA	16	NA	0.1
Aquatic Ecosystems Marine Water			NA	4.4	NA	70	NA	0.1
Recreation/Drinking Water			NA	10	NA	NC	NA	0.01
Irrigation			NA	2000	NA	NC	NA	NC

exceedance of 95% level of protection - aquatic ecosystems

Table B5: Results of Acid Sulfate Soil Testing

Sample ID	Sample Depth [a] (m)	Sample level (AHD)	Sample Description	Screening Test Results				Laboratory Results							
				pH			Strength of Reaction [b]	pH_{KCL}	S_{KCL}	Scr %S	s-TAA %S	S_{NAS} %S	s-ANC_{BT} %S	Net Acidity[c] %S	Exisiting and Potential Acidity %S
				pH_F	pH_{FOX}	pH_F - pH_{FOX}									
1	1.1	1.439	Dark Borwn Silty Sand	6.9	6.8	0.0	1								
	1.5	1.039	Pale Brown Silty Sand	7.5	7.3	0.2	1								
	2	0.539	Pale Brown Silty Sand	7.7	7.8	-0.1	1								
	2.5	0.039	Pale Brown Silty Sand	8.0	8.0	0.0	1								
	2.9	-0.361	Pale Brown Silty Sand	8.7	7.9	0.8	1								
2	2.2	1.448	Brown Sand	8.8	8.3	0.5	1								
	2.3	1.348	Pale Brown Sand, Organics in Samples	8.8	7.1	**1.7**	1								
	2.5	1.148	Pale Brown Sand, Organics in Samples	8.3	4.7	**3.6**	1	6.8	<0.005	<0.005	<0.01	NT	0.18	<0.005	<0.005
	2.8	0.848	Pale Brown Sand	8.3	7.6	0.7	1								
	3.2	0.448	Pale Brown Sand	8.6	7.8	0.8	1								
	3.5	0.148	Pale Brown Sand	9.0	7.9	**1.1**	1								
	4	-0.352	Pale Brown Sand	8.8	7.6	**1.2**	1								
	4.5	-0.852	Pale Brown Sand	9.1	8.0	**1.1**	1								
	5	-1.352	Pale Brown Sand	9.2	8.1	**1.2**	1								
3	2.5	1.366	Pale Brown Sand	8.8	7.0	**1.8**	1								
	3.0	0.866	Pale Brown Sand	8.5	7.4	**1.0**	1								
	3.5	0.366	Pale Brown Sand	8.4	7.4	**1.1**	1								
	4	-0.134	Pale Brown Sand	8.6	7.5	**1.2**	1								
4	1.50	2.44	Dark Brown Sand	8.5	4.8	**3.8**	1	7.8	0.015	0.02	<0.01	NT	0.27	<0.005	0.016
	1.7	2.24	Dark Brown Sand	8.6	7.5	**1.1**	1								
	2	1.94	Dark Brown Sand	8.9	6.7	**2.2**	1								
	2.5	1.44	Dark Brown Sand	8.6	8.1	0.5	1								
	3.0	0.94	Dark Brown Sand	8.6	6.7	**1.9**	1								
	3.5	0.44	Dark Brown Sand	8.6	7.7	0.8	1								
	4	-0.06	Dark Brown Sand	8.2	8.2	0.0	1								
5	3	1.263	Dark Brown Sand	9.1	5.9	**3.2**	1	6.6	<0.005	<0.005	<0.01	NT	0.35	<0.005	<0.005
	3.5	0.763	Dark Brown Sand	8.4	6.5	**1.9**	1								
	4	0.263	Dark Brown Sand	8.4	6.4	**2.0**	1								
6	1.5	1.24	Dark Brown Sand	8.4	6.2	**2.2**	1								
	2	0.74	Dark Brown Sand	8.6	6.8	**1.7**	1								
	2.5	0.24	Dark Brown Sand	8.6	6.6	**2.0**	1	6.2	<0.005	<0.005	<0.01	NT	NT	<0.005	<0.005
	3	-0.26	Dark Brown Sand	8.5	7.0	**1.4**	1								
7	3.5	0.778	Dark Brown Sand	8.6	6.7	**1.9**	1								
	4	0.278	Dark Brown Sand	8.5	6.9	**1.6**	1								
8	2	1.411	Dark Brown Sand	8.6	7.3	**1.4**	1								
	2.5	0.911	Dark Brown Sand	8.7	7.0	**1.7**	1								
	3	0.411	Dark Brown Sand	8.9	8.0	0.8	1								
9	2	1.805	Dark Brown Sand	9.0	7.0	**2.0**	1	6.2	<0.005	<0.005	<0.01	NT	NT	<0.005	<0.005
	2.5	1.305	Dark Brown Sand	8.7	7.5	**1.2**	1								
	3	0.805	Dark Brown Sand	8.6	7.6	**1.1**	1								
10	1.5	1.314	Brown grey sandy gravel fill	10.4	10.1	0.2	4-H-F								
	2	0.814	Brown grey sandy gravel fill	10.6	10.4	0.2	4-H-F								
	2.5	0.314	Brown grey sandy gravel fill	10.3	10.2	0.2	4-H-F								
QASSIT Guideline			Coarse sands, poorly buffered	<4[d]	<3.5[e]	≥1[e]	-	Coarse sands, poorly buffered							0.01
			Coarse sands to loamy sands and peats					Coarse sands to loamy sands and peats							0.03
			Medium sandy loams to light clays					Medium sandy loams to light clays							0.06[f]/0.03[g]
			Fine medium to heavy clays & silty clays					Fine medium to heavy clays & silty clays							0.1[f]/0.03[g]
NASSG Guideline			Coarse and Peats: sands to loamy sands	-	-	-	-	Coarse and Peats: sands to loamy sands							≥0.03
			Medium: clayey sand to light clays					Medium: clayey sand to light clays							≥0.03[g]/≥0.06[f]
			Fine: light medium to heavy clays					Fine: light medium to heavy clays							≥0.03[g]/≥0.1[f]

Notes to Table B5:

a Depth below ground surface

b Strength of Reaction

1 denotes no or slight reaction

2 denotes moderate reaction

3 denotes high reaction

4 denotes very vigorous reaction

F denotes bubbling/frothy reaction indicative of organics

H denotes heat generated

c Calculated by the laboratory based on the ABA equation in ASS Laboratory Methods Guidelines (Ref ?)

d For actual acid sulphate soils (ASS)

e Indicative value only for Potential Acid Sulphate Soils (PASS)

f Action Criteria for disturbance of 1-1000 tonnes of material

g Action Criteria for disturbance of more than 1000 tonnes of material

Bold results indicative of ASS

Shaded results indicate an exceedence of QASSIT action criteria

pH_F - Soil pH Test (1:5 soil:distilled water)

pH_{FOX} - Soil Peroxide pH Test (1:4 soil:distilled water following oxidation of soil with 30% hydrogen peroxide (H_2O_2))

*Laboratory methods used to quantify ANC are likely to overestimate environmental effectiveness

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 253850

Client Details

Client	Douglas Partners Newcastle
Attention	Patrick Heads
Address	Box 324 Hunter Region Mail Centre, Newcastle, NSW, 2310

Sample Details

Your Reference	**102159, Newcastle**
Number of Samples	6 SOIL
Date samples received	21/10/2020
Date completed instructions received	21/10/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	28/10/2020
Date of Issue	28/10/2020

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Asbestos Approved By
Analysed by Asbestos Approved Identifier: [redacted]
Authorised by Asbestos Approved Signatory: [redacted]

Results Approved By
[redacted] Team Leader, Inorganics
[redacted] Senior Chemist
[redacted], Metals Supervisor
[redacted] Senior Chemist
[redacted], Asbestos Supervisor
[redacted] Chemist
[redacted] Senior Chemist

Authorised By
[redacted]

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	23/10/2020	23/10/2020	23/10/2020	23/10/2020	23/10/2020
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	0.4	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	112	104	129	124	105

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	22/10/2020
Date analysed	-	23/10/2020
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<3
Surrogate aaa-Trifluorotoluene	%	117

svTRH (C10-C40) in Soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	23/10/2020	23/10/2020	23/10/2020	23/10/2020	23/10/2020
TRH C_{10} - C_{14}	mg/kg	59	70	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	320	300	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	340	170	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	69	92	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	69	92	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	550	400	<100	<100	140
TRH >C_{34} -C_{40}	mg/kg	270	130	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	890	620	<50	<50	140
Surrogate o-Terphenyl	%	100	138	90	96	115

svTRH (C10-C40) in Soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	22/10/2020
Date analysed	-	23/10/2020
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	103

PAHs in Soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Naphthalene	mg/kg	0.2	<0.1	<0.1	<0.1	0.2
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.5
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.5
Phenanthrene	mg/kg	0.7	0.4	<0.1	<0.1	5.0
Anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	1.4
Fluoranthene	mg/kg	1.0	0.4	<0.1	<0.1	7.8
Pyrene	mg/kg	1	0.4	<0.1	<0.1	7.0
Benzo(a)anthracene	mg/kg	0.6	0.3	<0.1	<0.1	3.7
Chrysene	mg/kg	0.6	0.3	<0.1	<0.1	2.9
Benzo(b,j+k)fluoranthene	mg/kg	1	0.4	<0.2	<0.2	4.8
Benzo(a)pyrene	mg/kg	0.5	0.1	<0.05	<0.05	3.1
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	<0.1	<0.1	<0.1	1.4
Dibenzo(a,h)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	0.5
Benzo(g,h,i)perylene	mg/kg	0.2	<0.1	<0.1	<0.1	1.5
Total +ve PAH's	mg/kg	6.4	2.3	<0.05	<0.05	41
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.8	<0.5	<0.5	<0.5	4.7
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.8	<0.5	<0.5	<0.5	4.7
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.8	<0.5	<0.5	<0.5	4.7
Surrogate p-Terphenyl-d14	%	95	94	108	94	104

PAHs in Soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	22/10/2020
Date analysed	-	22/10/2020
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	99

Organochlorine Pesticides in soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	0.2
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	92	91	103	93	104

Organochlorine Pesticides in soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	22/10/2020
Date analysed	-	22/10/2020
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	95

Organophosphorus Pesticides in Soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	92	91	103	93	104

Organophosphorus Pesticides in Soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	22/10/2020
Date analysed	-	22/10/2020
Dichlorvos	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Parathion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Ethion	mg/kg	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1
Surrogate TCMX	%	95

PCBs in Soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	92	91	103	93	104

PCBs in Soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	22/10/2020
Date analysed	-	22/10/2020
Aroclor 1016	mg/kg	<0.1
Aroclor 1221	mg/kg	<0.1
Aroclor 1232	mg/kg	<0.1
Aroclor 1242	mg/kg	<0.1
Aroclor 1248	mg/kg	<0.1
Aroclor 1254	mg/kg	<0.1
Aroclor 1260	mg/kg	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1
Surrogate TCMX	%	95

Acid Extractable metals in soil						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Arsenic	mg/kg	130	23	<4	<4	7
Cadmium	mg/kg	5.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	11	4	6	11	10
Copper	mg/kg	150	120	1	5	15
Lead	mg/kg	700	170	5	8	110
Mercury	mg/kg	0.3	0.5	<0.1	<0.1	0.1
Nickel	mg/kg	23	9	1	4	5
Zinc	mg/kg	1,700	79	19	18	140
Iron	mg/kg	31,000	8,900	5,800	9,500	17,000
Manganese	mg/kg	430	120	50	90	130

Acid Extractable metals in soil		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date prepared	-	22/10/2020
Date analysed	-	22/10/2020
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	4
Copper	mg/kg	<1
Lead	mg/kg	<1
Mercury	mg/kg	<0.1
Nickel	mg/kg	<1
Zinc	mg/kg	2
Iron	mg/kg	1,000
Manganese	mg/kg	5

Moisture						
Our Reference		253850-1	253850-2	253850-3	253850-4	253850-5
Your Reference	UNITS	1/0.5	2/2.0	2/2.8	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020	12/10/2020	12/10/2020	12/10/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	22/10/2020	22/10/2020	22/10/2020	22/10/2020	22/10/2020
Date analysed	-	23/10/2020	23/10/2020	23/10/2020	23/10/2020	23/10/2020
Moisture	%	14	7.3	6.0	8.5	15

Moisture		
Our Reference		253850-6
Your Reference	UNITS	5/4.0
Date Sampled		12/10/2020
Type of sample		SOIL
Date prepared	-	22/10/2020
Date analysed	-	23/10/2020
Moisture	%	14

Asbestos ID - soils			
Our Reference		253850-4	253850-5
Your Reference	UNITS	4/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020
Type of sample		SOIL	SOIL
Date analysed	-	28/10/2020	28/10/2020
Sample mass tested	g	Approx. 65g	Approx. 35g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected

Misc Inorg - Soil			
Our Reference		253850-2	253850-6
Your Reference	UNITS	2/2.0	5/4.0
Date Sampled		12/10/2020	12/10/2020
Type of sample		SOIL	SOIL
Date prepared	-	23/10/2020	23/10/2020
Date analysed	-	23/10/2020	23/10/2020
pH 1:5 soil:water	pH Units	6.8	7.3
Electrical Conductivity 1:5 soil:water	µS/cm	43	23

Coal Tar			
Our Reference		253850-2	253850-4
Your Reference	UNITS	2/2.0	4/0.5
Date Sampled		12/10/2020	12/10/2020
Type of sample		SOIL	SOIL
Date prepared	-	23/10/2020	23/10/2020
Date analysed	-	23/10/2020	23/10/2020
Presence of Coal Tar*	-	Absent	Absent

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.
RTA T542	Determination of Phenol in core samples as per RTA test method T542. This procedure gives and indication of whether a sample of asphalt has been made with coal tar. The coal tar method gives an approximate result with a high degree of uncertainty.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			23/10/2020	1	22/10/2020	22/10/2020		22/10/2020	[NT]
Date analysed	-			23/10/2020	1	23/10/2020	23/10/2020		23/10/2020	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	105	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	105	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	1	0.4	0.3	29	108	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	97	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	103	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	108	[NT]
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	104	[NT]
naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	88	1	112	84	29	103	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	[NT]
Date analysed	-			23/10/2020	[NT]	[NT]	[NT]	[NT]	23/10/2020	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	130	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	110	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	130	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	110	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
Surrogate o-Terphenyl	%		Org-020	90	[NT]	[NT]	[NT]	[NT]	118	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	253850-2
Date extracted	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Date analysed	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	95	90
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	87	99
Fluorene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	96	98
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	101	85
Anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	100	81
Pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	100	80
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	102	82
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	102	88
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	112	[NT]	[NT]	[NT]	[NT]	100	92

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	253850-2
Date extracted	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Date analysed	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	87
HCB	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	89	72
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	93	87
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	97	81
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	99	86
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	91
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	97	77
Endrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	89	88
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	92	79
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	99	76
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	103	[NT]	[NT]	[NT]	[NT]	95	92

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	253850-2
Date extracted	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Date analysed	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	100	124
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	96	88
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	93	101
Malathion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	120
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	99	97
Parathion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	78	94
Bromophos-ethyl	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	113	121
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	103	[NT]	[NT]	[NT]	[NT]	95	92

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	253850-2
Date extracted	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Date analysed	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	22/10/2020
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	80	80
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-021	103	[NT]	[NT]	[NT]	[NT]	95	92

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date prepared	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	[NT]
Date analysed	-			22/10/2020	[NT]	[NT]	[NT]	[NT]	22/10/2020	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	106	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	109	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	115	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Iron	mg/kg	10	Metals-020	<10	[NT]	[NT]	[NT]	[NT]	117	[NT]
Manganese	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	108	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date prepared	-			23/10/2020	[NT]	[NT]	[NT]	[NT]	23/10/2020	[NT]
Date analysed	-			23/10/2020	[NT]	[NT]	[NT]	[NT]	23/10/2020	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

pH/EC
Samples were out of the recommended holding time for this analysis.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures.
We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples 253850-4,5 were sub-sampled from jars provided by the client.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 253850-A

Client Details

Client	Douglas Partners Newcastle
Attention	Patrick Heads
Address	Box 324 Hunter Region Mail Centre, Newcastle, NSW, 2310

Sample Details

Your Reference	**102159, Newcastle**
Number of Samples	6 SOIL
Date samples received	21/10/2020
Date completed instructions received	13/11/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	20/11/2020
Date of Issue	20/11/2020

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By

[redacted] Senior Chemist
[redacted], Senior Chemist
[redacted], Metals Supervisor

Authorised By

[redacted]

Metals in TCLP USEPA1311			
Our Reference		253850-A-1	253850-A-5
Your Reference	UNITS	1/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020
Type of sample		SOIL	SOIL
Date extracted	-	18/11/2020	18/11/2020
Date analysed	-	18/11/2020	18/11/2020
pH of soil for fluid# determ.	pH units	7.6	7.9
pH of soil TCLP (after HCl)	pH units	1.8	1.8
Extraction fluid used	-	1	1
pH of final Leachate	pH units	5.1	5.1
Arsenic in TCLP	mg/L	0.07	[NA]
Lead in TCLP	mg/L	0.2	0.08

PAHs in TCLP (USEPA 1311)		
Our Reference		253850-A-5
Your Reference	UNITS	5/1.5
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	17/11/2020
Date analysed	-	17/11/2020
Naphthalene in TCLP	mg/L	<0.001
Acenaphthylene in TCLP	mg/L	<0.001
Acenaphthene in TCLP	mg/L	<0.001
Fluorene in TCLP	mg/L	<0.001
Phenanthrene in TCLP	mg/L	<0.001
Anthracene in TCLP	mg/L	<0.001
Fluoranthene in TCLP	mg/L	<0.001
Pyrene in TCLP	mg/L	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001
Chrysene in TCLP	mg/L	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001
Total +ve PAH's	mg/L	NIL (+)VE
Surrogate p-Terphenyl-d14	%	78

Metals-ASLP Neutral (ICP-MS)			
Our Reference		253850-A-1	253850-A-5
Your Reference	UNITS	1/0.5	5/1.5
Date Sampled		12/10/2020	12/10/2020
Type of sample		SOIL	SOIL
Date extracted	-	20/11/2020	20/11/2020
Date analysed	-	20/11/2020	20/11/2020
pH of final Leachate	pH units	8.4	8.4
Lead in ASLP	µg/L	320	[NA]

PAHs in Water Leach - Low Level		
Our Reference		253850-A-5
Your Reference	UNITS	5/1.5
Date Sampled		12/10/2020
Type of sample		SOIL
Date extracted	-	17/11/2020
Date analysed	-	17/11/2020
Naphthalene	µg/L	<0.1
Acenaphthylene	µg/L	<0.1
Acenaphthene	µg/L	<0.1
Fluorene	µg/L	<0.1
Phenanthrene	µg/L	<0.1
Anthracene	µg/L	<0.1
Fluoranthene	µg/L	<0.1
Pyrene	µg/L	<0.1
Benzo(a)anthracene	µg/L	<0.1
Chrysene	µg/L	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2
Benzo(a)pyrene	µg/L	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1
Surrogate p-Terphenyl-d14	%	90

Method ID	Methodology Summary
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction (zHE) using AS4439 and USEPA 1311.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004. Please note that the mass used may be scaled down from the default based on sample mass available.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS following leaching using neutralised deionised water by AS 4439.3 - 1997.
Org-022/025	Leachates are extracted with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-022/025 ASLP	ASLP Leachates are extracted with Dichloromethane and analysed by GC-MS/GC-MSMS.

QUALITY CONTROL: Metals in TCLP USEPA1311					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			18/11/2020	[NT]	[NT]	[NT]	[NT]	18/11/2020	[NT]
Date analysed	-			18/11/2020	[NT]	[NT]	[NT]	[NT]	18/11/2020	[NT]
Arsenic in TCLP	mg/L	0.05	Metals-020 ICP-AES	<0.05	[NT]	[NT]	[NT]	[NT]	114	[NT]
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	[NT]	[NT]	[NT]	[NT]	99	[NT]

QUALITY CONTROL: PAHs in TCLP (USEPA 1311)					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			17/11/2020	[NT]	[NT]	[NT]	[NT]	17/11/2020	[NT]
Date analysed	-			17/11/2020	[NT]	[NT]	[NT]	[NT]	17/11/2020	[NT]
Naphthalene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	106	[NT]
Acenaphthylene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	88	[NT]
Fluorene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	96	[NT]
Phenanthrene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	124	[NT]
Anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	114	[NT]
Pyrene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	114	[NT]
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	130	[NT]
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-022/025	<0.002	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	125	[NT]
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	95	[NT]	[NT]	[NT]	[NT]	71	[NT]

QUALITY CONTROL: Metals-ASLP Neutral (ICP-MS)					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			20/11/2020	[NT]	[NT]	[NT]	[NT]	20/11/2020	[NT]
Date analysed	-			20/11/2020	[NT]	[NT]	[NT]	[NT]	20/11/2020	[NT]
Lead in ASLP	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: PAHs in Water Leach - Low Level						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			17/11/2020	[NT]	[NT]	[NT]	[NT]	17/11/2020	[NT]
Date analysed	-			17/11/2020	[NT]	[NT]	[NT]	[NT]	17/11/2020	[NT]
Naphthalene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Fluorene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Phenanthrene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	124	[NT]
Anthracene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Pyrene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	130	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025 ASLP	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	125	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	95	[NT]	[NT]	[NT]	[NT]	71	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

PAH - out of recommended holding time

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 255045

Client Details

Client	Douglas Partners Newcastle
Attention	[redacted]
Address	Box 324 Hunter Region Mail Centre, Newcastle, NSW, 2310

Sample Details

Your Reference	**102159, Newcastle**
Number of Samples	12 SOIL
Date samples received	05/11/2020
Date completed instructions received	05/11/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	12/11/2020
Date of Issue	12/11/2020

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Asbestos Approved By
Analysed by Asbestos Approved Identifier: [redacted]
Authorised by Asbestos Approved Signatory: [redacted]

Results Approved By
[redacted] Team Leader, Inorganics
[redacted], Senior Chemist
[redacted] Metals Supervisor
[redacted], Asbestos Supervisor
[redacted], Senior Chemist

Authorised By
[redacted]

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		255045-1	255045-2	255045-3	255045-4	255045-5
Your Reference	UNITS	3	6	7	8	9
Depth		1.0	0.5	1.5	0.05	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	09/11/2020	09/11/2020	09/11/2020	09/11/2020	09/11/2020
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	89	91	82	80	93

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		255045-6	255045-7	255045-8	255045-9	255045-10
Your Reference	UNITS	10	10	11	11	12
Depth		1.0	2.0	1.0	2.5	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	09/11/2020	09/11/2020	09/11/2020	09/11/2020	09/11/2020
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	84	85	86	88	88

vTRH(C6-C10)/BTEXN in Soil			
Our Reference		255045-11	255045-12
Your Reference	UNITS	12	D1/JRK
Depth		2.5	-
Date Sampled		2/11/2020	2/11/2020
Type of sample		SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020
Date analysed	-	09/11/2020	09/11/2020
TRH C_6 - C_9	mg/kg	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25
Benzene	mg/kg	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
o-Xylene	mg/kg	<1	<1
naphthalene	mg/kg	<1	<1
Total +ve Xylenes	mg/kg	<3	<3
Surrogate aaa-Trifluorotoluene	%	92	81

svTRH (C10-C40) in Soil						
Our Reference		255045-1	255045-2	255045-3	255045-4	255045-5
Your Reference	UNITS	3	6	7	8	9
Depth		1.0	0.5	1.5	0.05	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	110	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	140	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	140	<50
Surrogate o-Terphenyl	%	99	96	96	98	92

svTRH (C10-C40) in Soil						
Our Reference		255045-6	255045-7	255045-8	255045-9	255045-10
Your Reference	UNITS	10	10	11	11	12
Depth		1.0	2.0	1.0	2.5	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	100	<100	120
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	100	<100	140	<100	160
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	100	<50	140	<50	160
Surrogate o-Terphenyl	%	90	100	103	98	106

svTRH (C10-C40) in Soil			
Our Reference		255045-11	255045-12
Your Reference	UNITS	12	D1/JRK
Depth		2.5	-
Date Sampled		2/11/2020	2/11/2020
Type of sample		SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020
TRH C_{10} - C_{14}	mg/kg	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50
Surrogate o-Terphenyl	%	96	97

PAHs in Soil						
Our Reference		255045-1	255045-2	255045-3	255045-4	255045-5
Your Reference	UNITS	3	6	7	8	9
Depth		1.0	0.5	1.5	0.05	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Naphthalene	mg/kg	<0.1	<0.1	<0.1	0.9	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	0.1	0.2	0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	0.4	<0.1
Fluorene	mg/kg	<0.1	<0.1	0.1	1.2	<0.1
Phenanthrene	mg/kg	0.5	0.4	1	11	0.7
Anthracene	mg/kg	0.1	0.2	0.4	1.5	0.2
Fluoranthene	mg/kg	1.4	1	2.2	12	1.1
Pyrene	mg/kg	1.4	0.9	2.0	11	0.9
Benzo(a)anthracene	mg/kg	1.0	0.6	1.5	4.5	0.7
Chrysene	mg/kg	0.7	0.5	1.0	4.1	0.6
Benzo(b,j+k)fluoranthene	mg/kg	1	0.9	2	9.0	0.9
Benzo(a)pyrene	mg/kg	0.69	0.54	1.0	5.0	0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	0.4	0.3	0.4	3.1	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	0.5	<0.1
Benzo(g,h,i)perylene	mg/kg	0.5	0.4	0.5	5.1	0.2
Total +ve PAH's	mg/kg	7.9	5.7	12	68	6.2
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1	0.7	1.4	7.2	0.7
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.0	0.8	1.5	7.2	0.7
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.1	0.8	1.5	7.2	0.8
Surrogate p-Terphenyl-d14	%	104	92	96	97	85

PAHs in Soil						
Our Reference		255045-6	255045-7	255045-8	255045-9	255045-10
Your Reference	UNITS	10	10	11	11	12
Depth		1.0	2.0	1.0	2.5	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Naphthalene	mg/kg	0.2	<0.1	0.1	<0.1	0.2
Acenaphthylene	mg/kg	0.2	<0.1	0.2	<0.1	0.2
Acenaphthene	mg/kg	0.1	<0.1	0.4	<0.1	0.2
Fluorene	mg/kg	0.2	<0.1	0.2	<0.1	0.2
Phenanthrene	mg/kg	2.6	<0.1	4.3	<0.1	2.3
Anthracene	mg/kg	0.6	<0.1	1.2	<0.1	0.7
Fluoranthene	mg/kg	6.2	<0.1	8.6	0.2	4.9
Pyrene	mg/kg	6.0	<0.1	7.7	0.2	4.6
Benzo(a)anthracene	mg/kg	3.6	<0.1	4.0	<0.1	2.6
Chrysene	mg/kg	2.4	<0.1	3.2	<0.1	1.9
Benzo(b,j+k)fluoranthene	mg/kg	4.6	<0.2	5.2	<0.2	3.2
Benzo(a)pyrene	mg/kg	2.7	<0.05	3.4	0.06	2.0
Indeno(1,2,3-c,d)pyrene	mg/kg	1.8	<0.1	1.7	<0.1	1.0
Dibenzo(a,h)anthracene	mg/kg	0.3	<0.1	0.3	<0.1	0.2
Benzo(g,h,i)perylene	mg/kg	2.1	<0.1	2.4	<0.1	1.4
Total +ve PAH's	mg/kg	33	<0.05	43	0.4	25
Benzo(a)pyrene TEQ calc (zero)	mg/kg	4.1	<0.5	4.8	<0.5	2.9
Benzo(a)pyrene TEQ calc(half)	mg/kg	4.1	<0.5	4.8	<0.5	2.9
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	4.1	<0.5	4.8	<0.5	2.9
Surrogate p-Terphenyl-d14	%	107	91	111	99	107

PAHs in Soil				
Our Reference		255045-11	255045-12	255045-14
Your Reference	UNITS	12	D1/JRK	12 - [TRIPLICATE]
Depth		2.5	-	2.5
Date Sampled		2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.2	0.3
Anthracene	mg/kg	<0.1	<0.1	0.1
Fluoranthene	mg/kg	0.2	0.4	0.5
Pyrene	mg/kg	0.2	0.4	0.5
Benzo(a)anthracene	mg/kg	0.1	0.4	0.2
Chrysene	mg/kg	0.1	0.3	0.2
Benzo(b,j+k)fluoranthene	mg/kg	0.2	0.5	0.3
Benzo(a)pyrene	mg/kg	0.1	0.3	0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.2	0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.1	0.2	0.2
Total +ve PAH's	mg/kg	1.1	2.8	2.6
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	0.5	<0.5
Surrogate p-Terphenyl-d14	%	90	95	98

Organochlorine Pesticides in soil						
Our Reference		255045-1	255045-2	255045-3	255045-4	255045-5
Your Reference	UNITS	3	6	7	8	9
Depth		1.0	0.5	1.5	0.05	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	104	93	106	87	95

Organochlorine Pesticides in soil						
Our Reference		255045-6	255045-7	255045-8	255045-9	255045-10
Your Reference	UNITS	10	10	11	11	12
Depth		1.0	2.0	1.0	2.5	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	99	107	93	97	97

Organochlorine Pesticides in soil			
Our Reference		255045-11	255045-12
Your Reference	UNITS	12	D1/JRK
Depth		2.5	-
Date Sampled		2/11/2020	2/11/2020
Type of sample		SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020
alpha-BHC	mg/kg	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	0.3
Endrin	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1
Surrogate TCMX	%	109	95

Organophosphorus Pesticides in Soil						
Our Reference		255045-1	255045-2	255045-3	255045-4	255045-5
Your Reference	UNITS	3	6	7	8	9
Depth		1.0	0.5	1.5	0.05	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	104	93	106	87	95

Organophosphorus Pesticides in Soil						
Our Reference		255045-6	255045-7	255045-8	255045-9	255045-10
Your Reference	UNITS	10	10	11	11	12
Depth		1.0	2.0	1.0	2.5	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	99	107	93	97	97

Organophosphorus Pesticides in Soil			
Our Reference		255045-11	255045-12
Your Reference	UNITS	12	D1/JRK
Depth		2.5	-
Date Sampled		2/11/2020	2/11/2020
Type of sample		SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020
Dichlorvos	mg/kg	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1
Surrogate TCMX	%	109	95

PCBs in Soil						
Our Reference		255045-1	255045-2	255045-3	255045-4	255045-5
Your Reference	UNITS	3	6	7	8	9
Depth		1.0	0.5	1.5	0.05	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	104	93	106	87	95

PCBs in Soil						
Our Reference		255045-6	255045-7	255045-8	255045-9	255045-10
Your Reference	UNITS	10	10	11	11	12
Depth		1.0	2.0	1.0	2.5	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	99	107	93	97	97

PCBs in Soil			
Our Reference		255045-11	255045-12
Your Reference	UNITS	12	D1/JRK
Depth		2.5	-
Date Sampled		2/11/2020	2/11/2020
Type of sample		SOIL	SOIL
Date extracted	-	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1
Surrogate TCMX	%	109	95

Acid Extractable metals in soil						
Our Reference		255045-1	255045-2	255045-3	255045-4	255045-5
Your Reference	UNITS	3	6	7	8	9
Depth		1.0	0.5	1.5	0.05	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Arsenic	mg/kg	22	17	7	4	9
Cadmium	mg/kg	<0.4	0.6	<0.4	<0.4	<0.4
Chromium	mg/kg	15	6	9	8	12
Copper	mg/kg	24	29	18	14	25
Lead	mg/kg	87	150	96	64	95
Mercury	mg/kg	<0.1	0.5	0.1	<0.1	0.2
Nickel	mg/kg	7	5	6	5	8
Zinc	mg/kg	140	210	120	110	97
Manganese	mg/kg	110	65	110	99	230
Iron	mg/kg	8,600	8,100	10,000	4,900	36,000

Acid Extractable metals in soil						
Our Reference		255045-6	255045-7	255045-8	255045-9	255045-10
Your Reference	UNITS	10	10	11	11	12
Depth		1.0	2.0	1.0	2.5	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Arsenic	mg/kg	9	<4	7	<4	9
Cadmium	mg/kg	4.6	<0.4	0.6	<0.4	0.6
Chromium	mg/kg	16	2	24	6	12
Copper	mg/kg	150	<1	190	4	32
Lead	mg/kg	360	<1	190	9	110
Mercury	mg/kg	0.7	<0.1	0.6	<0.1	0.2
Nickel	mg/kg	14	<1	9	<1	9
Zinc	mg/kg	2,000	<1	380	13	260
Manganese	mg/kg	460	1,500	350	1,300	290
Iron	mg/kg	22,000	300	18,000	1,800	9,800

Acid Extractable metals in soil					
Our Reference		255045-11	255045-12	255045-13	255045-14
Your Reference	UNITS	12	D1/JRK	3 - [TRIPLICATE]	12 - [TRIPLICATE]
Depth		2.5	-	1.0	2.5
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL
Date prepared	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Arsenic	mg/kg	7	9	15	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	10	10	11	7
Copper	mg/kg	8	21	22	7
Lead	mg/kg	44	89	61	68
Mercury	mg/kg	<0.1	0.2	<0.1	<0.1
Nickel	mg/kg	4	6	7	3
Zinc	mg/kg	70	140	140	90
Manganese	mg/kg	3,000	130	96	2,500
Iron	mg/kg	8,800	25,000	8,200	6,800

Misc Inorg - Soil				
Our Reference	UNITS	255045-3	255045-6	255045-8
Your Reference		7	10	11
Depth		1.5	1.0	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	09/11/2020	09/11/2020	09/11/2020
Date analysed	-	09/11/2020	09/11/2020	09/11/2020
pH 1:5 soil:water	pH Units	8.9	8.1	8.5
Electrical Conductivity 1:5 soil:water	µS/cm	220	76	110

Coal Tar				
Our Reference		255045-3	255045-6	255045-8
Your Reference	UNITS	7	10	11
Depth		1.5	1.0	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	11/11/2020	11/11/2020	11/11/2020
Date analysed	-	11/11/2020	11/11/2020	11/11/2020
Presence of Coal Tar*	-	Absent	Absent	Absent

Moisture						
Our Reference		255045-1	255045-2	255045-3	255045-4	255045-5
Your Reference	UNITS	3	6	7	8	9
Depth		1.0	0.5	1.5	0.05	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	09/11/2020	09/11/2020	09/11/2020	09/11/2020	09/11/2020
Moisture	%	7.4	8.6	14	11	12

Moisture						
Our Reference		255045-6	255045-7	255045-8	255045-9	255045-10
Your Reference	UNITS	10	10	11	11	12
Depth		1.0	2.0	1.0	2.5	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	06/11/2020	06/11/2020	06/11/2020	06/11/2020	06/11/2020
Date analysed	-	09/11/2020	09/11/2020	09/11/2020	09/11/2020	09/11/2020
Moisture	%	9.8	7.8	12	7.7	12

Moisture			
Our Reference		255045-11	255045-12
Your Reference	UNITS	12	D1/JRK
Depth		2.5	-
Date Sampled		2/11/2020	2/11/2020
Type of sample		SOIL	SOIL
Date prepared	-	06/11/2020	06/11/2020
Date analysed	-	09/11/2020	09/11/2020
Moisture	%	9.4	15

Asbestos ID - soils						
Our Reference		255045-3	255045-5	255045-6	255045-7	255045-8
Your Reference	UNITS	7	9	10	10	11
Depth		1.5	1.0	1.0	2.0	1.0
Date Sampled		2/11/2020	2/11/2020	2/11/2020	2/11/2020	2/11/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date analysed	-	09/11/2020	09/11/2020	09/11/2020	09/11/2020	09/11/2020
Sample mass tested	g	Approx. 40g	Approx. 30g	Approx. 30g	Approx. 30g	Approx. 25g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils		
Our Reference		255045-9
Your Reference	UNITS	11
Depth		2.5
Date Sampled		2/11/2020
Type of sample		SOIL
Date analysed	-	09/11/2020
Sample mass tested	g	Approx. 30g
Sample Description	-	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.
RTA T542	Determination of Phenol in core samples as per RTA test method T542. This procedure gives and indication of whether a sample of asphalt has been made with coal tar. The coal tar method gives an approximate result with a high degree of uncertainty.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	255045-2
Date extracted	-			06/11/2020	1	06/11/2020	06/11/2020		06/11/2020	06/11/2020
Date analysed	-			09/11/2020	1	09/11/2020	09/11/2020		09/11/2020	09/11/2020
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	85	87
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	85	87
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	80	78
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	84	84
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	84	88
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	88	92
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	80	84
naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	87	1	89	93	4	89	84

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	06/11/2020	06/11/2020		[NT]	[NT]
Date analysed	-			[NT]	11	09/11/2020	09/11/2020		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	11	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	11	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	11	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	11	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	11	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
naphthalene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	11	92	90	2	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	255045-2
Date extracted	-			06/11/2020	1	06/11/2020	06/11/2020		06/11/2020	06/11/2020
Date analysed	-			06/11/2020	1	06/11/2020	06/11/2020		06/11/2020	06/11/2020
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	124	121
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	<100	<100	0	85	89
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	<100	<100	0	71	140
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	<50	<50	0	124	121
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	<100	<100	0	85	89
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	<100	<100	0	71	140
Surrogate o-Terphenyl	%		Org-020	96	1	99	97	2	98	96

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	06/11/2020	06/11/2020		[NT]	[NT]
Date analysed	-			[NT]	11	06/11/2020	06/11/2020		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	11	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	11	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	11	96	96	0	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	255045-2
Date extracted	-			06/11/2020	1	06/11/2020	06/11/2020		06/11/2020	06/11/2020
Date analysed	-			06/11/2020	1	06/11/2020	06/11/2020		06/11/2020	06/11/2020
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	97	98
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	101.00	99.00
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	102	119
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	0.5	0.4	22	107	118
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	0.1	0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	1.4	1.5	7	102	86
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	1.4	1.8	25	102	91
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	1.0	1.0	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	0.7	0.7	0	116	117
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	1	1	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	0.69	0.94	31	105	95
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	0.4	0.4	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	0.5	0.6	18	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	95	1	104	108	4	99	86

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	06/11/2020	06/11/2020		[NT]	[NT]
Date analysed	-			[NT]	11	06/11/2020	06/11/2020		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	0.5	133	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	0.7	150	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	5.3	193	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	1.8	179	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	11	0.2	10	192	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	11	0.2	8.7	191	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	11	0.1	3.7	189	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	11	0.1	2.8	186	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	11	0.2	4.6	183	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	11	0.1	3.0	187	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	1.7	178	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	0.3	100	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	11	0.1	2.1	182	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	11	90	103	13	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	255045-2
Date extracted	-			06/11/2020	1	06/11/2020	06/11/2020		06/11/2020	06/11/2020
Date analysed	-			06/11/2020	1	06/11/2020	06/11/2020		06/11/2020	06/11/2020
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	80	106
HCB	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	92	113
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	77	85
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	95	95
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	103	90
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	99	89
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	111	105
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	66
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	79
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	84	82
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	103	1	104	85	20	96	95

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	06/11/2020	06/11/2020		[NT]	[NT]
Date analysed	-			[NT]	11	06/11/2020	06/11/2020		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	11	109	119	9	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	12	06/11/2020	06/11/2020		[NT]	[NT]
Date analysed	-			[NT]	12	06/11/2020	06/11/2020		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	12	0.3	0.4	29	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	12	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	12	95	105	10	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	255045-2
Date extracted	-			06/11/2020	1	06/11/2020	06/11/2020		06/11/2020	06/11/2020
Date analysed	-			06/11/2020	1	06/11/2020	06/11/2020		06/11/2020	06/11/2020
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	73	72
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	82	95
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	75	91
Malathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	71	90
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	80	95
Parathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	80	90
Bromophos-ethyl	mg/kg	0.1	Org-022	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	103	115
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	103	1	104	85	20	96	95

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	06/11/2020	06/11/2020		[NT]	[NT]
Date analysed	-			[NT]	11	06/11/2020	06/11/2020		[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	11	109	119	9	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	255045-2
Date extracted	-			06/11/2020	1	06/11/2020	06/11/2020		06/11/2020	06/11/2020
Date analysed	-			06/11/2020	1	06/11/2020	06/11/2020		06/11/2020	06/11/2020
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	100	100
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	103	1	104	85	20	96	95

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	06/11/2020	06/11/2020		[NT]	[NT]
Date analysed	-			[NT]	11	06/11/2020	06/11/2020		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	11	109	119	9	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	255045-2
Date prepared	-			06/11/2020	1	06/11/2020	06/11/2020		06/11/2020	06/11/2020
Date analysed	-			06/11/2020	1	06/11/2020	06/11/2020		06/11/2020	06/11/2020
Arsenic	mg/kg	4	Metals-020	<4	1	22	19	15	107	115
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	111	110
Chromium	mg/kg	1	Metals-020	<1	1	15	12	22	105	110
Copper	mg/kg	1	Metals-020	<1	1	24	24	0	102	#
Lead	mg/kg	1	Metals-020	<1	1	87	65	29	108	#
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	106	#
Nickel	mg/kg	1	Metals-020	<1	1	7	11	44	107	105
Zinc	mg/kg	1	Metals-020	<1	1	140	150	7	110	91
Manganese	mg/kg	1	Metals-020	<1	1	110	180	48	109	#
Iron	mg/kg	10	Metals-020	<10	1	8600	11000	24	127	##

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	06/11/2020	06/11/2020		[NT]	[NT]
Date analysed	-			[NT]	11	06/11/2020	06/11/2020		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	11	7	5	33	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	11	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	11	10	8	22	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	11	8	8	0	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	11	44	110	86	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	11	4	4	0	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	11	70	110	44	[NT]	[NT]
Manganese	mg/kg	1	Metals-020	[NT]	11	3000	1900	45	[NT]	[NT]
Iron	mg/kg	10	Metals-020	[NT]	11	8800	6600	29	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			09/11/2020	8	09/11/2020	09/11/2020		09/11/2020	[NT]
Date analysed	-			09/11/2020	8	09/11/2020	09/11/2020		09/11/2020	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	8	8.5	8.3	2	99	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	8	110	100	10	102	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Acid Extractable Metals in Soil:
-The laboratory RPD acceptance criteria has been exceeded for 255045-1 for Mn. Therefore a triplicate result has been issued as laboratory sample number 255045-13.
-The laboratory RPD acceptance criteria has been exceeded for 255045-11 for Pb, Zn and Mn. Therefore a triplicate result has been issued as laboratory sample number 255045-14.
-# Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.
-## Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Asbestos: Excessive sample volume was provided for asbestos analysis. A portion of the supplied sample was sub-sampled according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g (50mL) of sample in its own container as per AS4964-2004.
Note: Samples were sub-sampled from jars provided by the client.

PAHs in Soil - The laboratory RPD acceptance criteria has been exceeded for 255045-11. Therefore a triplicate result has been issued as laboratory sample number 255045-14.
The RPD for duplicate results is accepted due to the non homogenous nature of sample 255045-11.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 255045-A

Client Details

Client	Douglas Partners Newcastle
Attention	[redacted]
Address	Box 324 Hunter Region Mail Centre, Newcastle, NSW, 2310

Sample Details

Your Reference	**102159, Newcastle**
Number of Samples	12 SOIL
Date samples received	05/11/2020
Date completed instructions received	13/11/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	20/11/2020
Date of Issue	20/11/2020

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By

[redacted] Senior Chemist

[redacted], Metals Supervisor

Authorised By

[redacted]

Metals in TCLP USEPA1311			
Our Reference		255045-A-4	255045-A-8
Your Reference	UNITS	8	11
Depth		0.05	1.0
Date Sampled		2/11/2020	2/11/2020
Type of sample		SOIL	SOIL
Date extracted	-	18/11/2020	18/11/2020
Date analysed	-	18/11/2020	18/11/2020
pH of soil for fluid# determ.	pH units	7.6	8.9
pH of soil TCLP (after HCl)	pH units	1.7	1.8
Extraction fluid used	-	1	1
pH of final Leachate	pH units	5.0	5.2
Lead in TCLP	mg/L	[NA]	0.1

PAHs in TCLP (USEPA 1311)			
Our Reference		255045-A-4	255045-A-8
Your Reference	UNITS	8	11
Depth		0.05	1.0
Date Sampled		2/11/2020	2/11/2020
Type of sample		SOIL	SOIL
Date extracted	-	17/11/2020	17/11/2020
Date analysed	-	17/11/2020	17/11/2020
Naphthalene in TCLP	mg/L	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001
Phenanthrene in TCLP	mg/L	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001
Total +ve PAH's	mg/L	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	76	74

PAHs in Water Leach - Low Level			
Our Reference		255045-A-4	255045-A-8
Your Reference	UNITS	8	11
Depth		0.05	1.0
Date Sampled		2/11/2020	2/11/2020
Type of sample		SOIL	SOIL
pH of final Leachate	pH units	6.5	9.1
Date extracted	-	17/11/2020	17/11/2020
Date analysed	-	17/11/2020	17/11/2020
Naphthalene	µg/L	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	70	70

Method ID	Methodology Summary
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction (zHE) using AS4439 and USEPA 1311.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004. Please note that the mass used may be scaled down from the default based on sample mass available.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Org-022/025	Leachates are extracted with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-022/025 ASLP	ASLP Leachates are extracted with Dichloromethane and analysed by GC-MS/GC-MSMS.

QUALITY CONTROL: Metals in TCLP USEPA1311					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			18/11/2020	[NT]	[NT]	[NT]	[NT]	18/11/2020	[NT]
Date analysed	-			18/11/2020	[NT]	[NT]	[NT]	[NT]	18/11/2020	[NT]
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	[NT]	[NT]	[NT]	[NT]	99	[NT]

QUALITY CONTROL: PAHs in TCLP (USEPA 1311)					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			17/11/2020	[NT]	[NT]	[NT]	[NT]	17/11/2020	[NT]
Date analysed	-			17/11/2020	[NT]	[NT]	[NT]	[NT]	17/11/2020	[NT]
Naphthalene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	106	[NT]
Acenaphthylene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	88	[NT]
Fluorene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	96	[NT]
Phenanthrene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	124	[NT]
Anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	114	[NT]
Pyrene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	114	[NT]
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	130	[NT]
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-022/025	<0.002	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	125	[NT]
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	95	[NT]	[NT]	[NT]	[NT]	71	[NT]

QUALITY CONTROL: PAHs in Water Leach - Low Level						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			17/11/2020	[NT]	[NT]	[NT]	[NT]	17/11/2020	[NT]
Date analysed	-			17/11/2020	[NT]	[NT]	[NT]	[NT]	17/11/2020	[NT]
Naphthalene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Fluorene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Phenanthrene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	124	[NT]
Anthracene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Pyrene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	130	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025 ASLP	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	125	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025 ASLP	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	95	[NT]	[NT]	[NT]	[NT]	71	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 256265

Client Details

Client	Douglas Partners Newcastle
Attention	Patrick Heads
Address	Box 324 Hunter Region Mail Centre, Newcastle, NSW, 2310

Sample Details

Your Reference	**102159, Newcastle**
Number of Samples	5 soil
Date samples received	20/11/2020
Date completed instructions received	20/11/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	27/11/2020
Date of Issue	27/11/2020

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
[redacted], Senior Chemist

[redacted]

Chromium Suite						
Our Reference		256265-1	256265-2	256265-3	256265-4	256265-5
Your Reference	UNITS	Bore 2	Bore 4	Bore 5	Bore 6	Bore 9
Depth		2.5	1.5	3.0	2.5	2.0
Date Sampled		12/10/2020	12/10/2020	12/10/2020	2/11/2020	2/11/2020
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020
Date analysed	-	23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020
pH $_{kcl}$	pH units	6.8	7.8	6.6	6.2	6.2
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
TAA pH 6.5	moles H^+ /t	<5	<5	<5	<5	<5
Chromium Reducible Sulfur	%w/w	<0.005	0.02	<0.005	<0.005	<0.005
a-Chromium Reducible Sulfur	moles H^+ /t	<3	10	<3	<3	<3
S_{HCl}	%w/w S	NT	NT	NT	NT	NT
S_{KCl}	%w/w S	<0.005	0.015	<0.005	<0.005	<0.005
S_{NAS}	%w/w S	NT	NT	NT	NT	NT
ANC_{BT}	% $CaCO_3$	0.55	0.85	0.35	NT	NT
s-ANC_{BT}	%w/w S	0.18	0.27	0.11	NT	NT
s-Net Acidity	%w/w S	<0.005	<0.005	<0.005	<0.005	<0.005
a-Net Acidity	moles H^+ /t	<5	<5	<5	<5	<5
Liming rate	kg $CaCO_3$ /t	<0.75	<0.75	<0.75	<0.75	<0.75
a-Net Acidity without ANCE	moles H^+ /t	<5	10	<5	<5	<5
Liming rate without ANCE	kg $CaCO_3$ /t	<0.75	0.75	<0.75	<0.75	<0.75
s-Net Acidity without ANCE	%w/w S	<0.005	0.016	<0.005	<0.005	<0.005

Method ID	Methodology Summary
Inorg-068	Chromium Reducible Sulfur - Hydrogen Sulfide is quantified by iodometric titration after distillation to determine potential acidity. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004.

QUALITY CONTROL: Chromium Suite						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			23/11/2020	1	23/11/2020	23/11/2020		23/11/2020	[NT]
Date analysed	-			23/11/2020	1	23/11/2020	23/11/2020		23/11/2020	[NT]
pH $_{kcl}$	pH units		Inorg-068	[NT]	1	6.8	6.8	0	94	[NT]
s-TAA pH 6.5	%w/w S	0.01	Inorg-068	<0.01	1	<0.01	<0.01	0	[NT]	[NT]
TAA pH 6.5	moles H^+ /t	5	Inorg-068	<5	1	<5	<5	0	95	[NT]
Chromium Reducible Sulfur	%w/w	0.005	Inorg-068	<0.005	1	<0.005	<0.005	0	[NT]	[NT]
a-Chromium Reducible Sulfur	moles H^+ /t	3	Inorg-068	<3	1	<3	<3	0	116	[NT]
S_{HCl}	%w/w S	0.005	Inorg-068	<0.005	1	NT	NT		[NT]	[NT]
S_{KCl}	%w/w S	0.005	Inorg-068	<0.005	1	<0.005	<0.005	0	[NT]	[NT]
S_{NAS}	%w/w S	0.005	Inorg-068	<0.005	1	NT	NT		[NT]	[NT]
ANC_{BT}	% $CaCO_3$	0.05	Inorg-068	<0.05	1	0.55	0.55	0	[NT]	[NT]
s-ANC_{BT}	%w/w S	0.05	Inorg-068	<0.05	1	0.18	0.18	0	[NT]	[NT]
s-Net Acidity	%w/w S	0.005	Inorg-068	<0.005	1	<0.005	<0.005	0	[NT]	[NT]
a-Net Acidity	moles H^+ /t	5	Inorg-068	<5	1	<5	<5	0	[NT]	[NT]
Liming rate	kg $CaCO_3$ /t	0.75	Inorg-068	<0.75	1	<0.75	<0.75	0	[NT]	[NT]
a-Net Acidity without ANCE	moles H^+ /t	5	Inorg-068	<5	1	<5	<5	0	[NT]	[NT]
Liming rate without ANCE	kg $CaCO_3$ /t	0.75	Inorg-068	<0.75	1	<0.75	<0.75	0	[NT]	[NT]
s-Net Acidity without ANCE	%w/w S	0.005	Inorg-068	<0.005	1	<0.005	<0.005	0	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Appendix C

Data Quality Report
Site Assessment Criteria
Field Work Methodology
Chain of Custody (Field and Despatch)
Sample Receipt

Appendix C
Data Quality Objectives, Newcastle Harbour Foreshore Park
Wharf Road, Newcastle East

C1.0 Data Quality Objectives

The assessment has been devised broadly in accordance with the seven-step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).

Step	Summary
1: State the problem	The objective of the investigation is to confirm the contamination status of mounded soils within the site with respect to the proposed land use. The report is being undertaken as the land may be redeveloped. A preliminary conceptual site model (CSM) has been prepared (Section 7) for the proposed development. The project team consisted of experienced environmental engineers working in the roles of Project Principal, Project Reviewer, Project Manager and Field staff. For the purposes of the assessment, the client (City of Newcastle) nominated the investigation locations.
2: Identify the decisions / goal of the study	The site history has identified possible contaminating previous uses which are identified in the CSM (Section 7). The CSM identifies the associated contaminants of potential concern (COPC) and the likely impacted media. The site assessment criteria (SAC) for each of the COPC are detailed in Appendix C. The decision is to establish whether or not the results fall below the SAC. On this basis, an assessment of the site's suitability from a contamination perspective and whether (or not) further assessment and / or remediation will be derived.
3: Identify the information inputs	Inputs to the investigation will be the results of analysis of samples to measure the concentration of COPC identified in the CSM (Section 7) at the site using NATA accredited laboratories and methods, where possible. The SAC for each of the COPC are detailed in Appendix C. A photoionization detector (PID) will be used on-site to screen soils for VOC. PID readings will be used to inform sample selection for laboratory analysis.
4: Define the study boundaries	The lateral boundaries of the investigation area are shown on Drawing 1, Appendix D. The vertical boundaries are to the extent of contamination impact as determined from the site history assessment and site observations. The assessment is limited to the timeframe over which the field investigation was undertaken. Constraints to the assessment are identified and discussed in the conclusions of the report.

Step	Summary
5: Develop the analytical approach (or decision rule)	The decision rule is to compare all analytical results with SAC (Appendix C based on NEPC (2013)). Where guideline values are absent, other sources of guideline values accepted by NEPC (2013) shall be adopted where possible. Where a sample result exceeds the adopted criterion, a further site-specific assessment will be made as to the risk posed by the presence of that contaminant(s). Initial comparisons will be with individual results then, where required, summary statistics (including mean, standard deviation and 95% upper confidence limit (UCL) of the arithmetic mean (95% UCL) to assess potential risks posed by the site contamination. Quality control results are to be assessed according to their relative percent difference (RPD) values. For field duplicates, triplicates and laboratory results, RPDs should generally be below 30%; for field blanks. The field and laboratory quality assurance assessment is included in Appendix C.
6: Specify the performance or acceptance criteria	Baseline condition: Contaminants at the site exceed human health and environmental SAC and poses a potentially unacceptable risk to receptors (null hypothesis). Alternative condition: Contaminants at the site complies with human health and environmental SAC and as such, does not pose a potentially unacceptable risk to receptors (alternative hypothesis). Unless conclusive information from the collected data is sufficient to reject the null hypothesis, it is assumed that the baseline condition is true.
7: Optimise the design for obtaining data	As the purpose of the sampling program is to assess for potential contamination across the site, the sampling program is reliant on professional judgement to identify and sample the potentially affected areas. Further details regarding the proposed sampling plan are presented in Section 8.

C2.0 References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

Douglas Partners Pty Ltd

Appendix C
Site Assessment Criteria, Foreshore Park Master Plan
Wharf Road, Newcastle East

C1.0 Introduction

C1.1 Guidelines

The following key guidelines were consulted for deriving the site assessment criteria (SAC):

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013);
- CRC CARE *Health screening levels for petroleum hydrocarbons in soil and groundwater* (CRC CARE, 2011);
- ANZG *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018);
- ANZECC *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000).

C1.2 General

The SAC applied in the current investigation are informed by the CSM which identified human and environmental receptors to potential contamination on the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The following inputs are relevant to the selection and/or derivation of the SAC:

- Land use: recreational.
    - Corresponding to land use category 'C', defined as public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. It does not include undeveloped public open space (such as urban bushland and reserves) which should be subject to a site-specific assessment where appropriate.
- Soil type: sand.

C2.0 Soils

C2.1 Health Investigation and Screening Levels

The generic health investigation levels (HIL) and health screening levels (HSL) are considered to be appropriate for the assessment of human health risk via all relevant pathways of exposure associated with contamination at the site. The adopted soil HIL and HSL for the contaminants of concern are in Table 1 and **Error! Reference source not found.**.

Table 1: Health Investigation Levels (mg/kg)

Contaminant	HIL-C
Metals	
Arsenic	300
Cadmium	90
Chromium (VI)	300
Copper	17 000
Lead	600
Manganese	19 000
Mercury (inorganic)	80
Nickel	1200
Zinc	30 000
PAH	
B(a)P TEQ	3
Total PAH	300
OCP	
DDT+DDE+DDD	400
Aldrin and dieldrin	10
Chlordane	70
Endosulfan	340
Endrin	20
Heptachlor	10
HCB	10
Methoxychlor	400
OPP	
Chlorpyrifos	250
PCB	
PCB	1

Table 2: Health Screening Levels (mg/kg)

Contaminant	HSL-C	HSL-C	HSL-C	HSL-C
SAND	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	NL	NL	NL	NL
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	NL	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	NL	NL	NL	NL
TRH F2	NL	NL	NL	NL

Notes to Table 2:

TRH F1 is TRH F1 minus BTEX

TRH F2 is TRH F2 minus naphthalene

The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'

HSL for commercial landuse may be required should structures be present

The HSL for direct contact derived from CRC CARE (2011) are in Table 3.

Table 3: Health Screening Levels for Direct Contact (mg/kg)

Contaminant	DC HSL-C	DC HSL-IMW
Benzene	120	1100
Toluene	18 000	120 000
Ethylbenzene	5300	85 000
Xylenes	15 000	130 000
Naphthalene	1900	29 000
TRH F1	5100	82 000
TRH F2	3800	62 000
TRH F3	5300	85 000
TRH F4	7400	12 000

Notes to Table 3:

TRH F1 is TRH F1 minus BTEX

TRH F2 is TRH F2 minus naphthalene

IMW intrusive maintenance worker

C2.2 Asbestos in Soil

Based on the CSM and/or current site access limitations, a detailed asbestos assessment was not considered to be warranted at this stage. However, due to the history of widespread use of ACM products across Australia, ACM can be encountered unexpectedly and sporadically at a site. Therefore, the presence or absence of asbestos at a limit of reporting of 0.1 g/kg (AS:4964) has been adopted for this investigation / assessment as an initial screen.

The HSL for asbestos in soil are based on likely exposure levels for different scenarios published in NEPC (2013) for the following forms of asbestos:

- Bonded asbestos containing material (ACM); and
- Fibrous asbestos and asbestos fines (FA and AF).

The HSL are in Table .

Table 4: Health Screening Levels for Asbestos

Form of Asbestos	HSL-C
ACM	0.02%
FA and AF	0.001%
FA and AF and ACM	No visible asbestos for surface soil *

Notes to Table 4:
Surface soils defined as top 10 cm.
* Based on site observations at the sampling points and the analytical results of surface samples.

C2.3 Ecological Investigation Levels

Ecological investigation levels (EIL) and added contaminant limits (ACL), where appropriate, have been derived in NEPC (2013) for arsenic, copper, chromium (III), nickel, lead, zinc, DDT and naphthalene. The adopted EIL, derived using the interactive (excel) calculation spreadsheet on the NEPM toolbox website are shown in Table , with inputs into their derivation shown in Table .

Table 5: Inputs to the Derivation of the Ecological Investigation Levels

Variable	Input	Rationale
Age of contaminants	“Aged” (>2 years)	Remnant fill/soil from historical industrial site use
pH	7.9	Laboratory testing
CEC	5 $cmol_c/kg$	Generally coarse soils with minimal CEC
Clay content	1%	Sand fill and soil profile
Traffic volumes	high	Established urban recreational area, former industrial area
State / Territory	NSW	-

Table 6: Ecological Investigation Levels (mg/kg)

Contaminant	EIL-A-B-C
Metals	
Arsenic	100
Copper	160
Nickel	60
Chromium III	320
Lead	1100
Zinc	480
PAH	
Naphthalene	170
OCP	
DDT	180

C2.4 Ecological Screening Levels

Ecological screening levels (ESL) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. The adopted ESL are shown in Table .

Table 7: Ecological Screening Levels (mg/kg)

Contaminant	Soil Type	EIL-A-B-C
Benzene	Coarse	50
Toluene	Coarse	85
Ethylbenzene	Coarse	70
Xylenes	Coarse	105
TRH F1	Coarse/ Fine	180*
TRH F2	Coarse/ Fine	120*
TRH F3	Coarse	300
TRH F4	Coarse	2800
B(a)P	Coarse	0.7
TRH F1	Coarse/ Fine	180*
TRH F2	Coarse/ Fine	120*

Notes to Table 7:

ESL are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability

TRH F1 is TRH F1 minus BTEX

TRH F2 is TRH F2 including naphthalene

C2.5 Management Limits

In addition to appropriate consideration and application of the HSL and ESL, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards;
- Effects on buried infrastructure eg: penetration of, or damage to, in-ground services.

The adopted management limits are in Table .

Table 8: Management Limits (mg/kg)

Contaminant	Soil Type	ML-A-B-C
TRH F1	Coarse	700
TRH F2	Coarse	1000
TRH F3	Coarse	2500
TRH F4	Coarse	10 000

Notes to Table 8:
TRH F1 is TRH F1 including BTEX
TRH F2 is TRH F2 including naphthalene

C2.6 Water Leachability

Water leachability criteria has been adapted from groundwater investigation levels (GIL) for aquatic ecosystems derived from ANZG (2018). The adopted criteria for this assessment have been selected based on the potential risks posed from contamination sourced from the site to receptors at or down-gradient of the site, as identified by the conceptual site model (CSM). The receptors, exposure points and pathways are summarised in Table .

Table 9: Summary of Potential Receptors and Potential Risks

Receptor	Location	Exposure Point	Exposure Pathway
Surface water aquatic ecosystem	Down-gradient from site.	Receiving surface water body at the groundwater discharge point.	Exposure to contaminants.
Human recreation (eg: swimming, sailing, fishing)	Down-gradient from site.	Receiving surface water body at the groundwater discharge point.	Ingestion / dermal absorption of contaminants during recreational activities.

The rationale for the selection of GIL is in Table 2.

Table 2: Groundwater Investigation Level Rationale

Receptor / Beneficial Use	GIL	Source	Comments / Rationale
Aquatic ecosystem	DGV	ANZG (2018)	Freshwater 95% LOP for slightly to moderately disturbed systems Marine water 95% LOP for slightly to moderately disturbed systems
Recreational waters	GV	NHMRC (2008)	Based on the NHMRC (2018) values x10 to account for ingestion of water whilst undertaking recreational activities.
Irrigation	LTV / STV	ANZECC (2000)	Generally applicable to particular crops and should be interpreted with caution in this regard.

Notes to Table 10:
DGV default guideline value
% LOP percentage level of protection of species
GV guideline value

The criteria for water leachability testing, based on the protection of aquatic ecosystems, irrigation and recreation are presented in Table 3.

Table 3: Water Leachability Criteria (µg/L)

Contaminant	Protection of Aquatic Ecosystems		Recreation / Drinking Water	Irrigation
	Fresh Water	Marine Water		
Metals				
Lead	3.4	4.4	10	2000
PAH				
B(a)P	0.1	0.1	0.01	-
Naphthalene	16	70	-	-

Notes to Table 11:
Where the contaminant does not have a % LOP, the 'unknown' LOP has been adopted

C3.0 References

ANZECC. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australia and New Zealand Environment and Conservation Council.

ANZG. (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Canberra, ACT: Australian and New Zealand Governments and Australian state and territory governments.

CRC CARE. (2011). *Health screening levels for petroleum hydrocarbons in soil and groundwater.* Parts 1 to 3, Technical Report No. 10: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

HEPA. (2020). *PFAS National Environmental Management Plan (NEMP).* Version 2.0: Heads of EPAs Australia and New Zealand and Australian Government Department of the Environment.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

NHMRC. (2008). *Guidelines for Managing Risks In Recreational Water.*

NHMRC, NRMMC. (2016). *Australian Drinking Water Guidelines 6 2011, Version 3.2.* Canberra: National Health and Medical Research Council, National Resource Management Ministerial Council.

Douglas Partners Pty Ltd

Appendix C
Field Work Methods, Newcastle Harbour Foreshore Masterplan
Wharf Road, Newcastle East

C1.0 Guidelines

The following key guideline was consulted for the field work methodology:

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).

C2.0 Soil Sampling

Soil sampling is carried out in accordance with DP standard operating procedures. The general sampling and sample management procedures comprise:

- Collect soil samples directly from single use sample tube, SPT sample tube or solid flight auger;
- Transfer samples in laboratory-prepared glass jars with Teflon lined lids by hand, capping immediately and minimising headspace within the sample jar;
- Collect replicate samples in zip-lock bags for PID screening;
- Collect ~40 g to 50 g samples in zip-lock bags for asbestos (presence / absence) analysis;
- Wear a new disposable nitrile glove for each sample point thereby minimising potential for cross-contamination;
- Collect 10% replicate samples for QC purposes;
- Label sample containers with individual and unique identification details, including project number, sample location and sample depth (where applicable);
- Place samples into a cooled, insulated and sealed container for transport to the laboratory; and
- Use chain of custody documentation.

C2.1 Field Testing

Field testing is carried out in accordance with DP standard operating procedures. The general sampling and sample management procedures comprise:

PID Field Test

- Calibrate the PID with isobutylene gas at 100 ppm and with fresh air prior to commencement of each successive day's field work;
- Allow the headspace in the PID zip-lock bag samples to equilibrate; and
- Screen using the PID.

C3.0 References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

Douglas Partners Pty Ltd

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY FIELD SHEET

Project No:	102159.00	**Client Project Name:**	Preliminary Geotechnical Investigation and Waste Classification
Client:	City of Newcastle	**Location:**	Wharf Road, Newcastle East
Project Manager:	[redacted]	**DP Lab Received** By:	[redacted] Date: 12/10/20

Do samples contain 'potential' HBM? Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									DP Lab	For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Storage Locn *	Lab 1 [A] Date	Lab 2 [B] Date	Lab 3 [C] Date	
1/0.05	0.05		S	G.P	✓	JRK	12/10/20	8:00	College	20/10/20			
1/0.3	0.3		↓	↓	✓	↓	↓	↓		✓			
1/0.5	0.5				✓								
1/1.0	1.0				✓								
1/1.1	1.1				✓								
1/1.5	1.5				✓								
1/2.0	2.0				✓								
1/2.5	2.5				✓								
1/2.9	2.9			↓	✓								
1/1.2-1.65	1.2-1.65			P	✓								
1/2.5-2.95	2.5-2.95			↓	✓								
2/0.05	0.05			G.P	✓								
2/0.5	0.5			↓	✓								
2/1.0	1.0				✓								
2/1.5	1.5				✓					✓			
2/2.0	2.0				✓								
2/2.2	2.2		↓	↓	✓	↓	↓	↓					

* **Default storage:** **glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge**

A Provide name of Lab 1 Envirolab

B Provide name of Lab 2

C Provide name of Lab 3

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY FIELD SHEET

Project No:	102159.00	**Client Project Name:**	Preliminary Geotechnical Investigation and Waste Classification
Client:	City of Newcastle	**Location:**	Wharf Road, Newcastle East
Project Manager:	[redacted]	**DP Lab Received**	By: [redacted] Date: 12/10/20

Do samples contain 'potential' HBM? Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									DP Lab	For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Storage Locn *	Lab 1 [A] Date	Lab 2 [B] Date	Lab 3 [C] Date	
2/2.3	2.3		S	G,P	✓				fridge				
2/2.5	2.5		↓	↓	✓					✓			
2/2.8	2.8				✓								
2/2.9	2.9				✓								
2/3.2	3.2				✓								
2/3.5	3.5				✓								
2/4.0	4.0				✓								
2/4.5	4.5				✓								
2/5.0	5.0			↓	✓								
2/1.0-1.45	1.0-1.45			P	✓								
2/2.5-2.76	2.5-2.76			↓	✓								
2/4.0-4.45	4.0-4.45				✓								
4/0.05	0.05			G,P	✓					✓			
4/0.5	0.5			↓	✓								
4/1.0	1.0				✓								
4/1.2	1.2				✓								
4/1.5	1.5		↓	↓	✓								

* **Default storage: glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge**

A Provide name of Lab 1 Envirolab

B Provide name of Lab 2

C Provide name of Lab 3

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY FIELD SHEET

Project No:	102159.00	**Client Project Name:**	Preliminary Geotechnical Investigation and Waste Classification
Client:	City of Newcastle	**Location:**	Wharf Road, Newcastle East
Project Manager:	[redacted]	**DP Lab Received** By:	[redacted] Date: 12/10/20

Do samples contain 'potential' HBM? Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									DP Lab	For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Storage Locn *	Lab 1 [A] Date	Lab 2 [B] Date	Lab 3 [C] Date	
4/1.7	1.7		S	G,P	✓	JRK	12/10/20	8:00	Fridge	20/10/20			
4/1.85	1.85				✓								
4/2.0	2.0				✓								
4/2.5	2.5				✓								
4/3.0	3.0				✓								
4/3.5	3.5				✓								
4/4.0	4.0				✓								
4/1.0-1.45	1.0-1.45			P	✓								
4/2.5-2.95	2.5-2.95				✓								
4/4.0-4.45	4.0-4.45				✓								
5/0.05	0.05			G,P	✓								
5/0.5	0.5				✓								
5/1.0	1.0				✓					✓			
5/1.5	1.5				✓								
5/2.0	2.0				✓								
5/2.5	2.5				✓								
5/3.0	3.0				✓								

* **Default storage:** glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge

A Provide name of Lab 1 Envirolab

B Provide name of Lab 2

C Provide name of Lab 3

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY FIELD SHEET

Project No:	102159.00	**Client Project Name:**	Preliminary Geotechnical Investigation and Waste Classification
Client:	City of Newcastle	**Location:**	Wharf Road, Newcastle East
Project Manager:	[redacted]	**DP Lab Received** By:	[redacted] Date: 12/10/20

Do samples contain 'potential' HBM? Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									DP Lab	For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Storage Locn *	Lab 1 [A] Date	Lab 2 [B] Date	Lab 3 [C] Date	
5/3.5	3.5		S	G,P	✓	JRK	12/10/20	8:00	fridge	20/10/20 ✓			
5/4.0	4.0		S	G,P	✓	↓	↓	↓					
5/1.0-1.45	1.0-1.45		↓	D	✓								
5/2.5-2.95	2.5-2.95			↓	✓								
5/4.0-4.45	4.0-4.45				✓								

* **Default storage:** glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge

A Provide name of Lab 1 Envirolab

B Provide name of Lab 2

C Provide name of Lab 3

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY FIELD SHEET

Project No:	102159.00	**Client Project Name:**	Preliminary Geotechnical Investigation and Waste Classification
Client:	City of Newcastle	**Location:**	Wharf Road, Newcastle East
Project Manager:	[redacted]	**DP Lab Received** By:	[redacted] Date: 2/11/20

Do samples contain 'potential' HBM? Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									DP Lab	For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Storage Locn *	Lab 1 [A] Date	Lab 2 [B] Date	Lab 3 [C] Date	
3/0.05	0.05		S	G,P	✓	JRK	2/11/20	8:00	Fridge/ freezer/	4/11/20			
3/0.5	0.5		↓	↓	✓	↓	↓	↓		✓			
3/1.0	1.0				✓								
3/1.5	1.5				✓								
3/2.0	2.0				✓								
3/2.5	2.5				✓								
3/3.0	3.0				✓								
3/3.5	3.5				✓								
3/4.0	4.0				✓								
6/0.05	0.05				✓					✓			
6/0.5	0.5				✓								
6/1.0	1.0				✓								
6/1.5	1.5				✓								
6/2.0	2.0				✓								
6/2.5	2.5				✓								
6/3.0	3.0				✓								
7/0.05	0.05		↓	↓	✓	↓	↓	14:30					

* **Default storage:** **glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge**

A Provide name of Lab 1 Envirolab

B Provide name of Lab 2

C Provide name of Lab 3

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY FIELD SHEET

Project No:	102159.00	**Client Project Name:**	Preliminary Geotechnical Investigation and Waste Classification
Client:	City of Newcastle	**Location:**	Wharf Road, Newcastle East
Project Manager:	[redacted]	**DP Lab Received** By:	[redacted] Date: 2/11/20

Do samples contain 'potential' HBM? Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									DP Lab	For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Storage Locn *	Lab 1 [A] Date	Lab 2 [B] Date	Lab 3 [C] Date	
7/0.5	0.5		S	G,P	✓	JRK	2/11/20	8:00	Fridge/ freezer	4/11/20			
7/1.0	1.0		↓	↓	✓	↓	↓	↓		✓			
7/1.5	1.5				✓								
7/2.0	2.0				✓								
7/2.5	2.5				✓								
7/3.0	3.0				✓								
7/3.5	3.5				✓								
7/4.0	4.0				✓					✓			
8/0.05	0.05				✓								
8/0.5	0.5				✓								
8/1.0	1.0				✓								
8/1.6	1.6				✓								
8/2.0	2.0				✓								
8/2.5	2.5				✓								
8/3.0	3.0				✓								
9/0.05	0.05				✓								
9/0.5	0.5		↓	↓	✓	↓	↓	14:30					

* **Default storage:** **glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge**

A Provide name of Lab 1 Envirolab

B Provide name of Lab 2

C Provide name of Lab 3

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY FIELD SHEET

Project No:	102159.00	**Client Project Name:**	Preliminary Geotechnical Investigation and Waste Classification
Client:	City of Newcastle	**Location:**	Wharf Road, Newcastle East
Project Manager:	[redacted]	**DP Lab Received** By:	[redacted] Date: 2/11/20

Do samples contain 'potential' HBM? Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									DP Lab	For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Storage Locn *	Lab 1 [A] Date	Lab 2 [B] Date	Lab 3 [C] Date	
9/1.0	1.0	D1/JRK	S	G,P	✓	JRK	2/11/20	8:00	Fridge/ freezer	4/11/20 ✓ +D1/JRK			
9/1.5	1.5				✓								
9/2.0	2.0				✓								
9/2.5	2.5				✓								
9/3.0	3.0				✓								
10/0.05	0.05				✓								
10/0.5	0.5				✓					✓			
10/1.0	1.0				✓								
10/1.5	1.5				✓					✓			
10/2.0	2.0				✓								
10/2.5	2.5				✓								
11/0.05	0.05				✓								
11/0.5	0.5	D2/JRK			✓					✓			
11/1.0	1.0				✓								
11/1.5	1.5				✓								
11/2.0	2.0				✓					✓			
11/2.5	2.5		↓	↓	✓	↓	↓	14:30					

* **Default storage:** glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge

A Provide name of Lab 1 Envirolab

B Provide name of Lab 2

C Provide name of Lab 3

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY FIELD SHEET

Project No:	102159.00	**Client Project Name:**	Preliminary Geotechnical Investigation and Waste Classification
Client:	City of Newcastle	**Location:**	Wharf Road, Newcastle East
Project Manager:	[redacted]	**DP Lab Received** By:	[redacted] Date: 2/11/20

Do samples contain 'potential' HBM? Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									DP Lab	For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	ASS Samples	Sampling By	Sampling Date	Sampling Time	Storage Locn *	Lab 1 [A] Date	Lab 2 [B] Date	Lab 3 [C] Date	
12/0.05	0.05		S	G, P	✓	JRK	2/11/20	8:00	Fridge/ freezer	4/11/20			
12/0.5	0.5		↓	↓	✓	↓	↓	↓		✓			
12/1.0	1.0				✓								
12/1.2	1.2				✓								
12/1.5	1.5				✓								
12/2.0	2.0				✓			14:30		✓			
12/2.5	2.5		↓	↓	✓	↓	↓						

* **Default storage:** **glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge**

A Provide name of Lab 1 Envirolab

B Provide name of Lab 2

C Provide name of Lab 3

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET (2)

Project No: 102159	**Suburb/Town: Newcastle**	**To: Envirolab Services**	
DP Order No: 153501	**DP Contact Person:** [redacted]	**Chatswood**	
Prior Storage: Esky ☐ Fridge ☒ Shelved ☐		**Ph: 02 99106200**	**Attn:** [redacted]
Do samples contain 'potential' HBM? Yes ☐ No ☒ (If YES, then handle, transport and store in accordance with FPM HAZID)			

Sample				Analytes										Notes
DP ID	Date Sampled	Type S-soil W-water	Lab ID	TCLP Pb	TCLP As	TCLP PAH	ASLP Pb	ASLP PAH low level						
1/0.5	12/10/20	S	1	✓	✓		✓							
5/1.5	12/10/20		5	✓		✓		✓						
8/0.0-0.05	2/11/20		N/A			✓		✓						
11/1.0	2/11/20		N/A	✓		✓		✓						
PQL (S) mg/kg														
PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐													

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle) As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe

Total number of samples in container: .....

Date relinquished:...Ref 253850 and...255045.... By: ...PH.....

Results required by:.....20/11/20.....

☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☒ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature: [redacted]

Date: 13/11/20

Lab Ref: 253850-A

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET (2)

Project No: 102159	**Suburb/Town: Newcastle**	**To: Envirolab Services**	
DP Order No: 153501	**DP Contact Person:** [redacted]	**Chatswood**	
Prior Storage: Esky ☐ Fridge ☒ Shelved ☐		**Ph: 02 99106200**	**Attn:** [redacted]
Do samples contain 'potential' HBM? Yes ☐ No ☒ (If YES, then handle, transport and store in accordance with FPM HAZID)			

Sample				Analytes										Notes
DP ID	Date Sampled	Type S-soil W-water	Lab ID	TCLP Pb	TCLP As	TCLP PAH	ASLP Pb	ASLP PAH low level						
1/0.5	12/10/20	S	1	✓	✓		✓							
5/1.5	12/10/20		5	✓		✓		✓						
8/0.0-0.05	2/11/20		N/A			✓		✓						
11/1.0	2/11/20		N/A	✓		✓		✓						
PQL (S) mg/kg														
PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐													

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle) As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe

Total number of samples in container: .....

Date relinquished:...Ref 253850 and...255045.... By: ...PH.....

Results required by:.....20/11/20.....

☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☒ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature: [redacted]

Date: 13/11/20

Lab Ref: 253850-A

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET (1)

Project No: 102159	**Suburb/Town:** NEWCASTLE	**To: Envirolab Services Chatswood**	
DP Order No:	**DP Contact Person:** [redacted]		
Prior Storage: Esky ☒ Fridge ☒ Shelved ☐		**Ph: 02 99106200**	**Attn:** [redacted]

Do samples contain 'potential' HBM? Yes ☑ No ☒ (If YES, then handle, transport and store in accordance with FPM HAZID)

Sample DP ID	Date Sampled	Type S-soil W-water	Lab ID	Metals *	Total Phenol	BTEX/ TRH	OCs/ OPs	PAHs	PCBs	Asbestos ID	coal tar ID	pH	EC	
1 | 0.5	12/10/20	S	1	✓		✓	✓	✓	✓					combo 6
2 | 2.0	↓	↓	2	✓		✓	✓	✓	✓		✓	✓	✓	combo 6 + coal tar + pH + EC
2 | 2.8			3	✓		✓	✓	✓	✓					combo 6
4 | 0.5			4	✓		✓	✓	✓	✓	✓	✓			combo 6a + coal tar
5 | 1.5			5	✓		✓	✓	✓	✓	✓				combo 6a
5 | 4.0	↓	↓	6	✓		✓	✓	✓	✓			✓	✓	combo 6 + pH + EC
PQL (S) mg/kg														
PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐													

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 253850

Date Received: 21/10/20
Time Received: 10:25
Received By: AZ
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle) (As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe)

Total number of samples in container: 6

Date relinquished: 20/10/20 By: PH

Results required by: 26/10/20

☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☑ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature: [redacted]

Date: 21/10 10:25

Lab Ref: PZC

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET (1)

Project No: 102159	**Suburb/Town:** NEWCASTLE	**To: Envirolab Services Chatswood**	
DP Order No:	**DP Contact Person:** [redacted]		
Prior Storage: Esky ☒ Fridge ☒ Shelved ☐		**Ph: 02 99106200**	**Attn:** [redacted]
Do samples contain 'potential' HBM? Yes ☑ No ☒ (If YES, then handle, transport and store in accordance with FPM HAZID)			

Sample DP ID	Date Sampled	Type S-soil W-water	Lab ID	Metals *	Total Phenol	BTEX/ TRH	OCs/ OPs	PAHs	PCBs	Asbestos ID	coal tar ID	pH	EC	
1 | 0.5	12/10/20	S	1	✓		✓	✓	✓	✓					combo 6
2 | 2.0	↓	↓	2	✓		✓	✓	✓	✓		✓	✓	✓	combo 6 + coal tar + pH + EC
2 | 2.8			3	✓		✓	✓	✓	✓					combo 6
4 | 0.5			4	✓		✓	✓	✓	✓	✓	✓			combo 6a + coal tar
5 | 1.5			5	✓		✓	✓	✓	✓	✓				combo 6a
5 | 4.0	↓	↓	6	✓		✓	✓	✓	✓			✓	✓	combo 6 + pH + EC
PQL (S) mg/kg														
PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐													

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 253850

Date Received: 21/10
Time Received: 10:25
Received By: AZ
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle) (As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe)

Total number of samples in container: 6
Date relinquished: 20/10/20 By: PH
Results required by: 26/10/20
☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☑ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature: [redacted]
Date: 21/10 10:25
Lab Ref: 253850

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET (2)

Project No: 102159	**Suburb/Town: Newcastle**	**To: Envirolab Services**	
DP Order No: 153501	**DP Contact Person:** [redacted]	**Chatswood**	
Prior Storage: Esky ☐ Fridge ☒ Shelved ☐		**Ph: 02 99106200**	**Attn:** [redacted]

Do samples contain 'potential' HBM? Yes ☐ No ☒ (If YES, then handle, transport and store in accordance with FPM HAZID)

Sample				Analytes										Notes
DP ID	Date Sampled	Type S-soil W-water	Lab ID	TCLP Pb	TCLP As	TCLP PAH	ASLP Pb	ASLP PAH low level						
1/0.5	12/10/20	S	N/A	✓	✓		✓							
5/1.5	12/10/20		N/A	✓		✓		✓						
8/0.0-0.05	2/11/20		4			✓		✓						
11/1.0	2/11/20		8	✓		✓		✓						
PQL (S) mg/kg														
PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐													

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle) As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe

Total number of samples in container: .....

Date relinquished:...Ref 253850 and...255045.... By: ...PH.....

Results required by:.....20/11/20.....

☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☒ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature: [redacted]

Date: 13/11/20

Lab Ref: 255045-A

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

Due 20/11/20

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET (2)

Project No: 102159	**Suburb/Town: Newcastle**	**To: Envirolab Services Chatswood**	
DP Order No: 153501	**DP Contact Person:** [redacted]		
Prior Storage: Esky ☐ Fridge ☒ Shelved ☐		**Ph: 02 99106200**	**Attn:** [redacted]
Do samples contain 'potential' HBM? Yes ☐ No ☒ (If YES, then handle, transport and store in accordance with FPM HAZID)			

Sample				Analytes										Notes
DP ID	Date Sampled	Type S-soil W-water	Lab ID	TCLP Pb	TCLP As	TCLP PAH	ASLP Pb	ASLP PAH low level						
1/0.5	12/10/20	S	N/A	✓	✓		✓							
5/1.5	12/10/20		N/A	✓		✓		✓						
8/0.0-0.05	2/11/20		4			✓		✓						
11/1.0	2/11/20		8	✓		✓		✓						
PQL (S) mg/kg														
PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐													

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle) As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe

Total number of samples in container: .....

Date relinquished:...Ref 253850 and...255045.... By: ...PH.....

Results required by:.....20/11/20.....

☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☒ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature: [redacted]

Date: 13/11/20

Lab Ref: 255045-A

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

Due 20/11/20

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET (1)

Project No: 102159	**Suburb/Town:** NEWCASTLE	**To: Envirolab Services Chatswood**	
DP Order No:	**DP Contact Person:** [redacted]		
Prior Storage: Esky ☒ Fridge ☒ Shelved ☐		**Ph: 02 99106200**	**Attn:** [redacted]

Do samples contain 'potential' HBM? Yes ☐ No ☒ (If YES, then handle, transport and store in accordance with FPM HAZID)

Sample DP ID	Date Sampled	Type S-soil W-water	Lab ID	Metals *	Total Phenol	BTEX/ TRH	OCs/ OPs	PAHs	PCBs	Asbestos ID	pH	EC	coal tar ID	
3/1.0	2/11/20	S	1	✓		✓	✓	✓	✓					combo6
6/0.5			2	✓		✓	✓	✓	✓					combo6
7/1.5			3	✓		✓	✓	✓	✓	✓	✓	✓	✓	combo6a + pH+EC+ coal tar
8/0.05			4	✓		✓	✓	✓	✓					combo6
9/1.0			5	✓		✓	✓	✓	✓	✓				combo6a
10/1.0			6	✓		✓	✓	✓	✓	✓	✓	✓	✓	combo6a+pH+EC+coal tar
10/2.0			7	✓		✓	✓	✓	✓	✓				combo6a
11/1.0			8	✓		✓	✓	✓	✓	✓	✓	✓	✓	combo6a+pH+EC+coal tar
11/2.5			9	✓		✓	✓	✓	✓	✓				combo6a
12/1.0			10	✓		✓	✓	✓	✓					combo6
12/2.5			11	✓		✓	✓	✓	✓					combo6
D1/SRK			12	✓		✓	✓	✓	✓					combo6
PQL (S) mg/kg														
PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐													

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle): As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe

Total number of samples in container: 12

Date relinquished: 6/11/20 By: .....

Results required by: 12/11/20

☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☑ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature: [redacted]

Date: 5-11-20

Lab Ref: 285045

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET (1)

Project No: 102159	**Suburb/Town:** NEWCASTLE	**To: Envirolab Services Chatswood**	
DP Order No:	**DP Contact Person:** [redacted]		
Prior Storage: Esky ☒ Fridge ☒ Shelved ☐		**Ph: 02 99106200**	**Attn:** [redacted]
Do samples contain 'potential' HBM? Yes ☐ No ☒ (If YES, then handle, transport and store in accordance with FPM HAZID)			

Sample DP ID	Date Sampled	Type S-soil W-water	Lab ID	Metals *	Total Phenol	BTEX/ TRH	OCs/ OPs	PAHs	PCBs	Asbestos ID	pH	EC	coal tar ID	
3/1.0	2/11/20	S	1	✓		✓	✓	✓	✓					combo 6
6/0.5			2	✓		✓	✓	✓	✓					combo 6
7/1.5			3	✓		✓	✓	✓	✓	✓	✓	✓	✓	combo 6a + pH+EC+ coal tar
8/0.05			4	✓		✓	✓	✓	✓					combo 6
9/1.0			5	✓		✓	✓	✓	✓	✓				combo 6a
10/1.0			6	✓		✓	✓	✓	✓	✓	✓	✓	✓	combo 6a + pH + EC + coal tar
10/2.0			7	✓		✓	✓	✓	✓	✓				combo 6a
11/1.0			8	✓		✓	✓	✓	✓	✓	✓	✓	✓	combo 6a + pH + EC + coal tar
11/2.5			9	✓		✓	✓	✓	✓	✓				combo 6a
12/1.0			10	✓		✓	✓	✓	✓					combo 6
12/2.5			11	✓		✓	✓	✓	✓					combo 6
01/SRK			12	✓		✓	✓	✓	✓					combo 6
PQL (S) mg/kg														
PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐													

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle): As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe

Total number of samples in container: 12

Date relinquished: 4/11/20 By: .....

Results required by: 12/11/20

☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☑ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature: [redacted]

Date: 5-11-20

Lab Ref: 286045

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET (2)

Project No: 102159	**Suburb/Town: NEWCASTLE**	**To: Envirolab Services Chatswood**
DP Order No: 153510	**DP Contact Person:** [redacted]	
Prior Storage: Esky ☐ Fridge ☒ Shelved ☐		**Ph: 02 9910 6200** **Attn:** [redacted]
Do samples contain 'potential' HBM? Yes ☐ No ☒ (If YES, then handle, transport and store in accordance with FPM HAZID)		

Sample				Analytes										Notes
DP ID	Date Sampled	Type S-soil W-water	Lab ID	ASS Chromium suite										
Bore 2/2.5	12/10/20	S	1	✓										
Bore 4/1.5	12/10/20	S	2	✓										
Bore 5/3.0	12/10/20	S	3	✓										
Bore 6/2.5	2/11/20	S	4	✓										
Bore 9/2.0	2/11/20	S	5	✓										
PQL (S) mg/kg														
PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐													

ENVIROLAB GROUP
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 256265
Date Received: 20/11/20
Time Received: 1040
Received By: Helen
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle) As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe

Total number of samples in container: ....5.....

Date relinquished:...19/11/20..... By: ...PH.....

Results required by:....27/11/20.....

☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☒ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature: [redacted]
Date: 20/11/20
Lab Ref: ECS

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET (2)

Project No: 102159	**Suburb/Town: NEWCASTLE**	**To: Envirolab Services Chatswood**
DP Order No: 153510	**DP Contact Person:** [redacted]	
Prior Storage: Esky ☐ Fridge ☒ Shelved ☐		**Ph: 02 9910 6200** **Attn:** [redacted]
Do samples contain 'potential' HBM? Yes ☐ No ☒ (If YES, then handle, transport and store in accordance with FPM HAZID)		

Sample				Analytes										Notes
DP ID	Date Sampled	Type S-soil W-water	Lab ID	ASS Chromium suite										
Bore 2/2.5	12/10/20	S	1	✓										
Bore 4/1.5	12/10/20	S	2	✓										
Bore 5/3.0	12/10/20	S	3	✓										
Bore 6/2.5	2/11/20	S	4	✓										
Bore 9/2.0	2/11/20	S	5	✓										
PQL (S) mg/kg														
PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐													

ENVIROLAB GROUP
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 256265
Date Received: 20/11/20
Time Received: 1040
Received By: Helen
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle) As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe

Total number of samples in container: ....5.....

Date relinquished:...19/11/20..... By: ...PH.....

Results required by:....27/11/20.....

☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☒ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature: [redacted]

Date: 20/11/20

Lab Ref: ECS

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Newcastle
Attention	[redacted]

Sample Login Details

Your reference	102159, Newcastle
Envirolab Reference	253850-A
Date Sample Received	21/10/2020
Date Instructions Received	13/11/2020
Date Results Expected to be Reported	20/11/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	6 SOIL
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	14.5
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

[redacted]	[redacted]
Phone: [redacted]	**Phone:** [redacted]
Fax: [redacted]	**Fax:** [redacted]
Email: [redacted]	**Email:** [redacted]

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	pH of soil for fluid#determ.	pH of soil TCLP (after HCl)	Extraction fluid used	pH of final Leachate	Arsenic in TCLP	Lead in TCLP	Naphthalene in TCLP	Acenaphthylene in TCLP	Acenaphthene in TCLP	Fluorene in TCLP	Phenanthrene in TCLP	Anthracene in TCLP	Fluoranthene in TCLP	Pyrene in TCLP	Benzo(a)anthracene in TCLP	Chrysene in TCLP	Benzo(bjk)fluoranthene in TCLP	Benzo(a)pyrene in TCLP	Indeno(1,2,3-c,d)pyrene - TCLP	Dibenzo(a,h)anthracene in TCLP	Benzo(g,h,i)perylene in TCLP	Total +vePAH's	Surrogate p-Terphenyl-d14	Metals-ASLP Neutral (ICP-MS)	PAHs in Water Leach - Low Level	On Hold
1/0.5	✓	✓	✓	✓	✓	✓																		✓		
2/2.0																										✓
2/2.8																										✓
4/0.5																										✓
5/1.5	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
5/4.0																										✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Newcastle
Attention	[redacted]

Sample Login Details

Your reference	102159, Newcastle
Envirolab Reference	253850
Date Sample Received	21/10/2020
Date Instructions Received	21/10/2020
Date Results Expected to be Reported	28/10/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	6 SOIL
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	14.5
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	PCBsin Soil	Acid Extractable metalsin soil	Asbestos ID - soils	Misc Inorg - Soil	Coal Tar
1/0.5	✓	✓	✓	✓	✓	✓	✓			
2/2.0	✓	✓	✓	✓	✓	✓	✓		✓	✓
2/2.8	✓	✓	✓	✓	✓	✓	✓			
4/0.5	✓	✓	✓	✓	✓	✓	✓	✓		✓
5/1.5	✓	✓	✓	✓	✓	✓	✓	✓		
5/4.0	✓	✓	✓	✓	✓	✓	✓		✓	

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Newcastle
Attention	[redacted]

Sample Login Details

Your reference	102159, Newcastle
Envirolab Reference	255045-A
Date Sample Received	05/11/2020
Date Instructions Received	13/11/2020
Date Results Expected to be Reported	20/11/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	12 SOIL
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	4
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	pH of soil for fluid#determ.	pH of soil TCLP (after HCl)	Extraction fluid used	pH of final Leachate	Lead in TCLP	Naphthalene in TCLP	Acenaphthylene in TCLP	Acenaphthene in TCLP	Fluorene in TCLP	Phenanthrene in TCLP	Anthracene in TCLP	Fluoranthene in TCLP	Pyrene in TCLP	Benzo(a)anthracene in TCLP	Chrysene in TCLP	Benzo(b)k)fluoranthene in TCLP	Benzo(a)pyrene in TCLP	Indeno(1,2,3-c,d)pyrene - TCLP	Dibenzo(a,h)anthracene in TCLP	Benzo(g,h,i)perylene in TCLP	Total +vePAH's	Surrogate p-Terphenyl-d14	PAHs in Water Leach - Low Level	On Hold
3-1.0																								✓
6-0.5																								✓
7-1.5																								✓
8-0.05	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
9-1.0																								✓
10-1.0																								✓
10-2.0																								✓
11-1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
11-2.5																								✓
12-1.0																								✓
12-2.5																								✓
D1/JRK																								✓
3 - [TRIPLICATE]-1.0																								✓
12 - [TRIPLICATE]-2.5																								✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt. Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Newcastle
Attention	[redacted]

Sample Login Details

Your reference	102159, Newcastle
Envirolab Reference	256265
Date Sample Received	20/11/2020
Date Instructions Received	20/11/2020
Date Results Expected to be Reported	27/11/2020

Sample Condition

Samples received in appropriate condition for analysis	Holding time exceedance
No. of Samples Provided	5 soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	4.7
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Please contact the laboratory within 24 hours if you wish to cancel the aforementioned testing. Otherwise testing will proceed as per the COC and hence invoice accordingly.

Please direct any queries to:

[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	Chromium Suite
Bore 2-2.5	✓
Bore 4-1.5	✓
Bore 5-3.0	✓
Bore 6-2.5	✓
Bore 9-2.0	✓

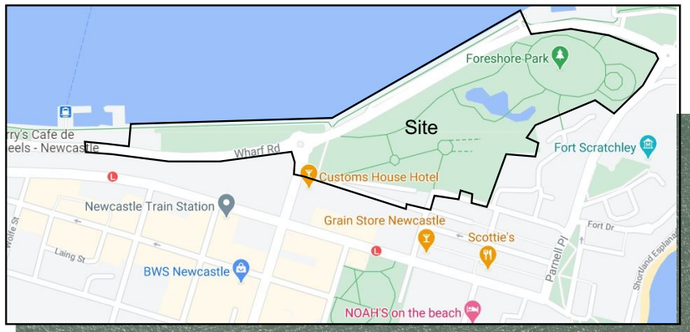
The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Appendix D

Drawing 1: Test Location Plan



Site Location

Queens Wharf Hotel

Joy Cummings Promenade

Wharf Road

Watt Street

Foreshore Park

1 2 3 4 5 6 7 8 9 10 11 12

0 75 150 m

Drawing adapted from Metromap Image dated 3.9.2020.
Test Locations are approximate only and were located using hand held dGPS.

Legend

Borehole Location

Site Boundary

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: City of Newcastle		
OFFICE: Newcastle	DRAWN BY: PLH	
SCALE: 1:2500 @ A3	DATE: 15.February.2021	

TITLE: **Test Location Plan - Preliminary Geotechnical Investigation and Waste Classification**
Newcastle Foreshore Park Master Plan
Wharf Road, Newcastle East

N

PROJECT No:	102159.00
DRAWING No:	1
REVISION:	0

Appendix C

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-115199

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation	✓				
	Filter	✓				
	Flow	✓				
	Valves, Diaphragm	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
Sensor	PID	✓	10.6ev			
Alarms	Beeper	✓	Low	High	TWA	STEL
	Settings	✓	50ppm	100ppm	N/A	N/A
Software	Version	✓				
Data logger	Operation	✓				
Download	Operation	✓				
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		93ppm Isobutylene	NATA	SY361		93.1ppm

Calibrated by: [redacted]

Calibration date: 24/05/2022

Next calibration due: 20/11/2022

SESL AUSTRALIA
Environment & Soil Sciences

Appendix D

		Metals								Asbestos	TPH		BTEX				PAH			PCBs	Organochlorine Pesticides																							
		Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Asbestos	C6-C9 Fraction	C10-C36 Fraction (Sum)	Benzene	Toluene	Ethylbenzene	Xylene Total	Benzo(a) pyrene	Benzo(a)pyrene TEQ (LOR)	PAHs (Sum of total)	PCBs (Sum of total)	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	Fibres	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		5	1	2	5	5	0.1	2	5	5	10	50	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2
NEPM 2013 Table 1A(1) HILs Rec C Soil		300	90		17,000	600	80	1,200	30,000									3	300	1				10		70						400		340				20				10		400
NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand																																											
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space		100																												180													
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil													50	85	70	105	0.7																										
Field ID	**Date**																																										
BH_0.1_0.5	**30/5/22**	6	<1	8	23	13	<0.1	11	67	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	1.3	2.2	12.9	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_0.1_1.0	**30/5/22**	280	4	9	294	1,370	0.3	20	1,610	ND	<10	940	<0.2	<0.5	<0.5	<0.5	2.9	4.2	28.2	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_0.3_0.2	**30/5/22**	<5	<1	8	16	23	<0.1	7	63	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_0.3_0.5	**30/5/22**	55	4	36	217	679	0.2	50	1,510	ND	<10	350	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	1.7	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_02_0.5	**30/5/22**	31	<1	6	32	125	<0.1	5	254	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_02_1.5	**30/5/22**	7	<1	2	13	36	<0.1	3	197	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_04_0.2	**30/5/22**	<5	<1	16	17	21	<0.1	13	75	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_04_0.5	**30/5/22**	46	9	8	136	901	0.2	16	2,960	ND	<10	400	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	5.0	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_05_0.2	**30/5/22**	15	<1	12	29	91	<0.1	8	151	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	0.9	1.7	7.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_05_1.0	**30/5/22**	75	2	97	104	225	0.3	25	502	ND	<10	400	<0.2	<0.5	<0.5	<0.5	0.7	1.4	6.7	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_06_0.5	**30/5/22**	12	<1	12	12	18	<0.1	3	23	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	3.7	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_06_1.0	**30/5/22**	9	<1	10	10	22	<0.1	<2	21		<10	<50	<0.2	<0.5	<0.5	<0.5	0.8	1.6	8.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_06_1.7	**30/5/22**	17	<1	4	22	40	<0.1	3	123	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_07_0.2	**30/5/22**	8	<1	9	24	92	<0.1	6	137	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	2.9	4.2	32.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_07_0.5	**30/5/22**	6	<1	6	17	58	<0.1	4	118	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	1.6	2.6	16.4	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_08_0.2	**30/5/22**	6	<1	12	19	55	<0.1	13	98	ND	<10	960	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_08_1.2	**30/5/22**	364	12	19	205	1,200	0.6	32	4,430	ND	13	<50	<0.2	<0.5	<0.5	<0.5	1.7	2.8	18.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_09_0.4	**30/5/22**	7	<1	8	26	57	0.2	16	125	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_09_1.0	**30/5/22**	12	<1	11	10	18	<0.1	<2	17	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_10_0.5	**30/5/22**	12	<1	14	10	14	<0.1	5	23	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_10_1.5	**30/5/22**	10	<1	<2	9	9	<0.1	<2	69	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_11_0.2	**31/5/22**	7	<1	12	38	95	0.2	14	144	ND	<10	120	<0.2	<0.5	<0.5	<0.5	1.0	1.8	8.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_11_1.0	**31/5/22**	108	21	12	444	1,610	0.8	16	1,580	ND	<10	1,980	<0.2	<0.5	<0.5	<0.5	0.9	1.7	10.6	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_11_2.0	**31/5/22**																																										
BH_12_0.2	**31/5/22**																<0.5	1.2	<0.5																									
BH_12_0.5	**31/5/22**	<5	<1	9	15	68	0.1	5	86	ND	<10	540	1.1	1.0	<0.5	<0.5	7.1	10.0	75.9	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_12_2.0	**31/5/22**	43	2	5	114	229	0.6	14	395	ND	64	1,280	<0.2	<0.5	<0.5	<0.5	1.4	2.3	13.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_12_2.5	**31/5/22**																																									
BH_13_0.2	**31/5/22**	<5	<1	4	18	53	<0.1	4	98	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	0.7	1.4	6.4	0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_13_0.5	**31/5/22**	<5	<1	6	13	70	<0.1	4	74	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	1.7	2.7	15.6	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_13_3.5	**31/5/22**																																									
BH_14_0.2	**31/5/22**	<5	<1	19	10	<5	<0.1	18	28	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_14_0.5	**31/5/22**	10	<1	9	58	217	0.2	13	181	ND	<10	350	<0.2	<0.5	<0.5	<0.5	3.9	5.6	42.8	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_14_1.5	**31/5/22**	7	1	10	51	111	0.1	11	549	ND	<10	440	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	3.6	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_14_2.0	**31/5/22**																																									
BH_15_0.5	**31/5/22**	<5	<1	12	17	39	<0.1	5	94	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	3.2	4.6	35.0	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_15_1.2	**31/5/22**	12	1	8	94	451	0.2	18	1,040	ND	<10	910	<0.2	<0.5	<0.5	<0.5	0.7	1.5	9.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_15_1.7	**31/5/22**																																									
BH_16_0.2	**31/5/22**	10	<1	6	25	75	0.1	6	152	ND	<10	130	<0.2	<0.5	<0.5	<0.5	4.2	6.0	45.8	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_16_1.0	**31/5/22**	6	<1	8	22	126	0.1	6	110	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	1.2	2.0	11.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_16_2.6	**31/5/22**																																									
BH_17_0.5	**31/5/22**	12	2	5	107	114	0.1	17	438	ND	<10	230	<0.2	<0.5	<0.5	<0.5	0.7	1.4	4.8	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_17_1.5	**31/5/22**	<5	<1	6	72	182	0.5	8	89	ND	23	<50	<0.2	<0.5	<0.5	<0.5	0.7	1.5	6.9	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_17_2.0	**31/5/22**																																									
BH_18_0.2	**31/5/22**	<5	<1	15	12	10	<0.1	15	31	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_18_0.5	**31/5/22**	<5	<1	7	21	78	<0.1	5	124	ND	<10	110	<0.2	<0.5	<0.5	<0.5	1.9	2.9	16.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_18_2.2	**31/5/22**																																									
BH_19_0.2	**31/5/22**	6	<1	6	22	150	0.2	5	140	ND	<10	120	<0.2	<0.5	<0.5	<0.5	2.7	4.0	30.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_19_1.0	**31/5/22**	9	<1	6	108	456	0.5	10	363	ND	25	270	2.2	0.8	<0.5	<0.5	0.5	1.2	3.2	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_19_1.5	**31/5/22**																																									
BH_20_0.2	**30/5/22**	<5	<1	9	21	29	<0.1	7	115	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH_20_1.0	**30/5/22**	119	2	3	48	141	0.1	13	600	ND	<10	120	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	2.0	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Duplicate 1	**31/5/22**	<5	<1	20	14	8	<0.1	19	30	ND	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Duplicate 2	**31/5/22**	38	2	10	150	626	0.5	19	887	ND	34	<50	1.6	0.6	<0.5	<0.5	1.0	1.8	9.5	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Statistics																																										
Minimum Detect		**6**	**1**	**2**	**9**	**8**	**0.1**	**3**	**17**	**0**	**13**	**110**	**1.1**	**0.6**	**ND**	**ND**	**0.5**	**1.2**	**1.7**	**0.2**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Maximum Detect		**364**	**21**	**97**	**444**	**1,610**	**0.8**	**50**	**4,430**	**0**	**64**	**1,980**	**2.2**	**1**	**ND**	**ND**	**7.1**	**10**	**75.9**	**0.2**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Average Concentration *		**32**	**1.8**	**12**	**62**	**227**	**0.16**	**11**	**453**	**0**	**8**	**234**	**0.2**	**0.29**	**0.25**	**0.25**	**1.1**	**2.2**	**11**	**0.053**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.1**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.1**
Standard Deviation *		**70**	**3.7**	**14**	**87**	**375**	**0.19**	**9.2**	**841**	**0**	**10**	**405**	**0.41**	**0.15**	**0**	**0**	**1.4**	**1.7**	**15**	**0.023**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
95% UCL (Student's-t) *		**49.4**	**2.711**	**15.36**	**84.24**	**322.6**	**0.212**	**13.57**	**665.8**	**0**	**10.7**	**336.7**	**0.308**	**0.325**	**0.25**	**0.25**	**1.487**	**2.589**	**14.88**	**0.0591**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.1**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.1**

* A Non Detect Multiplier of 0.5 has been applied.

Environmental Standards

2013, NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand
2013, NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil
2013, NEPM 2013 Table 1A(1) HILs Rec C Soil

SESL AUSTRALIA
Environment & Soil Sciences

Appendix E

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2218839**	Page	: 1 of 23
Amendment	: **(Preliminary Report)**		
Client	: **SESL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: RESULTS ADDRESS	Contact	: [redacted]
Address	: 16 CHILVERS ROAD THORNLEIGH 2120	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
[redacted]	: [redacted]	Telephone	: [redacted]
Project	: J003951	Date Samples Received	: 30-May-2022 15:35
Order number	: ----	Date Analysis Commenced	: 01-Jun-2022
C-O-C number	: ----	Issue Date	: 08-Jun-2022 17:03
Sampler	: Leo Ho		
Site	: ----		
Quote number	: SYBQ/404/21 SYDNEY BLANKET QUOTE		
No. of samples received	: 48		
No. of samples analysed	: 31		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Jake Spooner	Laboratory Technician	Newcastle - Asbestos, Mayfield West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

This report contains preliminary authorised results. The report may contain semi-quantitative results. Any result presented in this preliminary report may be subject to change in the final report.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) 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/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_20_0.2	BH_20_1.0	BH_0.1_0.5	BH_0.1_1.0	BH_0.3_0.2
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-001	ES2218839-003	ES2218839-006	ES2218839-007	ES2218839-009
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	28.1	11.2	7.8	15.7	19.2
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	No	No	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	No	No	No
Asbestos Type	1332-21-4	-	--	-	-	-	-	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	No	No	No
Organic Fibre	----	0.1	g/kg	No	No	No	No	No
Sample weight (dry)	----	0.01	g	303	354	425	378	418
APPROVED IDENTIFIER:	----	-	--	A.SMYLIE	A.SMYLIE	A.SMYLIE	A.SMYLIE	A.SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	119	6	280	<5
Cadmium	7440-43-9	1	mg/kg	<1	2	<1	4	<1
Chromium	7440-47-3	2	mg/kg	9	3	8	9	8
Copper	7440-50-8	5	mg/kg	21	48	23	294	16
Lead	7439-92-1	5	mg/kg	29	141	13	1370	23
Nickel	7440-02-0	2	mg/kg	7	13	11	20	7
Zinc	7440-66-6	5	mg/kg	115	600	67	1610	63
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.1	<0.1	0.3	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_20_0.2	BH_20_1.0	BH_0.1_0.5	BH_0.1_1.0	BH_0.3_0.2
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-001	ES2218839-003	ES2218839-006	ES2218839-007	ES2218839-009
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	**0.8**	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	**0.5**	**1.7**	**2.2**	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	**0.8**	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	**0.8**	**2.8**	**4.8**	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	**0.7**	**2.4**	**4.7**	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	**1.1**	**2.5**	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	**1.0**	**2.5**	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	**1.3**	**3.3**	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	**1.2**	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	**1.3**	**2.9**	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	**0.6**	**1.2**	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	**0.7**	**1.3**	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	**2.0**	**12.9**	**28.2**	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	**1.6**	**3.8**	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	**1.9**	**4.0**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	**2.2**	**4.2**	**1.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_20_0.2	BH_20_1.0	BH_0.1_0.5	BH_0.1_1.0	BH_0.3_0.2
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-001	ES2218839-003	ES2218839-006	ES2218839-007	ES2218839-009
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	**120**	<100	**470**	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	**470**	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	**120**	<50	**940**	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		**110**	**180**	<100	**820**	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	**200**	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**110**	**180**	<50	**1020**	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**96.7**	**110**	**51.3**	**93.7**	**87.6**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**102**	**113**	**106**	**127**	**94.6**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**113**	**118**	**109**	**111**	**90.2**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**86.6**	**81.4**	**80.7**	**78.6**	**82.6**
2-Chlorophenol-D4	93951-73-6	0.5	%		**98.8**	**88.3**	**86.8**	**86.0**	**87.3**
2.4.6-Tribromophenol	118-79-6	0.5	%		**94.3**	**81.6**	**78.3**	**83.6**	**82.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_20_0.2	BH_20_1.0	BH_0.1_0.5	BH_0.1_1.0	BH_0.3_0.2
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-001	ES2218839-003	ES2218839-006	ES2218839-007	ES2218839-009
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		107	91.1	92.9	92.5	93.0
Anthracene-d10	1719-06-8	0.5	%		105	88.0	92.3	90.1	93.8
4-Terphenyl-d14	1718-51-0	0.5	%		101	88.9	90.6	89.2	91.7
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		102	114	121	123	126
Toluene-D8	2037-26-5	0.2	%		86.4	92.5	103	99.8	102
4-Bromofluorobenzene	460-00-4	0.2	%		94.4	94.2	104	97.2	105

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_0.3_0.5	BH_02_0.5	BH_02_1.5	BH_04_0.2	BH_04_0.5
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-010	ES2218839-013	ES2218839-015	ES2218839-017	ES2218839-018
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	15.4	4.6	22.0	19.2	13.8
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	No	No	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	No	No	No
Asbestos Type	1332-21-4	-	--	-	-	-	-	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	No	No	No
Organic Fibre	----	0.1	g/kg	No	No	No	No	No
Sample weight (dry)	----	0.01	g	431	568	191	336	420
APPROVED IDENTIFIER:	----	-	--	A.SMYLIE	A.SMYLIE	A.SMYLIE	A.SMYLIE	A.SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	55	31	7	<5	46
Cadmium	7440-43-9	1	mg/kg	4	<1	<1	<1	9
Chromium	7440-47-3	2	mg/kg	36	6	2	16	8
Copper	7440-50-8	5	mg/kg	217	32	13	17	136
Lead	7439-92-1	5	mg/kg	679	125	36	21	901
Nickel	7440-02-0	2	mg/kg	50	5	3	13	16
Zinc	7440-66-6	5	mg/kg	1510	254	197	75	2960
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.2	<0.1	<0.1	<0.1	0.2
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_0.3_0.5	BH_02_0.5	BH_02_1.5	BH_04_0.2	BH_04_0.5
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-010	ES2218839-013	ES2218839-015	ES2218839-017	ES2218839-018
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		**0.5**	<0.5	<0.5	<0.5	**1.2**
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		**0.6**	<0.5	<0.5	<0.5	**1.1**
Pyrene	129-00-0	0.5	mg/kg		**0.6**	<0.5	<0.5	<0.5	**1.0**
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	**0.6**
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	**0.6**
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	**0.5**
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		**1.7**	<0.5	<0.5	<0.5	**5.0**
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg		**0.6**	**0.6**	**0.6**	**0.6**	**0.7**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg		**1.2**	**1.2**	**1.2**	**1.2**	**1.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_0.3_0.5	BH_02_0.5	BH_02_1.5	BH_04_0.2	BH_04_0.5
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-010	ES2218839-013	ES2218839-015	ES2218839-017	ES2218839-018
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	**160**	<100	<100	<100	**260**
C29 - C36 Fraction	----	100	mg/kg	**190**	<100	<100	<100	**140**
^ C10 - C36 Fraction (sum)	----	50	mg/kg	**350**	<50	<50	<50	**400**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	**290**	<100	<100	<100	**360**
>C34 - C40 Fraction	----	100	mg/kg	**100**	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	**390**	<50	<50	<50	**360**
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**103**	**83.3**	**89.5**	**102**	**116**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**78.5**	**81.1**	**99.4**	**103**	**128**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**108**	**96.7**	**93.9**	**111**	**114**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**76.0**	**78.9**	**81.8**	**78.5**	**76.8**
2-Chlorophenol-D4	93951-73-6	0.5	%	**82.5**	**85.8**	**88.0**	**83.6**	**85.3**
2.4.6-Tribromophenol	118-79-6	0.5	%	**75.2**	**76.1**	**78.8**	**79.8**	**75.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_0.3_0.5	BH_02_0.5	BH_02_1.5	BH_04_0.2	BH_04_0.5
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-010	ES2218839-013	ES2218839-015	ES2218839-017	ES2218839-018
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	90.9	90.4	92.5	91.5	95.3
Anthracene-d10	1719-06-8	0.5	%	88.2	90.6	92.1	90.2	88.0
4-Terphenyl-d14	1718-51-0	0.5	%	89.1	89.2	92.0	90.8	98.7
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	125	129	113	124	124
Toluene-D8	2037-26-5	0.2	%	98.5	105	93.8	102	102
4-Bromofluorobenzene	460-00-4	0.2	%	97.0	104	95.0	102	99.6

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_05_0.2	BH_05_1.0	BH_07_0.2	BH_07_0.5	BH_10_0.5
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-021	ES2218839-023	ES2218839-026	ES2218839-027	ES2218839-030
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	15.2	12.9	12.6	9.5	11.9
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	No	No	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	No	No	No
Asbestos Type	1332-21-4	-	--	-	-	-	-	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	No	No	No
Organic Fibre	----	0.1	g/kg	No	No	No	No	No
Sample weight (dry)	----	0.01	g	313	464	437	637	353
APPROVED IDENTIFIER:	----	-	--	A.SMYLIE	A.SMYLIE	J.SPOONER	J.SPOONER	J.SPOONER
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	15	75	8	6	12
Cadmium	7440-43-9	1	mg/kg	<1	2	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	12	97	9	6	14
Copper	7440-50-8	5	mg/kg	29	104	24	17	10
Lead	7439-92-1	5	mg/kg	91	225	92	58	14
Nickel	7440-02-0	2	mg/kg	8	25	6	4	5
Zinc	7440-66-6	5	mg/kg	151	502	137	118	23
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.3	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_05_0.2	BH_05_1.0	BH_07_0.2	BH_07_0.5	BH_10_0.5
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-021	ES2218839-023	ES2218839-026	ES2218839-027	ES2218839-030
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		**0.6**	**0.9**	**2.7**	**1.4**	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	**0.7**	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		**1.6**	**1.6**	**6.9**	**3.5**	<0.5
Pyrene	129-00-0	0.5	mg/kg		**1.6**	**1.5**	**6.6**	**3.4**	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		**0.7**	**0.6**	**2.3**	**1.2**	<0.5
Chrysene	218-01-9	0.5	mg/kg		**0.7**	**0.6**	**2.2**	**1.1**	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		**0.9**	**0.8**	**3.1**	**1.7**	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	**1.1**	**0.6**	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		**0.9**	**0.7**	**2.9**	**1.6**	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	**1.6**	**0.8**	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		**0.5**	<0.5	**2.0**	**1.1**	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		**7.5**	**6.7**	**32.1**	**16.4**	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		**1.1**	**0.8**	**3.8**	**2.0**	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**1.4**	**1.1**	**4.0**	**2.3**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.7**	**1.4**	**4.2**	**2.6**	**1.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_05_0.2	BH_05_1.0	BH_07_0.2	BH_07_0.5	BH_10_0.5
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-021	ES2218839-023	ES2218839-026	ES2218839-027	ES2218839-030
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	**210**	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	**190**	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	**400**	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		**140**	**330**	<100	**100**	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	**130**	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**140**	**460**	<50	**100**	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**87.2**	**86.4**	**82.4**	**96.5**	**86.1**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**90.3**	**95.0**	**91.7**	**105**	**94.7**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**104**	**95.0**	**83.7**	**111**	**96.0**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**77.2**	**76.8**	**78.3**	**76.0**	**77.9**
2-Chlorophenol-D4	93951-73-6	0.5	%		**83.7**	**84.2**	**85.3**	**83.4**	**83.8**
2.4.6-Tribromophenol	118-79-6	0.5	%		**75.6**	**76.3**	**76.9**	**75.0**	**65.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_05_0.2	BH_05_1.0	BH_07_0.2	BH_07_0.5	BH_10_0.5
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-021	ES2218839-023	ES2218839-026	ES2218839-027	ES2218839-030
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		89.8	90.6	91.0	88.7	90.0
Anthracene-d10	1719-06-8	0.5	%		89.6	89.2	89.8	89.9	89.9
4-Terphenyl-d14	1718-51-0	0.5	%		92.6	91.1	91.0	89.4	90.8
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		122	126	127	118	128
Toluene-D8	2037-26-5	0.2	%		104	103	106	96.5	108
4-Bromofluorobenzene	460-00-4	0.2	%		105	104	104	102	112

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_10_1.5	BH_09_0.4	BH_09_1.0	BH_08_0.2	BH_08_1.2
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-032	ES2218839-034	ES2218839-035	ES2218839-037	ES2218839-040
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	3.3	12.4	15.8	20.6	23.4
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	No	No	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	No	No	No
Asbestos Type	1332-21-4	-	--	-	-	-	-	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	No	No	No
Organic Fibre	----	0.1	g/kg	No	No	No	No	No
Sample weight (dry)	----	0.01	g	445	491	484	393	502
APPROVED IDENTIFIER:	----	-	--	J.SPOONER	J.SPOONER	J.SPOONER	A.SMYLIE	A.SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	10	7	12	6	364
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	12
Chromium	7440-47-3	2	mg/kg	<2	8	11	12	19
Copper	7440-50-8	5	mg/kg	9	26	10	19	205
Lead	7439-92-1	5	mg/kg	9	57	18	55	1200
Nickel	7440-02-0	2	mg/kg	<2	16	<2	13	32
Zinc	7440-66-6	5	mg/kg	69	125	17	98	4430
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.2	<0.1	<0.1	0.6
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_10_1.5	BH_09_0.4	BH_09_1.0	BH_08_0.2	BH_08_1.2
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-032	ES2218839-034	ES2218839-035	ES2218839-037	ES2218839-040
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	1.8
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	3.4
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	3.2
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	1.6
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	1.8
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	2.2
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	0.7
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	1.7
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	0.8
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	0.8
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	18.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	2.2
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	2.5
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	2.8

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_10_1.5	BH_09_0.4	BH_09_1.0	BH_08_0.2	BH_08_1.2
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-032	ES2218839-034	ES2218839-035	ES2218839-037	ES2218839-040
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	13
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	460	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	500	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	960	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	11
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	11
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	830	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	220	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	1050	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		85.4	111	127	117	117
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		87.9	113	115	106	133
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		82.4	116	112	113	111
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		79.2	78.1	80.7	79.9	74.9
2-Chlorophenol-D4	93951-73-6	0.5	%		85.4	85.4	87.3	86.0	82.4
2.4.6-Tribromophenol	118-79-6	0.5	%		66.1	69.8	69.0	74.2	75.2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_10_1.5	BH_09_0.4	BH_09_1.0	BH_08_0.2	BH_08_1.2
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-032	ES2218839-034	ES2218839-035	ES2218839-037	ES2218839-040
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	92.6	90.5	95.1	91.2	88.2
Anthracene-d10	1719-06-8	0.5	%	92.9	93.0	92.8	91.1	87.0
4-Terphenyl-d14	1718-51-0	0.5	%	94.8	93.8	96.2	94.7	86.8
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	130	125	125	75.9	126
Toluene-D8	2037-26-5	0.2	%	106	106	103	76.6	112
4-Bromofluorobenzene	460-00-4	0.2	%	108	106	104	76.5	101

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_06_0.5	BH_06_1.0	BH_06_1.7	----	----
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2218839-043	ES2218839-044	ES2218839-046	--------	--------
				Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	14.2	14.3	15.6	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	----	No	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	No	----	No	----	----
Asbestos Type	1332-21-4	-	--	-	----	-	----	----
Synthetic Mineral Fibre	----	0.1	g/kg	No	----	No	----	----
Organic Fibre	----	0.1	g/kg	No	----	No	----	----
Sample weight (dry)	----	0.01	g	512	----	497	----	----
APPROVED IDENTIFIER:	----	-	--	A.SMYLIE	----	A.SMYLIE	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	12	9	17	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	12	10	4	----	----
Copper	7440-50-8	5	mg/kg	12	10	22	----	----
Lead	7439-92-1	5	mg/kg	18	22	40	----	----
Nickel	7440-02-0	2	mg/kg	3	<2	3	----	----
Zinc	7440-66-6	5	mg/kg	23	21	123	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	<0.1	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_06_0.5	BH_06_1.0	BH_06_1.7	----	----
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	----	----
Compound	CAS Number	LOR	Unit		ES2218839-043	ES2218839-044	ES2218839-046	--------	--------
					Result	Result	Result	----	----
EP068A: Organochlorine Pesticides (OC) - Continued									
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	<0.2	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	<0.2	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg		**1.2**	**0.6**	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg		**1.3**	**1.9**	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg		**1.2**	**1.7**	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	**0.6**	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	**0.6**	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	**0.8**	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	**0.8**	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	**0.5**	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	**0.6**	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		**3.7**	**8.1**	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	**1.0**	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**1.3**	**0.6**	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.6**	**1.2**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_06_0.5	BH_06_1.0	BH_06_1.7	----	----
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2218839-043	ES2218839-044	ES2218839-046	--------	--------
				Result	Result	Result	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**101**	**79.2**	**101**	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**84.3**	**74.8**	**86.1**	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**88.6**	**75.8**	**113**	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**103**	**93.2**	**102**	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**100.0**	**91.1**	**100**	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**99.3**	**90.2**	**102**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_06_0.5	BH_06_1.0	BH_06_1.7	----	----
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	----	----
Compound	CAS Number	LOR	Unit		ES2218839-043	ES2218839-044	ES2218839-046	--------	--------
					Result	Result	Result	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		99.4	92.2	99.9	----	----
Anthracene-d10	1719-06-8	0.5	%		109	103	111	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		100	93.7	101	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		91.4	91.5	92.0	----	----
Toluene-D8	2037-26-5	0.2	%		107	102	101	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		112	108	110	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Sample ID - Sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	BH_20_0.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_20_1.0 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_0.1_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_0.1_1.0 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_0.3_0.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_0.3_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_02_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_02_1.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_04_0.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_04_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_05_0.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_05_1.0 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_07_0.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_07_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_10_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_10_1.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_09_0.4 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_09_1.0 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_08_0.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_08_1.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_06_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_06_1.7 - 30-May-2022 00:00	Soil sample.

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EA033-B: Potential Acidity

(SOIL) EA033-C: Acid Neutralising Capacity

(SOIL) EA033-D: Retained Acidity

(SOIL) EA033-A: Actual Acidity

(SOIL) EA033-E: Acid Base Accounting

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(SOIL) EA200: AS 4964 - 2004 Identification of Asbestos in Soils

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2218839**	Page	: 1 of 29
Client	: **SESL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: RESULTS ADDRESS	Contact	: [redacted]
Address	: 16 CHILVERS ROAD THORNLEIGH 2120	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: [redacted]	Telephone	: [redacted]
Project	: J003951	Date Samples Received	: 30-May-2022 15:35
Order number	: ----	Date Analysis Commenced	: 01-Jun-2022
C-O-C number	: ----	Issue Date	: 09-Jun-2022 16:06
Sampler	: Leo Ho		
Site	: ----		
Quote number	: SYBQ/404/21 SYDNEY BLANKET QUOTE		
No. of samples received	: 48		
No. of samples analysed	: 31		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Jake Spooner	Laboratory Technician	Newcastle - Asbestos, Mayfield West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- ASS: EA033 (CRS Suite):Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) 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/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_20_0.2	BH_20_1.0	BH_20_2.0	BH_0.1_0.5	BH_0.1_1.0
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-001	ES2218839-003	ES2218839-004	ES2218839-006	ES2218839-007
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	----	6.8	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	<0.02	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	----	0.016	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	----	<10	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.22	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	44	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.07	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	1.5	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	----	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	<10	----	----
Liming Rate	----	1	kg CaCO3/t	----	----	<1	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	----	<0.02	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	----	<10	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	----	<1	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	28.1	11.2	----	7.8	15.7
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	----	No	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	----	No	No
Asbestos Type	1332-21-4	-	--	-	-	----	-	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	----	No	No
Organic Fibre	----	0.1	g/kg	No	No	----	No	No
Sample weight (dry)	----	0.01	g	303	354	----	425	378
APPROVED IDENTIFIER:	----	-	--	A.SMYLIE	A.SMYLIE	----	A.SMYLIE	A.SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	119	----	6	280
Cadmium	7440-43-9	1	mg/kg	<1	2	----	<1	4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_20_0.2	BH_20_1.0	BH_20_2.0	BH_0.1_0.5	BH_0.1_1.0
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-001	ES2218839-003	ES2218839-004	ES2218839-006	ES2218839-007
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		9	3	----	8	9
Copper	7440-50-8	5	mg/kg		21	48	----	23	294
Lead	7439-92-1	5	mg/kg		29	141	----	13	1370
Nickel	7440-02-0	2	mg/kg		7	13	----	11	20
Zinc	7440-66-6	5	mg/kg		115	600	----	67	1610
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	0.1	----	<0.1	0.3
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	<0.1	----	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_20_0.2	BH_20_1.0	BH_20_2.0	BH_0.1_0.5	BH_0.1_1.0
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-001	ES2218839-003	ES2218839-004	ES2218839-006	ES2218839-007
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	----	<0.5	**0.8**
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	**0.5**	----	**1.7**	**2.2**
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	----	<0.5	**0.8**
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	**0.8**	----	**2.8**	**4.8**
Pyrene	129-00-0	0.5	mg/kg		<0.5	**0.7**	----	**2.4**	**4.7**
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	----	**1.1**	**2.5**
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	----	**1.0**	**2.5**
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	----	**1.3**	**3.3**
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	----	<0.5	**1.2**
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	----	**1.3**	**2.9**
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	----	**0.6**	**1.2**
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	----	**0.7**	**1.3**
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		<0.5	**2.0**	----	**12.9**	**28.2**
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg		<0.5	<0.5	----	**1.6**	**3.8**
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg		**0.6**	**0.6**	----	**1.9**	**4.0**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg		**1.2**	**1.2**	----	**2.2**	**4.2**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	----	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	----	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	**120**	----	<100	**470**
C29 - C36 Fraction	----	100	mg/kg		<100	<100	----	<100	**470**
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg		<50	**120**	----	<50	**940**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	----	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg		<10	<10	----	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	----	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		**110**	**180**	----	<100	**820**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_20_0.2	BH_20_1.0	BH_20_2.0	BH_0.1_0.5	BH_0.1_1.0
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-001	ES2218839-003	ES2218839-004	ES2218839-006	ES2218839-007
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	----	<100	**200**
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		**110**	**180**	----	<50	**1020**
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	<50	----	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	----	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**96.7**	**110**	----	**51.3**	**93.7**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**102**	**113**	----	**106**	**127**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**113**	**118**	----	**109**	**111**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**86.6**	**81.4**	----	**80.7**	**78.6**
2-Chlorophenol-D4	93951-73-6	0.5	%		**98.8**	**88.3**	----	**86.8**	**86.0**
2.4.6-Tribromophenol	118-79-6	0.5	%		**94.3**	**81.6**	----	**78.3**	**83.6**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**107**	**91.1**	----	**92.9**	**92.5**
Anthracene-d10	1719-06-8	0.5	%		**105**	**88.0**	----	**92.3**	**90.1**
4-Terphenyl-d14	1718-51-0	0.5	%		**101**	**88.9**	----	**90.6**	**89.2**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**102**	**114**	----	**121**	**123**
Toluene-D8	2037-26-5	0.2	%		**86.4**	**92.5**	----	**103**	**99.8**
4-Bromofluorobenzene	460-00-4	0.2	%		**94.4**	**94.2**	----	**104**	**97.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_0.1_1.5	BH_0.3_0.2	BH_0.3_0.5	BH_0.3_1.1	BH_02_0.5
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-008	ES2218839-009	ES2218839-010	ES2218839-011	ES2218839-013
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	6.7	----	----	6.4	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.018	----	----	0.022	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	12	----	----	13	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.26	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	52	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.08	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	----	----	1.5	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	13	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	1	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	----	----	0.02	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	12	----	----	13	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	----	----	1	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	19.2	15.4	----	4.6
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	No	No	----	No
Asbestos (Trace)	1332-21-4	5	Fibres	----	No	No	----	No
Asbestos Type	1332-21-4	-	--	----	-	-	----	-
Synthetic Mineral Fibre	----	0.1	g/kg	----	No	No	----	No
Organic Fibre	----	0.1	g/kg	----	No	No	----	No
Sample weight (dry)	----	0.01	g	----	418	431	----	568
APPROVED IDENTIFIER:	----	-	--	----	A.SMYLIE	A.SMYLIE	----	A.SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	<5	55	----	31
Cadmium	7440-43-9	1	mg/kg	----	<1	4	----	<1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_0.1_1.5	BH_0.3_0.2	BH_0.3_0.5	BH_0.3_1.1	BH_02_0.5
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-008	ES2218839-009	ES2218839-010	ES2218839-011	ES2218839-013
				Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued								
Chromium	7440-47-3	2	mg/kg	----	8	36	----	6
Copper	7440-50-8	5	mg/kg	----	16	217	----	32
Lead	7439-92-1	5	mg/kg	----	23	679	----	125
Nickel	7440-02-0	2	mg/kg	----	7	50	----	5
Zinc	7440-66-6	5	mg/kg	----	63	1510	----	254
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	<0.1	0.2	----	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	<0.1	<0.1	----	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Endrin	72-20-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	----	<0.2	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	----	<0.2	<0.2	----	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	----	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_0.1_1.5	BH_0.3_0.2	BH_0.3_0.5	BH_0.3_1.1	BH_02_0.5
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-008	ES2218839-009	ES2218839-010	ES2218839-011	ES2218839-013
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Fluorene	86-73-7	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		----	<0.5	**0.5**	----	<0.5
Anthracene	120-12-7	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		----	<0.5	**0.6**	----	<0.5
Pyrene	129-00-0	0.5	mg/kg		----	<0.5	**0.6**	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Chrysene	218-01-9	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	**1.7**	----	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	**0.6**	**0.6**	----	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	**1.2**	**1.2**	----	**1.2**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	<10	<10	----	<10
C10 - C14 Fraction	----	50	mg/kg		----	<50	<50	----	<50
C15 - C28 Fraction	----	100	mg/kg		----	<100	**160**	----	<100
C29 - C36 Fraction	----	100	mg/kg		----	<100	**190**	----	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	<50	**350**	----	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	<10	<10	----	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	<10	<10	----	<10
>C10 - C16 Fraction	----	50	mg/kg		----	<50	<50	----	<50
>C16 - C34 Fraction	----	100	mg/kg		----	<100	**290**	----	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_0.1_1.5	BH_0.3_0.2	BH_0.3_0.5	BH_0.3_1.1	BH_02_0.5
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-008	ES2218839-009	ES2218839-010	ES2218839-011	ES2218839-013
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		----	<100	100	----	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	<50	390	----	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	<50	<50	----	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
Toluene	108-88-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
^ Total Xylenes	----	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Naphthalene	91-20-3	1	mg/kg		----	<1	<1	----	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	87.6	103	----	83.3
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	94.6	78.5	----	81.1
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	90.2	108	----	96.7
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	82.6	76.0	----	78.9
2-Chlorophenol-D4	93951-73-6	0.5	%		----	87.3	82.5	----	85.8
2.4.6-Tribromophenol	118-79-6	0.5	%		----	82.0	75.2	----	76.1
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	93.0	90.9	----	90.4
Anthracene-d10	1719-06-8	0.5	%		----	93.8	88.2	----	90.6
4-Terphenyl-d14	1718-51-0	0.5	%		----	91.7	89.1	----	89.2
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	126	125	----	129
Toluene-D8	2037-26-5	0.2	%		----	102	98.5	----	105
4-Bromofluorobenzene	460-00-4	0.2	%		----	105	97.0	----	104

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_02_1.5	BH_04_0.2	BH_04_0.5	BH_04_1.5	BH_05_0.2
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-015	ES2218839-017	ES2218839-018	ES2218839-020	ES2218839-021
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	6.6	----	----	6.4	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.020	----	----	0.023	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	12	----	----	14	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.27	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	55	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.09	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	----	----	1.5	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	14	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	1	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	----	----	0.02	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	12	----	----	14	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	----	----	1	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	22.0	19.2	13.8	----	15.2
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	No	----	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	No	----	No
Asbestos Type	1332-21-4	-	--	-	-	-	----	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	No	----	No
Organic Fibre	----	0.1	g/kg	No	No	No	----	No
Sample weight (dry)	----	0.01	g	191	336	420	----	313
APPROVED IDENTIFIER:	----	-	--	A.SMYLIE	A.SMYLIE	A.SMYLIE	----	A.SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	7	<5	46	----	15
Cadmium	7440-43-9	1	mg/kg	<1	<1	9	----	<1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_02_1.5	BH_04_0.2	BH_04_0.5	BH_04_1.5	BH_05_0.2
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-015	ES2218839-017	ES2218839-018	ES2218839-020	ES2218839-021
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		2	16	8	----	12
Copper	7440-50-8	5	mg/kg		13	17	136	----	29
Lead	7439-92-1	5	mg/kg		36	21	901	----	91
Nickel	7440-02-0	2	mg/kg		3	13	16	----	8
Zinc	7440-66-6	5	mg/kg		197	75	2960	----	151
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	0.2	----	<0.1
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	<0.1	<0.1	----	<0.1
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	<0.2	----	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_02_1.5	BH_04_0.2	BH_04_0.5	BH_04_1.5	BH_05_0.2
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-015	ES2218839-017	ES2218839-018	ES2218839-020	ES2218839-021
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	<0.05	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	----	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	**1.2**	----	**0.6**
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	**1.1**	----	**1.6**
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	**1.0**	----	**1.6**
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	**0.6**	----	**0.7**
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	**0.6**	----	**0.7**
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	**0.5**	----	**0.9**
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	----	**0.9**
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	----	**0.5**
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	**5.0**	----	**7.5**
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	----	**1.1**
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	**0.7**	----	**1.4**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	**1.2**	----	**1.7**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	----	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	----	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	**260**	----	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	**140**	----	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	**400**	----	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	----	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	----	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	----	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	**360**	----	**140**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_02_1.5	BH_04_0.2	BH_04_0.5	BH_04_1.5	BH_05_0.2
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-015	ES2218839-017	ES2218839-018	ES2218839-020	ES2218839-021
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	----	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	**360**	----	**140**
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	----	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	----	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	----	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	----	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	----	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	----	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**89.5**	**102**	**116**	----	**87.2**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**99.4**	**103**	**128**	----	**90.3**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**93.9**	**111**	**114**	----	**104**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**81.8**	**78.5**	**76.8**	----	**77.2**
2-Chlorophenol-D4	93951-73-6	0.5	%		**88.0**	**83.6**	**85.3**	----	**83.7**
2.4.6-Tribromophenol	118-79-6	0.5	%		**78.8**	**79.8**	**75.2**	----	**75.6**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**92.5**	**91.5**	**95.3**	----	**89.8**
Anthracene-d10	1719-06-8	0.5	%		**92.1**	**90.2**	**88.0**	----	**89.6**
4-Terphenyl-d14	1718-51-0	0.5	%		**92.0**	**90.8**	**98.7**	----	**92.6**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**113**	**124**	**124**	----	**122**
Toluene-D8	2037-26-5	0.2	%		**93.8**	**102**	**102**	----	**104**
4-Bromofluorobenzene	460-00-4	0.2	%		**95.0**	**102**	**99.6**	----	**105**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_05_1.0	BH_05_3.5	BH_07_0.2	BH_07_0.5	BH_07_1.0
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-023	ES2218839-025	ES2218839-026	ES2218839-027	ES2218839-028
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	6.6	----	----	6.5
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	----	----	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	<0.02	----	----	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	0.024	----	----	0.025
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	15	----	----	16
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	0.19	----	----	0.45
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	37	----	----	89
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	0.06	----	----	0.14
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	1.5	----	----	1.5
Net Acidity (sulfur units)	----	0.02	% S	----	<0.02	----	----	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	----	<10	----	----	<10
Liming Rate	----	1	kg CaCO3/t	----	<1	----	----	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	0.02	----	----	0.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	15	----	----	16
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	1	----	----	1
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	12.9	----	12.6	9.5	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	----	No	No	----
Asbestos (Trace)	1332-21-4	5	Fibres	No	----	No	No	----
Asbestos Type	1332-21-4	-	--	-	----	-	-	----
Synthetic Mineral Fibre	----	0.1	g/kg	No	----	No	No	----
Organic Fibre	----	0.1	g/kg	No	----	No	No	----
Sample weight (dry)	----	0.01	g	464	----	437	637	----
APPROVED IDENTIFIER:	----	-	--	A.SMYLIE	----	J.SPOONER	J.SPOONER	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	75	----	8	6	----
Cadmium	7440-43-9	1	mg/kg	2	----	<1	<1	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_05_1.0	BH_05_3.5	BH_07_0.2	BH_07_0.5	BH_07_1.0
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-023	ES2218839-025	ES2218839-026	ES2218839-027	ES2218839-028
				Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued								
Chromium	7440-47-3	2	mg/kg	**97**	----	**9**	**6**	----
Copper	7440-50-8	5	mg/kg	**104**	----	**24**	**17**	----
Lead	7439-92-1	5	mg/kg	**225**	----	**92**	**58**	----
Nickel	7440-02-0	2	mg/kg	**25**	----	**6**	**4**	----
Zinc	7440-66-6	5	mg/kg	**502**	----	**137**	**118**	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	**0.3**	----	<0.1	<0.1	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	<0.1	<0.1	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Endrin	72-20-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	<0.2	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	<0.2	<0.2	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_05_1.0	BH_05_3.5	BH_07_0.2	BH_07_0.5	BH_07_1.0
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-023	ES2218839-025	ES2218839-026	ES2218839-027	ES2218839-028
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		**0.9**	----	**2.7**	**1.4**	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	**0.7**	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		**1.6**	----	**6.9**	**3.5**	----
Pyrene	129-00-0	0.5	mg/kg		**1.5**	----	**6.6**	**3.4**	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		**0.6**	----	**2.3**	**1.2**	----
Chrysene	218-01-9	0.5	mg/kg		**0.6**	----	**2.2**	**1.1**	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		**0.8**	----	**3.1**	**1.7**	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	**1.1**	**0.6**	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		**0.7**	----	**2.9**	**1.6**	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	**1.6**	**0.8**	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	**2.0**	**1.1**	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		**6.7**	----	**32.1**	**16.4**	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		**0.8**	----	**3.8**	**2.0**	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**1.1**	----	**4.0**	**2.3**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.4**	----	**4.2**	**2.6**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	----	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg		<50	----	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg		**210**	----	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg		**190**	----	<100	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		**400**	----	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	----	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg		<50	----	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg		**330**	----	<100	**100**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_05_1.0	BH_05_3.5	BH_07_0.2	BH_07_0.5	BH_07_1.0
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-023	ES2218839-025	ES2218839-026	ES2218839-027	ES2218839-028
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		**130**	----	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**460**	----	<50	**100**	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	<50	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	<0.2	<0.2	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg		<1	----	<1	<1	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**86.4**	----	**82.4**	**96.5**	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**95.0**	----	**91.7**	**105**	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**95.0**	----	**83.7**	**111**	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**76.8**	----	**78.3**	**76.0**	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**84.2**	----	**85.3**	**83.4**	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**76.3**	----	**76.9**	**75.0**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**90.6**	----	**91.0**	**88.7**	----
Anthracene-d10	1719-06-8	0.5	%		**89.2**	----	**89.8**	**89.9**	----
4-Terphenyl-d14	1718-51-0	0.5	%		**91.1**	----	**91.0**	**89.4**	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**126**	----	**127**	**118**	----
Toluene-D8	2037-26-5	0.2	%		**103**	----	**106**	**96.5**	----
4-Bromofluorobenzene	460-00-4	0.2	%		**104**	----	**104**	**102**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_10_0.5	BH_10_1.5	BH_09_0.4	BH_09_1.0	BH_08_0.2
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-030	ES2218839-032	ES2218839-034	ES2218839-035	ES2218839-037
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	6.4	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	<0.02	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	0.019	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	12	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	1.5	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	<0.02	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	12	----	----	----
Liming Rate	----	1	kg CaCO3/t	----	<1	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	<0.02	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	12	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	<1	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	11.9	3.3	12.4	15.8	20.6
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	No	No	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	No	No	No
Asbestos Type	1332-21-4	-	--	-	-	-	-	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	No	No	No
Organic Fibre	----	0.1	g/kg	No	No	No	No	No
Sample weight (dry)	----	0.01	g	353	445	491	484	393
APPROVED IDENTIFIER:	----	-	--	J.SPOONER	J.SPOONER	J.SPOONER	J.SPOONER	A.SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	12	10	7	12	6
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	14	<2	8	11	12
Copper	7440-50-8	5	mg/kg	10	9	26	10	19
Lead	7439-92-1	5	mg/kg	14	9	57	18	55
Nickel	7440-02-0	2	mg/kg	5	<2	16	<2	13
Zinc	7440-66-6	5	mg/kg	23	69	125	17	98
EG035T: Total Recoverable Mercury by FIMS								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_10_0.5	BH_10_1.5	BH_09_0.4	BH_09_1.0	BH_08_0.2
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-030	ES2218839-032	ES2218839-034	ES2218839-035	ES2218839-037
				Result	Result	Result	Result	Result
EG035T: Total Recoverable Mercury by FIMS - Continued								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	**0.2**	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_10_0.5	BH_10_1.5	BH_09_0.4	BH_09_1.0	BH_08_0.2
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-030	ES2218839-032	ES2218839-034	ES2218839-035	ES2218839-037
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	**460**
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	**500**
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	**960**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	**830**
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	**220**
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	**1050**
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_10_0.5	BH_10_1.5	BH_09_0.4	BH_09_1.0	BH_08_0.2
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-030	ES2218839-032	ES2218839-034	ES2218839-035	ES2218839-037
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		86.1	85.4	111	127	117
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		94.7	87.9	113	115	106
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		96.0	82.4	116	112	113
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		77.9	79.2	78.1	80.7	79.9
2-Chlorophenol-D4	93951-73-6	0.5	%		83.8	85.4	85.4	87.3	86.0
2.4.6-Tribromophenol	118-79-6	0.5	%		65.2	66.1	69.8	69.0	74.2
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		90.0	92.6	90.5	95.1	91.2
Anthracene-d10	1719-06-8	0.5	%		89.9	92.9	93.0	92.8	91.1
4-Terphenyl-d14	1718-51-0	0.5	%		90.8	94.8	93.8	96.2	94.7
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		128	130	125	125	75.9
Toluene-D8	2037-26-5	0.2	%		108	106	106	103	76.6
4-Bromofluorobenzene	460-00-4	0.2	%		112	108	106	104	76.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_08_1.2	BH_08_1.7	BH_06_0.5	BH_06_1.0	BH_06_1.7
			Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2218839-040	ES2218839-041	ES2218839-043	ES2218839-044	ES2218839-046
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	7.7	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	<0.02	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	0.067	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	42	----	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	1.08	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	217	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	0.35	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	1.5	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	<0.02	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	<10	----	----	----
Liming Rate	----	1	kg CaCO3/t	----	<1	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	0.07	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	42	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	3	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	23.4	----	14.2	14.3	15.6
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	----	No	----	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	----	No	----	No
Asbestos Type	1332-21-4	-	--	-	----	-	----	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	----	No	----	No
Organic Fibre	----	0.1	g/kg	No	----	No	----	No
Sample weight (dry)	----	0.01	g	502	----	512	----	497
APPROVED IDENTIFIER:	----	-	--	A.SMYLIE	----	A.SMYLIE	----	A.SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	364	----	12	9	17
Cadmium	7440-43-9	1	mg/kg	12	----	<1	<1	<1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_08_1.2	BH_08_1.7	BH_06_0.5	BH_06_1.0	BH_06_1.7
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-040	ES2218839-041	ES2218839-043	ES2218839-044	ES2218839-046
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		**19**	----	**12**	**10**	**4**
Copper	7440-50-8	5	mg/kg		**205**	----	**12**	**10**	**22**
Lead	7439-92-1	5	mg/kg		**1200**	----	**18**	**22**	**40**
Nickel	7440-02-0	2	mg/kg		**32**	----	**3**	<2	**3**
Zinc	7440-66-6	5	mg/kg		**4430**	----	**23**	**21**	**123**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		**0.6**	----	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	----	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_08_1.2	BH_08_1.7	BH_06_0.5	BH_06_1.0	BH_06_1.7
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-040	ES2218839-041	ES2218839-043	ES2218839-044	ES2218839-046
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	----	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		1.8	----	1.2	0.6	<0.5
Anthracene	120-12-7	0.5	mg/kg		0.5	----	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		3.4	----	1.3	1.9	<0.5
Pyrene	129-00-0	0.5	mg/kg		3.2	----	1.2	1.7	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		1.6	----	<0.5	0.6	<0.5
Chrysene	218-01-9	0.5	mg/kg		1.8	----	<0.5	0.6	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		2.2	----	<0.5	0.8	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		0.7	----	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		1.7	----	<0.5	0.8	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		0.8	----	<0.5	0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		0.8	----	<0.5	0.6	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		18.5	----	3.7	8.1	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		2.2	----	<0.5	1.0	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		2.5	----	0.6	1.3	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		2.8	----	1.2	1.6	1.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		13	----	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	----	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	----	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	----	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	----	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		11	----	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		11	----	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	----	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	----	<100	<100	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_08_1.2	BH_08_1.7	BH_06_0.5	BH_06_1.0	BH_06_1.7
				Sampling date / time	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00	30-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2218839-040	ES2218839-041	ES2218839-043	ES2218839-044	ES2218839-046
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	----	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	----	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	----	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**117**	----	**101**	**79.2**	**101**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**133**	----	**84.3**	**74.8**	**86.1**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**111**	----	**88.6**	**75.8**	**113**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**74.9**	----	**103**	**93.2**	**102**
2-Chlorophenol-D4	93951-73-6	0.5	%		**82.4**	----	**100.0**	**91.1**	**100**
2.4.6-Tribromophenol	118-79-6	0.5	%		**75.2**	----	**99.3**	**90.2**	**102**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**88.2**	----	**99.4**	**92.2**	**99.9**
Anthracene-d10	1719-06-8	0.5	%		**87.0**	----	**109**	**103**	**111**
4-Terphenyl-d14	1718-51-0	0.5	%		**86.8**	----	**100**	**93.7**	**101**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**126**	----	**91.4**	**91.5**	**92.0**
Toluene-D8	2037-26-5	0.2	%		**112**	----	**107**	**102**	**101**
4-Bromofluorobenzene	460-00-4	0.2	%		**101**	----	**112**	**108**	**110**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_06_2.0	----	----	----	----
			Sampling date / time	30-May-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2218839-047	--------	--------	--------	--------
				Result	----	----	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**6.6**	----	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	**0.017**	----	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**10**	----	----	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	**0.28**	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	**55**	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	**0.09**	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	**10**	----	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	----	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Sample ID - Sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	BH_20_0.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_20_1.0 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_0.1_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_0.1_1.0 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_0.3_0.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_0.3_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_02_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_02_1.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_04_0.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_04_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_05_0.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_05_1.0 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_07_0.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_07_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_10_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_10_1.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_09_0.4 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_09_1.0 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_08_0.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_08_1.2 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_06_0.5 - 30-May-2022 00:00	Soil sample.
EA200: Description	BH_06_1.7 - 30-May-2022 00:00	Soil sample.

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EA033-B: Potential Acidity

(SOIL) EA033-C: Acid Neutralising Capacity

(SOIL) EA033-D: Retained Acidity

(SOIL) EA033-A: Actual Acidity

(SOIL) EA033-E: Acid Base Accounting

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(SOIL) EA200: AS 4964 - 2004 Identification of Asbestos in Soils

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2218839**	Page	: 1 of 16
Amendment	: **(Preliminary Report)**		
Client	: **SESL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: RESULTS ADDRESS	Contact	: [redacted]
Address	: 16 CHILVERS ROAD THORNLEIGH 2120	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: [redacted]	Telephone	: [redacted]
Project	: J003951	Date Samples Received	: 30-May-2022
Order number	: ----	Date Analysis Commenced	: 01-Jun-2022
C-O-C number	: ----	Issue Date	: 08-Jun-2022
Sampler	: Leo Ho		
Site	: ----		
Quote number	: SYBQ/404/21 SYDNEY BLANKET QUOTE		
No. of samples received	: 48		
No. of samples analysed	: 31		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Jake Spooner	Laboratory Technician	Newcastle - Asbestos, Mayfield West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4379406)									
ES2218839-001	BH_20_0.2	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	9	10	13.4	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	7	7	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	21	23	8.5	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	29	33	13.8	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	115	110	4.0	0% - 20%
ES2218839-023	BH_05_1.0	EG005T: Cadmium	7440-43-9	1	mg/kg	2	2	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	97	107	10.4	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	25	23	8.3	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	75	60	22.0	0% - 50%
		EG005T: Copper	7440-50-8	5	mg/kg	104	106	2.0	0% - 20%
		EG005T: Lead	7439-92-1	5	mg/kg	225	198	13.1	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	502	463	8.0	0% - 20%
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4379409)									
ES2218839-044	BH_06_1.0	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	10	11	13.4	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	9	10	16.2	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	10	10	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	22	18	22.8	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	21	20	0.0	No Limit
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4379760)									
ES2218665-005	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4379760) - continued									
ES2218665-005	Anonymous	EG005T: Chromium	7440-47-3	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit
ES2219261-005	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	16	18	11.9	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	7	6	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	19	20	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	12	11	12.5	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	41	43	5.4	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4379411)									
ES2218839-007	BH_0.1_1.0	EA055: Moisture Content	----	0.1	%	15.7	15.2	3.1	0% - 50%
ES2218839-030	BH_10_0.5	EA055: Moisture Content	----	0.1	%	11.9	16.2	30.0	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4379412)									
ES2219287-001	Anonymous	EA055: Moisture Content	----	0.1	%	12.5	13.3	6.3	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4379765)									
ES2218665-014	Anonymous	EA055: Moisture Content	----	0.1	%	26.8	28.6	6.4	0% - 20%
ES2219261-008	Anonymous	EA055: Moisture Content	----	0.1	%	13.4	13.1	2.0	0% - 50%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4379405)									
ES2218839-001	BH_20_0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2218839-023	BH_05_1.0	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.3	0.3	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4379408)									
ES2218839-044	BH_06_1.0	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4379761)									
ES2218665-005	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2219261-005	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 4370218)									
ES2218839-001	BH_20_0.2	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2218839-021	BH_05_0.2	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 4374477)									
ES2218839-043	BH_06_0.5	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 4370217)									
ES2218839-001	BH_20_0.2	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 4370217) - continued									
ES2218839-001	BH_20_0.2	EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
ES2218839-021	BH_05_0.2	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 4374475)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 4374475) - continued									
ES2218839-043	BH_06_0.5	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4370216)									
ES2218839-001	BH_20_0.2	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4370216) - continued									
ES2218839-001	BH_20_0.2	EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES2218839-021	BH_05_0.2	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	0.6	0.6	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.6	1.7	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.6	1.7	6.2	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	0.7	0.7	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	0.7	0.8	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	0.9	1.0	12.3	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	0.9	0.9	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.5	0.6	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	7.5	8.0	6.5	0% - 50%
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	1.1	1.1	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4374476)									
ES2218859-006	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	0.5	0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	0.5	0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4374476) - continued									
ES2218859-006	Anonymous	EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	1.0	1.0	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES2218839-043	BH_06_0.5	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	1.2	1.0	22.4	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.3	1.1	10.5	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.2	1.0	16.5	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	3.7	3.1	17.6	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4370215)									
ES2218839-001	BH_20_0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2218839-021	BH_05_0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4374474)									
ES2218859-006	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2218839-043	BH_06_0.5	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4376417)									
ES2218839-001	BH_20_0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4376417) - continued									
ES2218839-021	BH_05_0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4378536)									
ES2217821-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES2219261-006	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4370215)									
ES2218839-001	BH_20_0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	110	120	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2218839-021	BH_05_0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	140	140	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4374474)									
ES2218859-006	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2218839-043	BH_06_0.5	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4376417)									
ES2218839-001	BH_20_0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES2218839-021	BH_05_0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4378536)									
ES2217821-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES2219261-006	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080: BTEXN (QC Lot: 4376417)									
ES2218839-001	BH_20_0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES2218839-021	BH_05_0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 4378536)									
ES2217821-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES2219261-006	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4379406)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	104	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	130	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	111	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	111	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	105	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	102	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	97.8	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4379409)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	107	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	113	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	112	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	108	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	106	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	102	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	101	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4379760)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	104	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	95.8	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	110	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	108	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	103	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	98.2	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	97.9	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4379405)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	79.3	70.0	125
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4379408)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	100	70.0	125
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4379761)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	113	70.0	125
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4370218)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	102	62.0	126
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4374477)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	82.0	62.0	126

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 4370217)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	95.2	69.0	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	95.1	65.0	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	98.1	67.0	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	96.4	68.0	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	91.4	65.0	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	96.4	67.0	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	95.4	69.0	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	99.5	62.0	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	96.2	63.0	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.2	66.0	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	97.8	64.0	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	97.2	66.0	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	96.1	67.0	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.7	67.0	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	98.4	69.0	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	98.9	69.0	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	94.5	56.0	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	100	62.0	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	91.7	66.0	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	95.2	64.0	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	93.2	54.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 4374475)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	84.0	69.0	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	84.5	65.0	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	88.5	67.0	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	86.1	68.0	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	84.5	65.0	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	85.5	67.0	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	85.1	69.0	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	88.5	62.0	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	86.8	63.0	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	93.7	66.0	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	87.4	64.0	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	87.3	66.0	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	89.4	67.0	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	85.7	67.0	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	89.3	69.0	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	90.2	69.0	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	87.1	56.0	120

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 4374475) - continued								
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	88.0	62.0	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	83.1	66.0	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	88.1	64.0	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	84.0	54.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4370216)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	117	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	111	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	109	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	111	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	115	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	99.1	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	114	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	113	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	99.7	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	109	75.0	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	99.8	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	108	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	106	70.0	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	103	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	100	62.0	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	104	63.0	121
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4374476)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	95.2	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	96.9	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	96.8	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	97.5	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	98.2	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	89.2	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	100	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	98.5	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	92.3	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	92.4	75.0	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	91.9	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	94.7	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	97.0	70.0	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	93.9	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	93.4	62.0	118

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4374476) - continued								
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	91.3	63.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4370215)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	110	75.0	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	108	77.0	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	106	71.0	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4374474)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	94.6	75.0	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	93.5	77.0	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	96.3	71.0	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4376417)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	108	68.4	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4378536)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	116	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4370215)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	106	77.0	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	105	74.0	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	108	63.0	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4374474)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	93.5	77.0	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	93.6	74.0	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	109	63.0	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4376417)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	109	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4378536)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	116	68.4	128
EP080: BTEXN (QCLot: 4376417)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	115	62.0	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	105	67.0	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	102	65.0	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	102	66.0	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	106	68.0	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	104	63.0	119
EP080: BTEXN (QCLot: 4378536)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	112	62.0	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	110	67.0	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	108	65.0	117

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	LCS: Spike Recovery (%)	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP080: BTEXN (QCLot: 4378536) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	108	66.0	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	113	68.0	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	108	63.0	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4379406)							
ES2218839-001	BH_20_0.2	EG005T: Arsenic	7440-38-2	50 mg/kg	95.5	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	84.0	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	96.8	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	91.8	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	96.9	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	93.9	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	89.1	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4379409)							
ES2218839-044	BH_06_1.0	EG005T: Arsenic	7440-38-2	50 mg/kg	102	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	83.4	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	98.5	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	93.7	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	96.6	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	94.2	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	96.3	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4379760)							
ES2218665-005	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	102	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	96.8	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	100	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	92.8	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	99.5	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	97.1	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	98.3	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4379405)							
ES2218839-001	BH_20_0.2	EG035T: Mercury	7439-97-6	5 mg/kg	79.4	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4379408)							
ES2218839-044	BH_06_1.0	EG035T: Mercury	7439-97-6	5 mg/kg	85.1	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4379761)							
ES2218665-005	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	84.9	70.0	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4370218)							
ES2218839-001	BH_20_0.2	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	87.5	70.0	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4374477)							
ES2218839-043	BH_06_0.5	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	86.3	70.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 4370217)							
ES2218839-001	BH_20_0.2	EP068: gamma-BHC	58-89-9	0.5 mg/kg	83.9	70.0	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	82.5	70.0	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	86.0	70.0	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	90.4	70.0	130
		EP068: Endrin	72-20-8	2 mg/kg	95.3	70.0	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	98.0	70.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 4374475)							
ES2218839-043	BH_06_0.5	EP068: gamma-BHC	58-89-9	0.5 mg/kg	93.3	70.0	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	89.6	70.0	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	78.7	70.0	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	97.4	70.0	130
		EP068: Endrin	72-20-8	2 mg/kg	104	70.0	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	75.7	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4370216)							
ES2218839-001	BH_20_0.2	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	102	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	110	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4374476)							
ES2218839-043	BH_06_0.5	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	99.8	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	102	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4370215)							
ES2218839-001	BH_20_0.2	EP071: C10 - C14 Fraction	----	480 mg/kg	87.3	73.0	137
		EP071: C15 - C28 Fraction	----	3100 mg/kg	93.3	53.0	131
		EP071: C29 - C36 Fraction	----	2060 mg/kg	103	52.0	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4374474)							
ES2218839-043	BH_06_0.5	EP071: C10 - C14 Fraction	----	480 mg/kg	98.4	73.0	137
		EP071: C15 - C28 Fraction	----	3100 mg/kg	108	53.0	131
		EP071: C29 - C36 Fraction	----	2060 mg/kg	106	52.0	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4376417)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4376417) - continued							
ES2218839-001	BH_20_0.2	EP080: C6 - C9 Fraction	----	32.5 mg/kg	99.8	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4378536)							
ES2217821-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	123	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4370215)							
ES2218839-001	BH_20_0.2	EP071: >C10 - C16 Fraction	----	860 mg/kg	78.0	73.0	137
		EP071: >C16 - C34 Fraction	----	4320 mg/kg	97.4	53.0	131
		EP071: >C34 - C40 Fraction	----	890 mg/kg	102	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4374474)							
ES2218839-043	BH_06_0.5	EP071: >C10 - C16 Fraction	----	860 mg/kg	87.1	73.0	137
		EP071: >C16 - C34 Fraction	----	4320 mg/kg	108	53.0	131
		EP071: >C34 - C40 Fraction	----	890 mg/kg	118	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4376417)							
ES2218839-001	BH_20_0.2	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	107	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4378536)							
ES2217821-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	123	70.0	130
EP080: BTEXN (QCLot: 4376417)							
ES2218839-001	BH_20_0.2	EP080: Benzene	71-43-2	2.5 mg/kg	106	70.0	130
		EP080: Toluene	108-88-3	2.5 mg/kg	96.0	70.0	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	97.9	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	95.7	70.0	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	100.0	70.0	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	95.2	70.0	130
EP080: BTEXN (QCLot: 4378536)							
ES2217821-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	95.4	70.0	130
		EP080: Toluene	108-88-3	2.5 mg/kg	101	70.0	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	105	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	107	70.0	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	104	70.0	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	96.2	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2218839**	Page	: 1 of 10
Amendment	: **(Preliminary Report)**		
Client	: **SESL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: RESULTS ADDRESS	Telephone	: +61-2-8784 8555
Project	: J003951	Date Samples Received	: 30-May-2022
Site	: ----	Issue Date	: 08-Jun-2022
Sampler	: Leo Ho	No. of samples received	: 48
Order number	: ----	No. of samples analysed	: 31

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity								
Snap Lock Bag - frozen on receipt at ALS (EA033)								
BH_20_2.0,	BH_0.1_1.5,	**30-May-2022**	**08-Jun-2022**	30-May-2023	✓	**Not Authorised**	06-Sep-2022	----
BH_0.3_1.1,	BH_02_1.5,							
BH_04_1.5,	BH_05_3.5,							
BH_07_1.0,	BH_10_1.5,							
BH_08_1.7,	BH_06_2.0							
EA033-B: Potential Acidity								
Snap Lock Bag - frozen on receipt at ALS (EA033)								
BH_20_2.0,	BH_0.1_1.5,	**30-May-2022**	**08-Jun-2022**	30-May-2023	✓	**Not Authorised**	06-Sep-2022	----
BH_0.3_1.1,	BH_02_1.5,							
BH_04_1.5,	BH_05_3.5,							
BH_07_1.0,	BH_10_1.5,							
BH_08_1.7,	BH_06_2.0							
EA033-C: Acid Neutralising Capacity								
Snap Lock Bag - frozen on receipt at ALS (EA033)								
BH_20_2.0,	BH_0.1_1.5,	**30-May-2022**	**08-Jun-2022**	30-May-2023	✓	**Not Authorised**	06-Sep-2022	----
BH_0.3_1.1,	BH_02_1.5,							
BH_04_1.5,	BH_05_3.5,							
BH_07_1.0,	BH_10_1.5,							
BH_08_1.7,	BH_06_2.0							
EA033-D: Retained Acidity								
Snap Lock Bag - frozen on receipt at ALS (EA033)								
BH_20_2.0,	BH_0.1_1.5,	**30-May-2022**	**08-Jun-2022**	30-May-2023	✓	**Not Authorised**	06-Sep-2022	----
BH_0.3_1.1,	BH_02_1.5,							
BH_04_1.5,	BH_05_3.5,							
BH_07_1.0,	BH_10_1.5,							
BH_08_1.7,	BH_06_2.0							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-E: Acid Base Accounting								
Snap Lock Bag - frozen on receipt at ALS (EA033)								
BH_20_2.0,	BH_0.1_1.5,	**30-May-2022**	**08-Jun-2022**	30-May-2023	✓	**Not Authorised**	06-Sep-2022	----
BH_0.3_1.1,	BH_02_1.5,							
BH_04_1.5,	BH_05_3.5,							
BH_07_1.0,	BH_10_1.5,							
BH_08_1.7,	BH_06_2.0							
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BH_20_0.2,	BH_20_1.0,	**30-May-2022**	**----**	----	----	**03-Jun-2022**	13-Jun-2022	✓
BH_0.1_0.5,	BH_0.1_1.0,							
BH_0.3_0.2,	BH_0.3_0.5,							
BH_02_0.5,	BH_02_1.5,							
BH_04_0.2,	BH_04_0.5,							
BH_05_0.2,	BH_05_1.0,							
BH_07_0.2,	BH_07_0.5,							
BH_10_0.5,	BH_10_1.5,							
BH_09_0.4,	BH_09_1.0,							
BH_08_0.2,	BH_08_1.2,							
BH_06_0.5,	BH_06_1.0,							
BH_06_1.7								
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Snap Lock Bag - Friable Asbestos/PSD Bag (EA200)								
BH_20_0.2,	BH_20_1.0,	**30-May-2022**	**----**	----	----	**01-Jun-2022**	26-Nov-2022	✓
BH_0.1_0.5,	BH_0.1_1.0,							
BH_0.3_0.2,	BH_0.3_0.5,							
BH_02_0.5,	BH_02_1.5,							
BH_04_0.2,	BH_04_0.5,							
BH_05_0.2,	BH_05_1.0,							
BH_07_0.2,	BH_07_0.5,							
BH_10_0.5,	BH_10_1.5,							
BH_09_0.4,	BH_09_1.0,							
BH_08_0.2,	BH_08_1.2,							
BH_06_0.5,	BH_06_1.7							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
BH_20_0.2, BH_0.1_0.5, BH_0.1_1.0, BH_0.3_0.2, BH_0.3_0.5, BH_02_0.5, BH_02_1.5, BH_04_0.2, BH_04_0.5, BH_05_0.2, BH_05_1.0, BH_07_0.2, BH_07_0.5, BH_10_0.5, BH_10_1.5, BH_09_0.4, BH_09_1.0, BH_08_0.2, BH_08_1.2, BH_06_0.5, BH_06_1.0, BH_06_1.7	**30-May-2022**	**03-Jun-2022**	26-Nov-2022	✓	**03-Jun-2022**	26-Nov-2022	✓
Soil Glass Jar - Unpreserved (EG005T)							
BH_20_1.0	**30-May-2022**	**03-Jun-2022**	26-Nov-2022	✓	**06-Jun-2022**	26-Nov-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
BH_20_0.2, BH_0.1_0.5, BH_0.1_1.0, BH_0.3_0.2, BH_0.3_0.5, BH_02_0.5, BH_02_1.5, BH_04_0.2, BH_04_0.5, BH_05_0.2, BH_05_1.0, BH_07_0.2, BH_07_0.5, BH_10_0.5, BH_10_1.5, BH_09_0.4, BH_09_1.0, BH_08_0.2, BH_08_1.2, BH_06_0.5, BH_06_1.0, BH_06_1.7	**30-May-2022**	**03-Jun-2022**	27-Jun-2022	✓	**03-Jun-2022**	27-Jun-2022	✓
Soil Glass Jar - Unpreserved (EG035T)							
BH_20_1.0	**30-May-2022**	**03-Jun-2022**	27-Jun-2022	✓	**06-Jun-2022**	27-Jun-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP066: Polychlorinated Biphenyls (PCB)							
Soil Glass Jar - Unpreserved (EP066)							
BH_20_0.2, BH_20_1.0, BH_0.1_0.5, BH_0.1_1.0, BH_0.3_0.2, BH_0.3_0.5, BH_02_0.5, BH_02_1.5, BH_04_0.2, BH_04_0.5, BH_05_0.2, BH_05_1.0, BH_07_0.2, BH_07_0.5, BH_10_0.5, BH_10_1.5, BH_09_0.4, BH_09_1.0, BH_08_0.2, BH_08_1.2, BH_06_0.5, BH_06_1.0, BH_06_1.7	**30-May-2022**	**03-Jun-2022**	13-Jun-2022	✓	**04-Jun-2022**	13-Jul-2022	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068)							
BH_20_0.2, BH_20_1.0, BH_0.1_0.5, BH_0.1_1.0, BH_0.3_0.2, BH_0.3_0.5, BH_02_0.5, BH_02_1.5, BH_04_0.2, BH_04_0.5, BH_05_0.2, BH_05_1.0, BH_07_0.2, BH_07_0.5, BH_10_0.5, BH_10_1.5, BH_09_0.4, BH_09_1.0, BH_08_0.2, BH_08_1.2, BH_06_0.5, BH_06_1.0, BH_06_1.7	**30-May-2022**	**03-Jun-2022**	13-Jun-2022	✓	**04-Jun-2022**	13-Jul-2022	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
BH_20_0.2, BH_20_1.0, BH_0.1_0.5, BH_0.1_1.0, BH_0.3_0.2, BH_0.3_0.5, BH_02_0.5, BH_02_1.5, BH_04_0.2, BH_04_0.5, BH_05_0.2, BH_05_1.0, BH_07_0.2, BH_07_0.5, BH_10_0.5, BH_10_1.5, BH_09_0.4, BH_09_1.0, BH_08_0.2, BH_08_1.2, BH_06_0.5, BH_06_1.0, BH_06_1.7	**30-May-2022**	**03-Jun-2022**	13-Jun-2022	✓	**04-Jun-2022**	13-Jul-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080)								
BH_20_0.2,	BH_20_1.0,	**30-May-2022**	**02-Jun-2022**	13-Jun-2022	✓	**03-Jun-2022**	13-Jun-2022	✓
BH_0.1_0.5,	BH_0.1_1.0,							
BH_0.3_0.2,	BH_0.3_0.5,							
BH_02_0.5,	BH_02_1.5,							
BH_04_0.2,	BH_04_0.5,							
BH_05_0.2,	BH_05_1.0,							
BH_07_0.2,	BH_07_0.5,							
BH_10_0.5,	BH_10_1.5,							
BH_09_0.4,	BH_09_1.0,							
BH_08_0.2,	BH_08_1.2							
Soil Glass Jar - Unpreserved (EP071)								
BH_20_0.2,	BH_20_1.0,	**30-May-2022**	**03-Jun-2022**	13-Jun-2022	✓	**03-Jun-2022**	13-Jul-2022	✓
BH_0.1_0.5,	BH_0.1_1.0,							
BH_0.3_0.2,	BH_0.3_0.5,							
BH_02_0.5,	BH_02_1.5,							
BH_04_0.2,	BH_04_0.5,							
BH_05_0.2,	BH_05_1.0,							
BH_07_0.2,	BH_07_0.5,							
BH_10_0.5,	BH_10_1.5,							
BH_09_0.4,	BH_09_1.0,							
BH_08_0.2,	BH_08_1.2							
Soil Glass Jar - Unpreserved (EP080)								
BH_06_0.5,	BH_06_1.0,	**30-May-2022**	**03-Jun-2022**	13-Jun-2022	✓	**04-Jun-2022**	13-Jun-2022	✓
BH_06_1.7								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080)							
BH_20_0.2, BH_20_1.0, BH_0.1_0.5, BH_0.1_1.0, BH_0.3_0.2, BH_0.3_0.5, BH_02_0.5, BH_02_1.5, BH_04_0.2, BH_04_0.5, BH_05_0.2, BH_05_1.0, BH_07_0.2, BH_07_0.5, BH_10_0.5, BH_10_1.5, BH_09_0.4, BH_09_1.0, BH_08_0.2, BH_08_1.2	**30-May-2022**	**02-Jun-2022**	13-Jun-2022	✓	**03-Jun-2022**	13-Jun-2022	✓
Soil Glass Jar - Unpreserved (EP071)							
BH_20_0.2, BH_20_1.0, BH_0.1_0.5, BH_0.1_1.0, BH_0.3_0.2, BH_0.3_0.5, BH_02_0.5, BH_02_1.5, BH_04_0.2, BH_04_0.5, BH_05_0.2, BH_05_1.0, BH_07_0.2, BH_07_0.5, BH_10_0.5, BH_10_1.5, BH_09_0.4, BH_09_1.0, BH_08_0.2, BH_08_1.2	**30-May-2022**	**03-Jun-2022**	13-Jun-2022	✓	**03-Jun-2022**	13-Jul-2022	✓
Soil Glass Jar - Unpreserved (EP080)							
BH_06_0.5, BH_06_1.0, BH_06_1.7	**30-May-2022**	**03-Jun-2022**	13-Jun-2022	✓	**04-Jun-2022**	13-Jun-2022	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
BH_20_0.2, BH_20_1.0, BH_0.1_0.5, BH_0.1_1.0, BH_0.3_0.2, BH_0.3_0.5, BH_02_0.5, BH_02_1.5, BH_04_0.2, BH_04_0.5, BH_05_0.2, BH_05_1.0, BH_07_0.2, BH_07_0.5, BH_10_0.5, BH_10_1.5, BH_09_0.4, BH_09_1.0, BH_08_0.2, BH_08_1.2	**30-May-2022**	**02-Jun-2022**	13-Jun-2022	✓	**03-Jun-2022**	13-Jun-2022	✓
Soil Glass Jar - Unpreserved (EP080)							
BH_06_0.5, BH_06_1.0, BH_06_1.7	**30-May-2022**	**03-Jun-2022**	13-Jun-2022	✓	**04-Jun-2022**	13-Jun-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	5	49	**10.20**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	4	31	**12.90**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	3	28	**10.71**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	3	25	**12.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	5	49	**10.20**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	5	49	**10.20**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	4	36	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	49	**6.12**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	49	**6.12**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	49	**6.12**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	49	**6.12**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	49	**6.12**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	49	**6.12**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	In house: Referenced to Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3).
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.

Preparation Methods	Method	Matrix	Method Descriptions
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

ASS / Brisbane
Asbestos / Newcastle
Subcon / Forward Lab / Split WO
Lab / Analysis:
Organised By / Date:
Relinquished By / Date:
Courier tracking:
WO No:
Attach By PO - Internal Sheet

CHAIN OF CUSTODY DOCUMENTATION

SESL AUSTRALIA

SESL Australia Pty Ltd	
16 Chilvers Rd, Thornleigh NSW 2120 Australia	LABORATORY: ALS
ABN 70 106 810 709	LABORATORY ADDRESS:
PROJECT LOCATION: Newcastle Foreshore Park NSW 2300	SAMPLER: Leo HO
PROJECT NUMBER: J003951	SAMPLER CONTACT No: 0431 075 936
PROJECT MANAGER: Leo HO	Email Reports to: Leo.h@sesl.com.au ; results@sesl.com.au; andres@sesl.com.au
PM CONTACT No: 0431 075 936	Email Invoices to: Leo.h@sesl.com.au ; payables@sesl.com.au

Turnaround Time -- -- (TAT) --: COC Number 1 of 5

☐ Standard TAT
☐ Non Standard or Urgent TAT
Required TAT:

COMMENTS OR ADDITIONAL DIRECTIONS

3 Esky.
4 Double Asb Bag (Double Based)

No.	Sample ID	Date & Time	Matrix (Soil, water, ACM, etc)	Containers and Preservatives	Suite 5-8 (TRH, BTEXN, PAH, OCP, PCB, 8 Metals)	Asbestos in Soil (presence/absence)	Chromium Suite					Hold	Additional Information (Comment on any gross contamination or specific requirements)
1	BH_20_0.2	/05/22	Soil	1 Jar, 1 bag	X	X							
2	BH_20_0.5	/05/22	Soil									X	
3	BH_20_1.0	/05/22	Soil		X	X							
4	BH_20_2.0	/05/22	Soil				X						
5	BH_01_0.2	/05/22	Soil									X	
6	BH_01_0.5	/05/22	Soil		X	X							
7	BH_01_1.0	/05/22	Soil		X	X							
8	BH_01_1.5	/05/22	Soil				X						
9	BH_03_0.2	/05/22	Soil		X	X							
10	BH_03_0.5	/05/22	Soil		X	X							

Environmental Division Sydney
Work Order Reference
ES2218839

Telephone : - 61-2-8784 8555

I attest that the proper field sampling procedure [redacted]

Relinquished By Sampler	[redacted]	Date / Time 30/5	Received by	[redacted]	Date / Time 30/5/22 16:20
Relinquished By	[redacted]	Date / Time 22 17:00	Received by	Sign	Date / Time
Relinquished By	[redacted]	Date / Time 30/5 4:18 pm	Received by	Sign	Date / Time

Temperature Received: 3.8°C (Cee)

E-MAILED

PM 30/5/22 2140

CHAIN OF CUSTODY DOCUMENTATION

SESL AUSTRALIA

SESL Australia Pty Ltd	
16 Chilvers Rd, Thornleigh NSW 2120 Australia	LABORATORY: ALS
ABN 70 106 810 709	LABORATORY ADDRESS:
PROJECT LOCATION: Newcastle Foreshore Park NSW 2300	SAMPLER: Leo HO
PROJECT NUMBER: 3003951	SAMPLER CONTACT No: 0431 075 936
PROJECT MANAGER: Leo HO	Email Reports to: Leo.h@sesl.com.au ; results@sesl.com.au; andres@sesl.com.au
PM CONTACT No: 0431 075 936	Email Invoices to: Leo.h@sesl.com.au ; payables@sesl.com.au

Turnaround Time (TAT): COC Number: 2 of 5

☐ Standard TAT

☐ Non Standard or Urgent TAT

Required TAT:

COMMENTS OR ADDITIONAL DIRECTIONS

No.	Sample ID	Date & Time	Matrix (Soil, water, ACM, etc)	Containers and Preservatives	REQUESTED ANALYSIS: Suite S-8 (TRH, BTEXN, PAH, OCP, PCB, 8 Metals)	Asbestos in Soil (presence/absence)	Chromium Suite					Hold	Additional Information (Comment on any gross contamination or specific requirements)
11	BH_03_0.9	/05/22	Soil				X						
12	BH_02_0.2	/05/22	Soil									X	
13	BH_02_0.5	/05/22	Soil		X	X							
14	BH_02_1.0	/05/22	Soil									X	
15	BH_02_1.5	/05/22	Soil		X	X	X						
16	BH_03_1.5	/05/22	Soil									X	
17	BH_04_0.2	/05/22	Soil		X	X							
18	BH_04_0.5	/05/22	Soil		X	X							
19	BH_04_1.0	/05/22	Soil				[illegible]					X	
20	BH_04_1.5	/05/22	Soil				X						

I attest that the proper field sampling procedures were used during the collection of these samples.

Relinquished By Sampler	[redacted]	Date / Time 7015	Received by	[redacted]	Date / Time 30/4/22 16:20
Relinquished By	[redacted]	Date / Time 4:18 pm	Received by	Sign	Date / Time
Relinquished By	[redacted]	Date / Time	Received by	Sign	Date / Time

Temperature Received: (ice) 5.8°C

DP 30/4/22 7140

CHAIN OF CUSTODY DOCUMENTATION

SESL AUSTRALIA

SESL Australia Pty Ltd	
16 Chilvers Rd, Thornleigh NSW 2120 Australia	LABORATORY: ALS
ABN 70 106 810 709	LABORATORY ADDRESS:
PROJECT LOCATION: Newcastle Foreshore Park NSW 2300	SAMPLER: Leo HO
PROJECT NUMBER: J003951	SAMPLER CONTACT No: 0431 075 936
PROJECT MANAGER: Leo HO	Email Reports to: Leo.h@sesl.com.au ; results@sesl.com.au; andres@sesl.com.au
PM CONTACT No: 0431 075 936	Email Invoices to: Leo.h@sesl.com.au ; payables@sesl.com.au

Turnaround Time (TAT): ☐ Standard TAT ☐ Non Standard or Urgent TAT — Required TAT:

COC Number: 3 of 5

COMMENTS OR ADDITIONAL DIRECTIONS

No.	Sample ID	Date & Time	Matrix (Soil, water, ACM, etc)	Containers and Preservatives	REQUESTED ANALYSIS: Suite S-8 (TRH, BTEXN, PAH, OCP, PCB, 8 Metals)	Asbestos in Soil (presence/absence)	Chromium Suite					Hold	Additional Information (Comment on any gross contamination or specific requirements)
21	BH_05_0.2	/05/22	Soil		X	X							
22	BH_05_0.5	/05/22	Soil									X	
23	BH_05_1.0	/05/22	Soil		X	X							
24	BH_05_2.0	/05/22	Soil									X	
25	BH_05_3.5	/05/22	Soil				X						
26	BH_07_0.2	/05/22	Soil		X	X							
27	BH_07_0.5	/05/22	Soil		X	X							
28	BH_07_1.0	/05/22	Soil				X						
29	BH_	/05/22	Soil										
30	BH_	/05/22	Soil										

I attest that the proper field sampling procedures were used during the collection of these samples.

Relinquished By Sampler	[redacted]	Date / Time 30/5 4:18 pm	Received by	[redacted]	Date / Time 16.20	Temperature Received: (Ice) 3.8°C
Relinquished By	[redacted]	Date / Time 17.05	Received by	Sign	Date / Time	
Relinquished By	[redacted]	Date / Time	Received by	Sign	Date / Time	

P1 30/5/22 7:40

CHAIN OF CUSTODY DOCUMENTATION

SESL AUSTRALIA

SESL Australia Pty Ltd	
16 Chilvers Rd, Thornleigh NSW 2120 Australia	LABORATORY: ALS
ABN 70 106 810 709	LABORATORY ADDRESS:
PROJECT LOCATION: Newcastle Foreshore Park NSW 2300	SAMPLER: Leo HO
PROJECT NUMBER: J003951	SAMPLER CONTACT No: 0431 075 936
PROJECT MANAGER: Leo HO	Email Reports to: Leo.h@sesl.com.au ; results@sesl.com.au; andres@sesl.com.au
PM CONTACT No: 0431 075 936	Email Invoices to: Leo.h@sesl.com.au ; payables@sesl.com.au

Turnaround Time (TAT): COC Number 4 of 5

☐ Standard TAT

☐ Non Standard or Urgent TAT

Required TAT:

COMMENTS OR ADDITIONAL DIRECTIONS

	No.	Sample ID	Date & Time	Matrix (Soil, water, ACM, etc)	Containers and Preservatives	REQUESTED ANALYSIS: Suite S-8 (TRH, BTEXN, PAH, OCP, PCB, 8 Metals)	Asbestos in Soil (presence/absence)	Chromium Suite					Hold	Additional Information (Comment on any gross contamination or specific requirements)
29	31	BH_10_0.2	/05/22	Soil									X	
30	32	BH_10_0.5	/05/22	Soil		X	X							
31	33	BH_10_1.0	/05/22	Soil									X	
32	34	BH_10_1.5	/05/22	Soil		X	X	X						
33	35	BH_09_0.2	/05/22	Soil									X	
34	36	BH_09_0.4	/05/22	Soil		X	X							
35	37	BH_09_1.0	/05/22	Soil		X	X							
36	38	BH_09_1.6	/05/22	Soil									X	
37	39	BH_08_0.2	/05/22	Soil		X	X							
38	40	BH_08_0.4	/05/22	Soil									X	

I attest that the proper field sampling procedures were used during the collection of these samples

Relinquished By Sampler	[redacted]	Date / Time 30/5 4:18 pm	Received by	[redacted]	Date / Time 30/5/22 16:20
Relinquished By	[redacted]	Date / Time 30/5/22 17:00	Received by	Sign	Date / Time
Relinquished By	[redacted]	Date / Time	Received by	Sign	Date / Time

Temperature Received: 3.8°C (ice)

PM 30/5/22 17:40

CHAIN OF CUSTODY DOCUMENTATION

SESL AUSTRALIA

SESL Australia Pty Ltd	
16 Chilvers Rd, Thornleigh NSW 2120 Australia	LABORATORY: ALS
ABN 70 106 810 709	LABORATORY ADDRESS:
PROJECT LOCATION: Newcastle Foreshore Park NSW 2300	SAMPLER: Leo HO
PROJECT NUMBER: J003951	SAMPLER CONTACT No: 0431 075 936
PROJECT MANAGER: Leo HO	Email Reports to: Leo.h@sesl.com.au ; results@sesl.com.au; andres@sesl.com.au
PM CONTACT No: 0431 075 936	Email Invoices to: Leo.h@sesl.com.au ; payables@sesl.com.au

Turnaround Time (TAT): ☐ Standard TAT ☐ Non Standard or Urgent TAT — Required TAT:

COC Number: 5 of 5

COMMENTS OR ADDITIONAL DIRECTIONS

	No.	Sample ID	Date & Time	Matrix (Soil, water, ACM, etc)	Containers and Preservatives	REQUESTED ANALYSIS: Suite S-8 (TRH, BTEXN, PAH, OCP, PCB, 8 Metals)	Asbestos in Soil (presence/absence)	Chromium Suite					Hold	Additional Information (Comment on any gross contamination or specific requirements)
39	41	BH_08_0.8	/05/22	Soil									X	
40	42	BH_08_1.2	/05/22	Soil		X	X							
41	43	BH_08_1.7	/05/22	Soil				X						
42	44	BH_06_0.2	/05/22	Soil									X	
43	45	BH_06_0.5	/05/22	Soil		X	X							
44	46	BH_06_0.8	/05/22	Soil									X	
45	47	BH_06_1.4	/05/22	Soil									X	
46	48	BH_06_1.7	/05/22	Soil		X	X							
47	49	BH_06_2.0	/05/22	Soil				X						
48		~~BH~~ DUP	/05/22	Soil										

I attest that the proper field sampling procedures were used during the collection of these samples.

Relinquished By Sampler	[redacted]	Date / Time 30/5 4:18 pm	Received by	[redacted]	Date / Time 30/5/22 16:20
Relinquished By	[redacted]	Date / Time 30/5/22 17:00	Received by	Sign	Date / Time
Relinquished By	[redacted]	Date / Time	Received by	Sign	Date / Time

Temperature Received: 3.8°C (ice)

PM 30/5/22 7:40

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2219062**	Page	: 1 of 29
Client	: **SESL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LEO HO	Contact	: [redacted]
Address	: 16 CHILVERS ROAD THORNLEIGH 2120	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: [redacted]
Project	: J003951	Date Samples Received	: 01-Jun-2022 07:39
Order number	: ----	Date Analysis Commenced	: 03-Jun-2022
C-O-C number	: ----	Issue Date	: 14-Jun-2022 14:22
Sampler	: [redacted]		
Site	: Newcastle Foreshore Park NSW 2300		
Quote number	: SYBQ/404/21 SYDNEY BLANKET QUOTE		
No. of samples received	: 45		
No. of samples analysed	: 30		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alana Smylie	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EP080: Batch ES2219062-45 Result has been confirmed by re-analysis.
- EP071: Results of sample Duplicate 2 have been confirmed by re-extraction and re-analysis.
- EP066 : Positive PCB result for sample #ES2219062_039 is confirmed by re-extraction and re-analysis.
- EG005T: Poor precision was obtained for Chromium and Zinc on sample ES2219056 # 001. Confirmed by redigestion and reanalysis.
- EG035: Positive Mercury result ES2219062 #3 has been confirmed by reanalysis.
- ASS: EA033 (CRS Suite):Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) 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/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2

- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_11_0.2	BH_11_1.0	BH_11_2.0	BH_15_0.5	BH_15_1.2
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-001	ES2219062-003	ES2219062-005	ES2219062-007	ES2219062-008
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	----	7.1	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	<0.02	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	----	0.023	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	----	14	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.19	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	38	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.06	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	1.5	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	----	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	<10	----	----
Liming Rate	----	1	kg CaCO3/t	----	----	<1	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	----	0.02	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	----	14	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	----	1	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	14.7	16.7	----	9.6	14.4
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	----	No	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	----	No	No
Asbestos Type	1332-21-4	-	--	-	-	----	-	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	----	No	No
Organic Fibre	----	0.1	g/kg	No	No	----	No	No
Sample weight (dry)	----	0.01	g	403	361	----	508	590
APPROVED IDENTIFIER:	----	-	--	A. SMYLIE	A. SMYLIE	----	A. SMYLIE	A. SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	7	108	----	<5	12
Cadmium	7440-43-9	1	mg/kg	<1	21	----	<1	1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_11_0.2	BH_11_1.0	BH_11_2.0	BH_15_0.5	BH_15_1.2
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-001	ES2219062-003	ES2219062-005	ES2219062-007	ES2219062-008
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		12	12	----	12	8
Copper	7440-50-8	5	mg/kg		38	444	----	17	94
Lead	7439-92-1	5	mg/kg		95	1610	----	39	451
Nickel	7440-02-0	2	mg/kg		14	16	----	5	18
Zinc	7440-66-6	5	mg/kg		144	1580	----	94	1040
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		0.2	0.8	----	<0.1	0.2
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	<0.1	----	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_11_0.2	BH_11_1.0	BH_11_2.0	BH_15_0.5	BH_15_1.2
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-001	ES2219062-003	ES2219062-005	ES2219062-007	ES2219062-008
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	**0.6**	**1.9**	----	**3.0**	**1.5**
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	**0.8**	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	**1.7**	**2.3**	----	**7.6**	**2.1**
Pyrene	129-00-0	0.5	mg/kg	**1.6**	**2.2**	----	**6.8**	**2.0**
Benz(a)anthracene	56-55-3	0.5	mg/kg	**0.8**	**1.1**	----	**2.8**	**1.1**
Chrysene	218-01-9	0.5	mg/kg	**0.7**	**1.1**	----	**2.5**	**1.1**
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	**1.0**	**1.1**	----	**3.2**	**1.0**
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	**1.3**	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	**1.0**	**0.9**	----	**3.2**	**0.7**
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	**0.5**	<0.5	----	**1.7**	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	**0.6**	<0.5	----	**2.1**	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	**8.5**	**10.6**	----	**35.0**	**9.5**
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	**1.2**	**1.1**	----	**4.1**	**0.9**
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**1.5**	**1.4**	----	**4.4**	**1.2**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.8**	**1.7**	----	**4.6**	**1.5**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	<50	<50
C15 - C28 Fraction	----	100	mg/kg	**120**	**1050**	----	<100	**580**
C29 - C36 Fraction	----	100	mg/kg	<100	**930**	----	<100	**330**
^ C10 - C36 Fraction (sum)	----	50	mg/kg	**120**	**1980**	----	<50	**910**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	**80**	----	<50	**80**
>C16 - C34 Fraction	----	100	mg/kg	**180**	**1730**	----	<100	**780**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_11_0.2	BH_11_1.0	BH_11_2.0	BH_15_0.5	BH_15_1.2
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-001	ES2219062-003	ES2219062-005	ES2219062-007	ES2219062-008
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	460	----	<100	190
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		180	2270	----	<50	1050
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	80	----	<50	80
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	----	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		78.1	118	----	92.6	95.6
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		68.5	112	----	92.2	106
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		86.9	112	----	71.3	99.6
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		83.7	80.4	----	83.0	78.6
2-Chlorophenol-D4	93951-73-6	0.5	%		95.2	86.2	----	89.9	84.7
2.4.6-Tribromophenol	118-79-6	0.5	%		78.7	84.2	----	83.0	87.0
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		109	87.7	----	92.6	88.3
Anthracene-d10	1719-06-8	0.5	%		114	81.1	----	94.7	81.5
4-Terphenyl-d14	1718-51-0	0.5	%		98.7	81.8	----	90.6	84.7
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		104	97.3	----	117	123
Toluene-D8	2037-26-5	0.2	%		98.7	86.6	----	119	112
4-Bromofluorobenzene	460-00-4	0.2	%		81.8	82.5	----	96.2	93.9

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_15_1.7	BH_18_0.2	BH_18_0.5	BH_18_2.2	BH_14_0.2
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-009	ES2219062-010	ES2219062-011	ES2219062-014	ES2219062-015
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	6.7	----	----	6.8	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.022	----	----	0.021	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	14	----	----	13	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.36	----	----	0.24	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	73	----	----	48	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.12	----	----	0.08	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	----	----	1.5	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	<0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	<10	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	<1	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.02	----	----	0.02	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	14	----	----	13	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	1	----	----	<1	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	11.1	7.6	----	12.3
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	No	No	----	No
Asbestos (Trace)	1332-21-4	5	Fibres	----	No	No	----	No
Asbestos Type	1332-21-4	-	--	----	-	-	----	-
Synthetic Mineral Fibre	----	0.1	g/kg	----	No	No	----	No
Organic Fibre	----	0.1	g/kg	----	No	No	----	No
Sample weight (dry)	----	0.01	g	----	629	597	----	408
APPROVED IDENTIFIER:	----	-	--	----	A. SMYLIE	A. SMYLIE	----	A. SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	<5	<5	----	<5
Cadmium	7440-43-9	1	mg/kg	----	<1	<1	----	<1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_15_1.7	BH_18_0.2	BH_18_0.5	BH_18_2.2	BH_14_0.2
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-009	ES2219062-010	ES2219062-011	ES2219062-014	ES2219062-015
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		----	15	7	----	19
Copper	7440-50-8	5	mg/kg		----	12	21	----	10
Lead	7439-92-1	5	mg/kg		----	10	78	----	<5
Nickel	7440-02-0	2	mg/kg		----	15	5	----	18
Zinc	7440-66-6	5	mg/kg		----	31	124	----	28
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		----	<0.1	<0.1	----	<0.1
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		----	<0.1	<0.1	----	<0.1
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Endrin	72-20-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		----	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_15_1.7	BH_18_0.2	BH_18_0.5	BH_18_2.2	BH_14_0.2
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-009	ES2219062-010	ES2219062-011	ES2219062-014	ES2219062-015
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Fluorene	86-73-7	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		----	<0.5	1.2	----	<0.5
Anthracene	120-12-7	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		----	<0.5	3.0	----	<0.5
Pyrene	129-00-0	0.5	mg/kg		----	<0.5	2.9	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	<0.5	1.3	----	<0.5
Chrysene	218-01-9	0.5	mg/kg		----	<0.5	1.3	----	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		----	<0.5	1.8	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	<0.5	0.8	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	1.9	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	1.0	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	1.3	----	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	16.5	----	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	2.4	----	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	0.6	2.7	----	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	1.2	2.9	----	1.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	<10	<10	----	<10
C10 - C14 Fraction	----	50	mg/kg		----	<50	<50	----	<50
C15 - C28 Fraction	----	100	mg/kg		----	<100	<100	----	<100
C29 - C36 Fraction	----	100	mg/kg		----	<100	110	----	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	<50	110	----	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	<10	<10	----	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	<10	<10	----	<10
>C10 - C16 Fraction	----	50	mg/kg		----	<50	<50	----	<50
>C16 - C34 Fraction	----	100	mg/kg		----	<100	170	----	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_15_1.7	BH_18_0.2	BH_18_0.5	BH_18_2.2	BH_14_0.2
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-009	ES2219062-010	ES2219062-011	ES2219062-014	ES2219062-015
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C34 - C40 Fraction	----	100	mg/kg	----	<100	<100	----	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	----	<50	170	----	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	----	<50	<50	----	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	<0.2	<0.2	----	<0.2
Toluene	108-88-3	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
^ Sum of BTEX	----	0.2	mg/kg	----	<0.2	<0.2	----	<0.2
^ Total Xylenes	----	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Naphthalene	91-20-3	1	mg/kg	----	<1	<1	----	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	84.8	83.4	----	78.5
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	----	87.4	79.2	----	88.4
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	----	52.0	80.9	----	68.5
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	----	80.8	83.0	----	82.2
2-Chlorophenol-D4	93951-73-6	0.5	%	----	87.2	90.0	----	88.1
2.4.6-Tribromophenol	118-79-6	0.5	%	----	76.7	79.8	----	77.8
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	----	90.4	91.5	----	90.3
Anthracene-d10	1719-06-8	0.5	%	----	94.0	93.1	----	94.6
4-Terphenyl-d14	1718-51-0	0.5	%	----	89.6	90.1	----	89.4
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	----	117	119	----	116
Toluene-D8	2037-26-5	0.2	%	----	117	119	----	110
4-Bromofluorobenzene	460-00-4	0.2	%	----	98.0	103	----	96.4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_14_0.5	BH_14_1.5	BH_14_2.0	BH_17_0.5	BH_17_1.5
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-016	ES2219062-018	ES2219062-019	ES2219062-021	ES2219062-023
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	----	9.3	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	<0.02	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	----	0.022	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	----	14	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.68	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	135	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.22	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	1.5	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	----	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	<10	----	----
Liming Rate	----	1	kg CaCO3/t	----	----	<1	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	----	0.02	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	----	14	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	----	1	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	11.2	10.3	----	13.2	19.5
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	----	No	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	----	No	No
Asbestos Type	1332-21-4	-	--	-	-	----	-	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	----	No	No
Organic Fibre	----	0.1	g/kg	No	No	----	No	No
Sample weight (dry)	----	0.01	g	453	433	----	352	710
APPROVED IDENTIFIER:	----	-	--	A. SMYLIE	A. SMYLIE	----	A. SMYLIE	A. SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	10	7	----	12	<5
Cadmium	7440-43-9	1	mg/kg	<1	1	----	2	<1

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Sample ID	BH_14_0.5	BH_14_1.5	BH_14_2.0	BH_17_0.5	BH_17_1.5
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
					ES2219062-016	ES2219062-018	ES2219062-019	ES2219062-021	ES2219062-023
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		**9**	**10**	**----**	**5**	**6**
Copper	7440-50-8	5	mg/kg		**58**	**51**	**----**	**107**	**72**
Lead	7439-92-1	5	mg/kg		**217**	**111**	**----**	**114**	**182**
Nickel	7440-02-0	2	mg/kg		**13**	**11**	**----**	**17**	**8**
Zinc	7440-66-6	5	mg/kg		**181**	**549**	**----**	**438**	**89**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		**0.2**	**0.1**	**----**	**0.1**	**0.5**
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	<0.1	**----**	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	**----**	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	**----**	<0.2	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	**----**	<0.05	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_14_0.5	BH_14_1.5	BH_14_2.0	BH_17_0.5	BH_17_1.5
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-016	ES2219062-018	ES2219062-019	ES2219062-021	ES2219062-023
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	**4.8**	**0.7**	----	<0.5	**1.0**
Anthracene	120-12-7	0.5	mg/kg	**1.2**	<0.5	----	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	**8.7**	**1.0**	----	**1.1**	**1.4**
Pyrene	129-00-0	0.5	mg/kg	**7.6**	**0.9**	----	**1.2**	**1.4**
Benz(a)anthracene	56-55-3	0.5	mg/kg	**3.3**	**0.5**	----	**0.5**	**0.8**
Chrysene	218-01-9	0.5	mg/kg	**3.0**	**0.5**	----	**0.5**	**0.8**
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	**4.3**	<0.5	----	**0.8**	**0.8**
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	**1.6**	<0.5	----	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	**3.9**	<0.5	----	**0.7**	**0.7**
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	**2.0**	<0.5	----	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	**2.4**	<0.5	----	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	**42.8**	**3.6**	----	**4.8**	**6.9**
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	**5.1**	<0.5	----	**0.8**	**0.9**
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**5.3**	**0.6**	----	**1.1**	**1.2**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**5.6**	**1.2**	----	**1.4**	**1.5**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	<10	**23**
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	<50	<50
C15 - C28 Fraction	----	100	mg/kg	**180**	**280**	----	**110**	<100
C29 - C36 Fraction	----	100	mg/kg	**170**	**160**	----	**120**	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	**350**	**440**	----	**230**	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	<10	**13**
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	<10	**13**
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	**280**	**380**	----	**190**	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_14_0.5	BH_14_1.5	BH_14_2.0	BH_17_0.5	BH_17_1.5
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-016	ES2219062-018	ES2219062-019	ES2219062-021	ES2219062-023
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		**120**	<100	----	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**400**	**380**	----	**190**	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	----	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	----	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**93.9**	**70.9**	----	**82.0**	**85.8**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**101**	**56.6**	----	**81.7**	**99.6**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**86.3**	**61.0**	----	**90.4**	**95.9**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**80.2**	**83.7**	----	**66.6**	**79.5**
2-Chlorophenol-D4	93951-73-6	0.5	%		**86.7**	**90.0**	----	**72.8**	**85.7**
2.4.6-Tribromophenol	118-79-6	0.5	%		**77.2**	**81.2**	----	**65.2**	**80.9**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**87.0**	**88.3**	----	**88.0**	**86.1**
Anthracene-d10	1719-06-8	0.5	%		**88.2**	**87.1**	----	**87.4**	**84.3**
4-Terphenyl-d14	1718-51-0	0.5	%		**86.8**	**87.4**	----	**85.9**	**83.9**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**117**	**108**	----	**110**	**94.0**
Toluene-D8	2037-26-5	0.2	%		**113**	**99.9**	----	**101**	**90.0**
4-Bromofluorobenzene	460-00-4	0.2	%		**95.0**	**87.3**	----	**84.4**	**74.4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_17_2.0	BH_19_0.2	BH_19_1.0	BH_19_1.5	BH_12_0.5
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-024	ES2219062-025	ES2219062-027	ES2219062-028	ES2219062-030
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.4	----	----	9.4	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.020	----	----	0.022	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	13	----	----	14	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.59	----	----	0.36	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	117	----	----	71	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.19	----	----	0.11	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	----	----	1.5	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	<0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	<10	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	<1	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.02	----	----	0.02	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	13	----	----	14	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	----	----	1	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	13.1	10.5	----	11.6
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	No	No	----	No
Asbestos (Trace)	1332-21-4	5	Fibres	----	No	No	----	No
Asbestos Type	1332-21-4	-	--	----	-	-	----	-
Synthetic Mineral Fibre	----	0.1	g/kg	----	No	No	----	No
Organic Fibre	----	0.1	g/kg	----	No	No	----	No
Sample weight (dry)	----	0.01	g	----	430	393	----	552
APPROVED IDENTIFIER:	----	-	--	----	A. SMYLIE	A. SMYLIE	----	A. SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	6	9	----	<5
Cadmium	7440-43-9	1	mg/kg	----	<1	<1	----	<1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_17_2.0	BH_19_0.2	BH_19_1.0	BH_19_1.5	BH_12_0.5
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-024	ES2219062-025	ES2219062-027	ES2219062-028	ES2219062-030
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		----	6	6	----	9
Copper	7440-50-8	5	mg/kg		----	22	108	----	15
Lead	7439-92-1	5	mg/kg		----	150	456	----	68
Nickel	7440-02-0	2	mg/kg		----	5	10	----	5
Zinc	7440-66-6	5	mg/kg		----	140	363	----	86
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		----	0.2	0.5	----	0.1
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		----	<0.1	<0.1	----	<0.1
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Endrin	72-20-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		----	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_17_2.0	BH_19_0.2	BH_19_1.0	BH_19_1.5	BH_12_0.5
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-024	ES2219062-025	ES2219062-027	ES2219062-028	ES2219062-030
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	<0.5	----	1.7
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	----	2.9	<0.5	----	6.9
Anthracene	120-12-7	0.5	mg/kg	----	0.7	<0.5	----	2.8
Fluoranthene	206-44-0	0.5	mg/kg	----	6.6	0.8	----	13.4
Pyrene	129-00-0	0.5	mg/kg	----	6.2	0.7	----	13.7
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	2.1	0.5	----	7.4
Chrysene	218-01-9	0.5	mg/kg	----	2.0	<0.5	----	6.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	2.6	0.7	----	6.7
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	1.1	<0.5	----	2.9
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	2.7	0.5	----	7.1
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	1.4	<0.5	----	2.8
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	<0.5	----	0.8
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	1.8	<0.5	----	3.2
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	30.1	3.2	----	75.9
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	3.4	0.6	----	10.0
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	----	3.7	0.9	----	10.0
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	----	4.0	1.2	----	10.0
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	<10	25	----	<10
C10 - C14 Fraction	----	50	mg/kg	----	<50	<50	----	<50
C15 - C28 Fraction	----	100	mg/kg	----	120	160	----	320
C29 - C36 Fraction	----	100	mg/kg	----	<100	110	----	220
^ C10 - C36 Fraction (sum)	----	50	mg/kg	----	120	270	----	540
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	<10	24	----	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	----	<10	21	----	<10
>C10 - C16 Fraction	----	50	mg/kg	----	<50	<50	----	<50
>C16 - C34 Fraction	----	100	mg/kg	----	180	230	----	480

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_17_2.0	BH_19_0.2	BH_19_1.0	BH_19_1.5	BH_12_0.5
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-024	ES2219062-025	ES2219062-027	ES2219062-028	ES2219062-030
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		----	<100	<100	----	**120**
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		----	**180**	**230**	----	**600**
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		----	<50	<50	----	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	**2.2**	----	**1.1**
Toluene	108-88-3	0.5	mg/kg		----	<0.5	**0.8**	----	**1.0**
Ethylbenzene	100-41-4	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		----	<0.2	**3.0**	----	**2.1**
^ **Total Xylenes**	----	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Naphthalene	91-20-3	1	mg/kg		----	<1	<1	----	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	**70.8**	**73.9**	----	**86.7**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	**88.6**	**96.9**	----	**88.3**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	**73.0**	**91.5**	----	**75.1**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	**81.2**	**79.8**	----	**81.8**
2-Chlorophenol-D4	93951-73-6	0.5	%		----	**88.4**	**85.8**	----	**88.3**
2.4.6-Tribromophenol	118-79-6	0.5	%		----	**80.4**	**78.9**	----	**80.9**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	**89.1**	**88.7**	----	**90.4**
Anthracene-d10	1719-06-8	0.5	%		----	**89.9**	**89.5**	----	**90.9**
4-Terphenyl-d14	1718-51-0	0.5	%		----	**88.1**	**87.4**	----	**91.0**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	**118**	**98.4**	----	**111**
Toluene-D8	2037-26-5	0.2	%		----	**110**	**98.2**	----	**103**
4-Bromofluorobenzene	460-00-4	0.2	%		----	**94.6**	**89.9**	----	**89.9**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_12_2.0	BH_12_2.5	BH_16_0.2	BH_16_1.0	BH_16_2.6
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-032	ES2219062-033	ES2219062-034	ES2219062-036	ES2219062-038
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	9.4	----	----	7.5
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	----	----	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	<0.02	----	----	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	0.025	----	----	0.032
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	16	----	----	20
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	1.72	----	----	0.19
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	344	----	----	38
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	0.55	----	----	0.06
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	1.5	----	----	1.5
Net Acidity (sulfur units)	----	0.02	% S	----	<0.02	----	----	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	----	<10	----	----	<10
Liming Rate	----	1	kg CaCO3/t	----	<1	----	----	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	0.02	----	----	0.03
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	16	----	----	20
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	1	----	----	1
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	13.0	----	10.7	9.8	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	----	No	No	----
Asbestos (Trace)	1332-21-4	5	Fibres	No	----	No	No	----
Asbestos Type	1332-21-4	-	--	-	----	-	-	----
Synthetic Mineral Fibre	----	0.1	g/kg	No	----	No	No	----
Organic Fibre	----	0.1	g/kg	No	----	No	No	----
Sample weight (dry)	----	0.01	g	384	----	414	473	----
APPROVED IDENTIFIER:	----	-	--	A. SMYLIE	----	A. SMYLIE	A. SMYLIE	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	43	----	10	6	----
Cadmium	7440-43-9	1	mg/kg	2	----	<1	<1	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_12_2.0	BH_12_2.5	BH_16_0.2	BH_16_1.0	BH_16_2.6
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-032	ES2219062-033	ES2219062-034	ES2219062-036	ES2219062-038
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		**5**	----	**6**	**8**	----
Copper	7440-50-8	5	mg/kg		**114**	----	**25**	**22**	----
Lead	7439-92-1	5	mg/kg		**229**	----	**75**	**126**	----
Nickel	7440-02-0	2	mg/kg		**14**	----	**6**	**6**	----
Zinc	7440-66-6	5	mg/kg		**395**	----	**152**	**110**	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		**0.6**	----	**0.1**	**0.1**	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	----	<0.1	<0.1	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
Aldrin	309-00-2	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
Endrin	72-20-8	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	<0.2	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	<0.05	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	<0.2	<0.2	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	----	<0.05	<0.05	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_12_2.0	BH_12_2.5	BH_16_0.2	BH_16_1.0	BH_16_2.6
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-032	ES2219062-033	ES2219062-034	ES2219062-036	ES2219062-038
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	**2.5**	----	**3.4**	**1.1**	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	**0.8**	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	**1.9**	----	**9.3**	**2.3**	----
Pyrene	129-00-0	0.5	mg/kg	**2.2**	----	**8.3**	**2.2**	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	**1.2**	----	**3.4**	**1.0**	----
Chrysene	218-01-9	0.5	mg/kg	**1.2**	----	**3.3**	**0.9**	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	**1.4**	----	**4.8**	**1.2**	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	**1.7**	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	**1.4**	----	**4.2**	**1.2**	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	**0.5**	----	**2.7**	**0.6**	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	**0.5**	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	**0.8**	----	**3.4**	**0.6**	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	**13.1**	----	**45.8**	**11.1**	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	**1.7**	----	**6.0**	**1.5**	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**2.0**	----	**6.0**	**1.8**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**2.3**	----	**6.0**	**2.0**	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	**64**	----	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg	**80**	----	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg	**840**	----	**130**	<100	----
C29 - C36 Fraction	----	100	mg/kg	**360**	----	<100	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	**1280**	----	**130**	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	**44**	----	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	**44**	----	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg	**140**	----	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg	**1050**	----	**200**	**150**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_12_2.0	BH_12_2.5	BH_16_0.2	BH_16_1.0	BH_16_2.6
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-032	ES2219062-033	ES2219062-034	ES2219062-036	ES2219062-038
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		**200**	----	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**1390**	----	**200**	**150**	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		**140**	----	<50	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	<0.2	<0.2	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg		<1	----	<1	<1	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**70.3**	----	**78.0**	**73.5**	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**83.0**	----	**88.2**	**79.9**	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**80.0**	----	**67.9**	**71.9**	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**79.2**	----	**80.1**	**74.1**	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**87.4**	----	**87.0**	**80.3**	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**83.5**	----	**74.6**	**66.4**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**88.5**	----	**89.7**	**85.1**	----
Anthracene-d10	1719-06-8	0.5	%		**79.9**	----	**90.2**	**88.3**	----
4-Terphenyl-d14	1718-51-0	0.5	%		**83.4**	----	**87.4**	**83.5**	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**105**	----	**114**	**94.9**	----
Toluene-D8	2037-26-5	0.2	%		**93.2**	----	**110**	**87.7**	----
4-Bromofluorobenzene	460-00-4	0.2	%		**79.2**	----	**94.3**	**76.2**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_13_0.2	BH_13_0.5	BH_13_3.5	Duplicate 1	Duplicate 2
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-039	ES2219062-040	ES2219062-043	ES2219062-044	ES2219062-045
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	----	9.5	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	<0.02	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	----	0.060	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	----	37	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	1.31	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	261	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.42	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	1.5	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	----	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	<10	----	----
Liming Rate	----	1	kg CaCO3/t	----	----	<1	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	----	0.06	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	----	37	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	----	3	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	14.1	11.4	----	12.1	12.7
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	----	No	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	----	No	No
Asbestos Type	1332-21-4	-	--	-	-	----	-	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	----	No	No
Organic Fibre	----	0.1	g/kg	No	No	----	No	No
Sample weight (dry)	----	0.01	g	584	531	----	399	391
APPROVED IDENTIFIER:	----	-	--	A. SMYLIE	A. SMYLIE	----	A. SMYLIE	A. SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	<5	38
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	<1	2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_13_0.2	BH_13_0.5	BH_13_3.5	Duplicate 1	Duplicate 2
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-039	ES2219062-040	ES2219062-043	ES2219062-044	ES2219062-045
				Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued								
Chromium	7440-47-3	2	mg/kg	4	6	----	20	10
Copper	7440-50-8	5	mg/kg	18	13	----	14	150
Lead	7439-92-1	5	mg/kg	53	70	----	8	626
Nickel	7440-02-0	2	mg/kg	4	4	----	19	19
Zinc	7440-66-6	5	mg/kg	98	74	----	30	887
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	<0.1	0.5
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	0.2	<0.1	----	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	----	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_13_0.2	BH_13_0.5	BH_13_3.5	Duplicate 1	Duplicate 2
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-039	ES2219062-040	ES2219062-043	ES2219062-044	ES2219062-045
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	**0.6**	**1.4**	----	<0.5	**0.8**
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	**1.4**	**3.1**	----	<0.5	**1.8**
Pyrene	129-00-0	0.5	mg/kg	**1.4**	**2.9**	----	<0.5	**1.8**
Benz(a)anthracene	56-55-3	0.5	mg/kg	**0.6**	**1.4**	----	<0.5	**0.9**
Chrysene	218-01-9	0.5	mg/kg	**0.5**	**1.2**	----	<0.5	**1.0**
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	**0.7**	**1.6**	----	<0.5	**1.2**
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	**0.6**	----	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	**0.7**	**1.7**	----	<0.5	**1.0**
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	**0.8**	----	<0.5	**0.5**
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	**0.5**	**0.9**	----	<0.5	**0.5**
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	**6.4**	**15.6**	----	<0.5	**9.5**
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	**0.8**	**2.2**	----	<0.5	**1.3**
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**1.1**	**2.4**	----	**0.6**	**1.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.4**	**2.7**	----	**1.2**	**1.8**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	<10	**34**
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	----	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	<10	**31**
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	<10	**29**
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	**100**	**110**	----	<100	**140**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_13_0.2	BH_13_0.5	BH_13_3.5	Duplicate 1	Duplicate 2
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-039	ES2219062-040	ES2219062-043	ES2219062-044	ES2219062-045
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	----	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**100**	**110**	----	<50	**140**
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	----	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	----	<0.2	**1.6**
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	**0.6**
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	----	<0.2	**2.2**
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	----	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**75.0**	**74.4**	----	**61.1**	**83.4**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**80.2**	**130**	----	**110**	**72.8**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**72.6**	**85.7**	----	**66.0**	**91.0**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**79.6**	**83.0**	----	**80.5**	**82.5**
2-Chlorophenol-D4	93951-73-6	0.5	%		**86.9**	**90.5**	----	**85.7**	**91.9**
2.4.6-Tribromophenol	118-79-6	0.5	%		**76.6**	**76.4**	----	**68.5**	**72.7**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**87.5**	**94.5**	----	**88.8**	**114**
Anthracene-d10	1719-06-8	0.5	%		**90.3**	**96.6**	----	**94.2**	**113**
4-Terphenyl-d14	1718-51-0	0.5	%		**86.8**	**94.4**	----	**89.4**	**103**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**99.9**	**106**	----	**116**	**114**
Toluene-D8	2037-26-5	0.2	%		**93.6**	**104**	----	**113**	**110**
4-Bromofluorobenzene	460-00-4	0.2	%		**84.2**	**89.9**	----	**98.4**	**105**

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Sample ID - Sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	BH_11_0.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_11_1.0 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_15_0.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_15_1.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_18_0.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_18_0.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_14_0.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_14_0.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_14_1.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_17_0.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_17_1.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_19_0.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_19_1.0 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_12_0.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_12_2.0 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_16_0.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_16_1.0 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_13_0.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_13_0.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	Duplicate 1 - 31-May-2022 00:00	Soil sample.
EA200: Description	Duplicate 2 - 31-May-2022 00:00	Soil sample.

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EA033-B: Potential Acidity

(SOIL) EA033-C: Acid Neutralising Capacity

(SOIL) EA033-D: Retained Acidity

(SOIL) EA033-A: Actual Acidity

(SOIL) EA033-E: Acid Base Accounting

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(SOIL) EA200: AS 4964 - 2004 Identification of Asbestos in Soils

QUALITY CONTROL REPORT

Work Order	: **ES2219062**	Page	: 1 of 17
Client	: **SESL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: [redacted]	Contact	: [redacted]
Address	: 16 CHILVERS ROAD THORNLEIGH 2120	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +[redacted]
Project	: J003951	Date Samples Received	: 01-Jun-2022
Order number	: ----	Date Analysis Commenced	: 03-Jun-2022
C-O-C number	: ----	Issue Date	: 14-Jun-2022
Sampler	: Leo Ho		
Site	: Newcastle Foreshore Park NSW 2300		
Quote number	: SYBQ/404/21 SYDNEY BLANKET QUOTE		
No. of samples received	: 45		
No. of samples analysed	: 30		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alana Smylie	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4387248)									
ES2219056-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	34	# 58	53.6	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	57	60	6.1	0% - 20%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	91	79	14.4	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	42	60	36.7	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	109	# 177	47.1	0% - 20%
ES2219062-016	BH_14_0.5	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	9	12	23.4	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	13	11	16.9	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	10	8	24.1	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	58	47	20.7	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	217	187	15.2	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	181	178	2.0	0% - 20%
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4387250)									
ES2219062-039	BH_13_0.2	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	4	4	24.7	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	4	3	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	6	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	18	19	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	53	49	7.4	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	98	93	5.3	0% - 50%
ES2219105-007	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	5	6	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4387250) - continued									
ES2219105-007	Anonymous	EG005T: Nickel	7440-02-0	2	mg/kg	6	6	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	9	9	0.0	No Limit
EA033-A: Actual Acidity (QC Lot: 4392597)									
EB2216336-001	Anonymous	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	6.1	6.1	0.0	0% - 20%
ES2219062-028	BH_19_1.5	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	9.4	9.4	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 4392597)									
EB2216336-001	Anonymous	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.023	0.023	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	15	14	0.0	No Limit
ES2219062-028	BH_19_1.5	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.022	0.022	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	14	14	0.0	No Limit
EA033-C: Acid Neutralising Capacity (QC Lot: 4392597)									
ES2219062-028	BH_19_1.5	EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.36	0.32	11.2	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.11	0.10	11.2	0% - 50%
		EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	71	64	11.2	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4387256)									
ES2219056-005	Anonymous	EA055: Moisture Content	----	0.1	%	15.6	15.1	3.2	0% - 50%
ES2219062-021	BH_17_0.5	EA055: Moisture Content	----	0.1	%	13.2	15.4	15.5	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4387257)									
ES2219062-040	BH_13_0.5	EA055: Moisture Content	----	0.1	%	11.4	10.9	5.0	0% - 50%
ES2219105-009	Anonymous	EA055: Moisture Content	----	0.1	%	4.5	4.7	4.8	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4387249)									
ES2219056-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2219062-016	BH_14_0.5	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4387251)									
ES2219062-039	BH_13_0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2219105-007	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 4378934)									
ES2219062-001	BH_11_0.2	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 4378934) - continued									
ES2219062-023	BH_17_1.5	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 4379950)									
ES2219062-045	Duplicate 2	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2219426-001	Anonymous	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 4378933)									
ES2219062-001	BH_11_0.2	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
ES2219062-023	BH_17_1.5	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 4378933) - continued									
ES2219062-023	BH_17_1.5	EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 4379953)									
ES2219062-045	Duplicate 2	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
ES2219426-001	Anonymous	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 4379953) - continued									
ES2219426-001	Anonymous	EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4378932)									
ES2219062-001	BH_11_0.2	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	0.6	<0.5	23.3	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.7	1.6	7.2	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.6	1.6	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	0.8	0.8	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	0.7	0.8	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	1.0	0.9	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.0	1.0	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.6	0.6	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	8.5	7.3	15.2	0% - 50%
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	1.2	1.2	0.0	No Limit
ES2219062-023	BH_17_1.5	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	1.0	1.1	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.4	1.3	8.9	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.4	1.2	11.1	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	0.8	0.7	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4378932) - continued									
ES2219062-023	BH_17_1.5	EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	0.8	0.7	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	0.8	0.8	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	0.7	0.6	15.6	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	6.9	6.4	7.5	0% - 50%
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	0.9	0.8	13.7	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4379952)									
ES2219062-045	Duplicate 2	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	0.8	0.8	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.8	1.9	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.8	1.8	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	0.9	1.0	12.9	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	1.0	1.0	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	1.2	1.4	12.8	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.0	1.1	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	0.5	0.6	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.5	0.6	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	9.5	10.7	11.9	0% - 20%
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	1.3	1.5	13.9	No Limit
ES2219426-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4379952) - continued									
ES2219426-001	Anonymous	EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4378931)									
ES2219062-001	BH_11_0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	120	120	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2219062-023	BH_17_1.5	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4379951)									
ES2219062-045	Duplicate 2	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2219426-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4380817)									
ES2219062-001	BH_11_0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES2219062-023	BH_17_1.5	EP080: C6 - C9 Fraction	----	10	mg/kg	23	20	13.2	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4380818)									
ES2219105-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES2219105-011	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4378931)									
ES2219062-001	BH_11_0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	180	160	10.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2219062-023	BH_17_1.5	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4379951)									
ES2219062-045	Duplicate 2	EP071: >C16 - C34 Fraction	----	100	mg/kg	140	130	13.8	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2219426-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4380817)									
ES2219062-001	BH_11_0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES2219062-023	BH_17_1.5	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	13	11	17.6	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4380818)									
ES2219105-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES2219105-011	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080: BTEXN (QC Lot: 4380817)									
ES2219062-001	BH_11_0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES2219062-023	BH_17_1.5	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP080: BTEXN (QC Lot: 4380818)									
ES2219105-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES2219105-011	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 4380818) - continued									
ES2219105-011	Anonymous	EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4387248)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	88.2	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	107	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	98.5	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	106	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	97.9	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	97.0	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	97.2	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4387250)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	88.0	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	99.4	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	93.0	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	105	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	95.0	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	92.9	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	91.2	66.0	133
EA033-A: Actual Acidity (QCLot: 4392597)								
EA033: pH KCl (23A)	----	----	pH Unit	----	4.4 pH Unit	98.5	91.0	107
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	19 mole H+ / t	78.2	70.0	124
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity (QCLot: 4392597)								
EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	0.246 % S	98.6	77.0	121
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 4392597)								
EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	<0.01	10 % CaCO3	99.6	91.0	112
EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	<0.01	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4387249)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	85.6	70.0	125
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4387251)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	90.2	70.0	125
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4378934)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	107	62.0	126
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4379950)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4379950) - continued								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	74.2	62.0	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 4378933)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	93.6	69.0	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	88.1	65.0	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	95.9	67.0	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	105	68.0	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	81.1	65.0	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.4	67.0	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	104	69.0	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	81.4	62.0	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	88.2	63.0	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	87.4	66.0	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	79.4	64.0	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	102	66.0	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	106	67.0	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	106	67.0	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	106	69.0	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.6	69.0	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	78.7	56.0	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	93.8	62.0	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	94.8	66.0	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	88.2	64.0	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	90.8	54.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 4379953)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	102	69.0	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	93.8	65.0	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	91.8	67.0	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	95.8	68.0	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	91.5	65.0	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	86.5	67.0	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	91.7	69.0	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	97.8	62.0	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	98.0	63.0	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	98.0	66.0	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	95.0	64.0	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	96.1	66.0	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	95.3	67.0	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	85.6	67.0	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	102	69.0	115

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 4379953) - continued								
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	94.8	69.0	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	101	56.0	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	99.6	62.0	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	76.8	66.0	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	96.2	64.0	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	79.6	54.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4378932)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	111	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	109	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	100	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	108	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	108	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	95.4	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	112	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	110	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	101	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	106	75.0	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	97.8	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	108	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	108	70.0	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	105	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	103	62.0	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	104	63.0	121
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4379952)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	113	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	109	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	105	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	109	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	111	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	98.6	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	113	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	111	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	102	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	112	75.0	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	98.5	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	112	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	109	70.0	126

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4379952) - continued								
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	106	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	105	62.0	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	103	63.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4378931)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	94.1	75.0	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	98.8	77.0	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	100	71.0	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4379951)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	86.1	75.0	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	93.5	77.0	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	96.0	71.0	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4380817)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	70.0	68.4	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4380818)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	105	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4378931)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	96.7	77.0	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	98.9	74.0	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	103	63.0	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4379951)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	91.4	77.0	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	93.4	74.0	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	100	63.0	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4380817)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	68.4	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4380818)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	100	68.4	128
EP080: BTEXN (QCLot: 4380817)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	78.4	62.0	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	74.9	67.0	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	72.4	65.0	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	76.1	66.0	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	76.8	68.0	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	76.8	63.0	119
EP080: BTEXN (QCLot: 4380818)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	108	62.0	116

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 4380818) - continued								
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	101	67.0	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	107	65.0	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	108	66.0	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	108	68.0	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	86.1	63.0	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4387248)							
ES2218897-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	101	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	90.0	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	# Not Determined	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	103	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	# Not Determined	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	98.3	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	# Not Determined	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4387250)							
ES2219062-036	BH_16_1.0	EG005T: Arsenic	7440-38-2	50 mg/kg	92.9	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	97.0	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	92.7	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	98.2	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	86.4	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	95.7	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	98.8	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4387249)							
ES2219056-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	89.9	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4387251)							
ES2219062-039	BH_13_0.2	EG035T: Mercury	7439-97-6	5 mg/kg	91.8	70.0	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4378934)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4378934) - continued							
ES2219062-001	BH_11_0.2	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	93.2	70.0	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4379950)							
ES2219062-045	Duplicate 2	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	83.1	70.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 4378933)							
ES2219062-001	BH_11_0.2	EP068: gamma-BHC	58-89-9	0.5 mg/kg	107	70.0	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	116	70.0	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	76.1	70.0	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	108	70.0	130
		EP068: Endrin	72-20-8	2 mg/kg	103	70.0	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	108	70.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 4379953)							
ES2219062-045	Duplicate 2	EP068: gamma-BHC	58-89-9	0.5 mg/kg	90.1	70.0	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	88.9	70.0	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	80.9	70.0	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	102	70.0	130
		EP068: Endrin	72-20-8	2 mg/kg	94.1	70.0	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	113	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4378932)							
ES2219062-001	BH_11_0.2	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	93.9	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	129	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4379952)							
ES2219062-045	Duplicate 2	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	96.3	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	95.4	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4378931)							
ES2219062-001	BH_11_0.2	EP071: C10 - C14 Fraction	----	480 mg/kg	109	73.0	137
		EP071: C15 - C28 Fraction	----	3100 mg/kg	113	53.0	131
		EP071: C29 - C36 Fraction	----	2060 mg/kg	117	52.0	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4379951)							
ES2219062-045	Duplicate 2	EP071: C10 - C14 Fraction	----	480 mg/kg	99.8	73.0	137
		EP071: C15 - C28 Fraction	----	3100 mg/kg	100	53.0	131
		EP071: C29 - C36 Fraction	----	2060 mg/kg	108	52.0	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4380817)							
ES2219062-001	BH_11_0.2	EP080: C6 - C9 Fraction	----	32.5 mg/kg	126	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4380818)							
ES2219062-045	Duplicate 2	EP080: C6 - C9 Fraction	----	32.5 mg/kg	76.7	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4378931)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4378931) - continued							
ES2219062-001	BH_11_0.2	EP071: >C10 - C16 Fraction	----	860 mg/kg	104	73.0	137
		EP071: >C16 - C34 Fraction	----	4320 mg/kg	116	53.0	131
		EP071: >C34 - C40 Fraction	----	890 mg/kg	112	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4379951)							
ES2219062-045	Duplicate 2	EP071: >C10 - C16 Fraction	----	860 mg/kg	85.7	73.0	137
		EP071: >C16 - C34 Fraction	----	4320 mg/kg	104	53.0	131
		EP071: >C34 - C40 Fraction	----	890 mg/kg	108	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4380817)							
ES2219062-001	BH_11_0.2	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	118	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4380818)							
ES2219062-045	Duplicate 2	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	87.0	70.0	130
EP080: BTEXN (QCLot: 4380817)							
ES2219062-001	BH_11_0.2	EP080: Benzene	71-43-2	2.5 mg/kg	118	70.0	130
		EP080: Toluene	108-88-3	2.5 mg/kg	114	70.0	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	122	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	125	70.0	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	123	70.0	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	96.7	70.0	130
EP080: BTEXN (QCLot: 4380818)							
ES2219062-045	Duplicate 2	EP080: Benzene	71-43-2	2.5 mg/kg	93.4	70.0	130
		EP080: Toluene	108-88-3	2.5 mg/kg	93.6	70.0	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	96.4	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	97.9	70.0	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	101	70.0	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	95.7	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2219062**	Page	: 1 of 10
Client	: **SESL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: [redacted]	Telephone	: [redacted]
Project	: J003951	Date Samples Received	: 01-Jun-2022
Site	: Newcastle Foreshore Park NSW 2300	Issue Date	: 14-Jun-2022
Sampler	: Leo Ho	No. of samples received	: 45
Order number	: ----	No. of samples analysed	: 30

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005(ED093)T: Total Metals by ICP-AES	ES2219056--001	Anonymous	**Chromium**	7440-47-3	53.6 %	0% - 20%	**RPD exceeds LOR based limits**
EG005(ED093)T: Total Metals by ICP-AES	ES2219056--001	Anonymous	**Zinc**	7440-66-6	47.1 %	0% - 20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EG005(ED093)T: Total Metals by ICP-AES	ES2218897--001	Anonymous	**Chromium**	7440-47-3	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005(ED093)T: Total Metals by ICP-AES	ES2218897--001	Anonymous	**Lead**	7439-92-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005(ED093)T: Total Metals by ICP-AES	ES2218897--001	Anonymous	**Zinc**	7440-66-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity							
Snap Lock Bag - frozen on receipt at ALS (EA033)							
BH_11_2.0, BH_15_1.7, BH_18_2.2, BH_14_2.0, BH_17_2.0, BH_19_1.5, BH_12_2.5, BH_16_2.6, BH_13_3.5	**31-May-2022**	**13-Jun-2022**	31-May-2023	✓	**13-Jun-2022**	11-Sep-2022	✓
EA033-B: Potential Acidity							
Snap Lock Bag - frozen on receipt at ALS (EA033)							
BH_11_2.0, BH_15_1.7, BH_18_2.2, BH_14_2.0, BH_17_2.0, BH_19_1.5, BH_12_2.5, BH_16_2.6, BH_13_3.5	**31-May-2022**	**13-Jun-2022**	31-May-2023	✓	**13-Jun-2022**	11-Sep-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-C: Acid Neutralising Capacity							
Snap Lock Bag - frozen on receipt at ALS (EA033)							
BH_11_2.0, BH_15_1.7, BH_18_2.2, BH_14_2.0, BH_17_2.0, BH_19_1.5, BH_12_2.5, BH_16_2.6, BH_13_3.5	**31-May-2022**	**13-Jun-2022**	31-May-2023	✓	**13-Jun-2022**	11-Sep-2022	✓
EA033-D: Retained Acidity							
Snap Lock Bag - frozen on receipt at ALS (EA033)							
BH_11_2.0, BH_15_1.7, BH_18_2.2, BH_14_2.0, BH_17_2.0, BH_19_1.5, BH_12_2.5, BH_16_2.6, BH_13_3.5	**31-May-2022**	**13-Jun-2022**	31-May-2023	✓	**13-Jun-2022**	11-Sep-2022	✓
EA033-E: Acid Base Accounting							
Snap Lock Bag - frozen on receipt at ALS (EA033)							
BH_11_2.0, BH_15_1.7, BH_18_2.2, BH_14_2.0, BH_17_2.0, BH_19_1.5, BH_12_2.5, BH_16_2.6, BH_13_3.5	**31-May-2022**	**13-Jun-2022**	31-May-2023	✓	**13-Jun-2022**	11-Sep-2022	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**----**	----	----	**08-Jun-2022**	14-Jun-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA200: AS 4964 - 2004 Identification of Asbestos in Soils							
Snap Lock Bag - Friable Asbestos/PSD Bag (EA200)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**----**	----	----	**03-Jun-2022**	27-Nov-2022	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**09-Jun-2022**	27-Nov-2022	✓	**09-Jun-2022**	27-Nov-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**09-Jun-2022**	28-Jun-2022	✓	**09-Jun-2022**	28-Jun-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP066: Polychlorinated Biphenyls (PCB)							
Soil Glass Jar - Unpreserved (EP066)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**06-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	16-Jul-2022	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**06-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	16-Jul-2022	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**06-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	16-Jul-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**05-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	14-Jun-2022	✓
Soil Glass Jar - Unpreserved (EP071)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**06-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	16-Jul-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**05-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	14-Jun-2022	✓
Soil Glass Jar - Unpreserved (EP071)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**06-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	16-Jul-2022	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**05-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	14-Jun-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chromium Suite for Acid Sulphate Soils	EA033	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	4	31	**12.90**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Chromium Suite for Acid Sulphate Soils	EA033	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chromium Suite for Acid Sulphate Soils	EA033	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	In house: Referenced to Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3).
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.

Preparation Methods	Method	Matrix	Method Descriptions
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2219062**	Page	: 1 of 32
Amendment	: **1**		
Client	: **SESL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: [redacted]	Contact	: [redacted]
Address	: 16 CHILVERS ROAD THORNLEIGH 2120	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: [redacted]
Project	: J003951	Date Samples Received	: 01-Jun-2022 07:39
Order number	: ----	Date Analysis Commenced	: 03-Jun-2022
C-O-C number	: ----	Issue Date	: 29-Jun-2022 11:25
Sampler	: Leo Ho		
Site	: Newcastle Foreshore Park NSW 2300		
Quote number	: SYBQ/404/21 SYDNEY BLANKET QUOTE		
No. of samples received	: 45		
No. of samples analysed	: 31		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alana Smylie	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EP080: Batch ES2219062-45 Result has been confirmed by re-analysis.
- EP071: Results of sample Duplicate 2 have been confirmed by re-extraction and re-analysis.
- EP066 : Positive PCB result for sample #ES2219062_039 is confirmed by re-extraction and re-analysis.
- EG005T: Poor precision was obtained for Chromium and Zinc on sample ES2219056 # 001. Confirmed by redigestion and reanalysis.
- EG035: Positive Mercury result ES2219062 #3 has been confirmed by reanalysis.
- ASS: EA033 (CRS Suite):Retained Acidity not required because pH KCl greater than or equal to 4.5
- Amendment (27/06/2022):This report has been amended to report PAH for sample BH12_0.2.
- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) 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/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.

- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_11_0.2	BH_11_1.0	BH_11_2.0	BH_15_0.5	BH_15_1.2
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-001	ES2219062-003	ES2219062-005	ES2219062-007	ES2219062-008
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	----	7.1	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	<0.02	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	----	0.023	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	----	14	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.19	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	38	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.06	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	1.5	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	----	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	<10	----	----
Liming Rate	----	1	kg CaCO3/t	----	----	<1	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	----	0.02	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	----	14	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	----	1	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	14.7	16.7	----	9.6	14.4
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	----	No	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	----	No	No
Asbestos Type	1332-21-4	-	--	-	-	----	-	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	----	No	No
Organic Fibre	----	0.1	g/kg	No	No	----	No	No
Sample weight (dry)	----	0.01	g	403	361	----	508	590
APPROVED IDENTIFIER:	----	-	--	A. SMYLIE	A. SMYLIE	----	A. SMYLIE	A. SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	7	108	----	<5	12
Cadmium	7440-43-9	1	mg/kg	<1	21	----	<1	1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_11_0.2	BH_11_1.0	BH_11_2.0	BH_15_0.5	BH_15_1.2
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-001	ES2219062-003	ES2219062-005	ES2219062-007	ES2219062-008
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		12	12	----	12	8
Copper	7440-50-8	5	mg/kg		38	444	----	17	94
Lead	7439-92-1	5	mg/kg		95	1610	----	39	451
Nickel	7440-02-0	2	mg/kg		14	16	----	5	18
Zinc	7440-66-6	5	mg/kg		144	1580	----	94	1040
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		0.2	0.8	----	<0.1	0.2
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	<0.1	----	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_11_0.2	BH_11_1.0	BH_11_2.0	BH_15_0.5	BH_15_1.2
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-001	ES2219062-003	ES2219062-005	ES2219062-007	ES2219062-008
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	**0.6**	**1.9**	----	**3.0**	**1.5**
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	**0.8**	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	**1.7**	**2.3**	----	**7.6**	**2.1**
Pyrene	129-00-0	0.5	mg/kg	**1.6**	**2.2**	----	**6.8**	**2.0**
Benz(a)anthracene	56-55-3	0.5	mg/kg	**0.8**	**1.1**	----	**2.8**	**1.1**
Chrysene	218-01-9	0.5	mg/kg	**0.7**	**1.1**	----	**2.5**	**1.1**
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	**1.0**	**1.1**	----	**3.2**	**1.0**
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	**1.3**	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	**1.0**	**0.9**	----	**3.2**	**0.7**
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	**0.5**	<0.5	----	**1.7**	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	**0.6**	<0.5	----	**2.1**	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	**8.5**	**10.6**	----	**35.0**	**9.5**
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	**1.2**	**1.1**	----	**4.1**	**0.9**
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**1.5**	**1.4**	----	**4.4**	**1.2**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.8**	**1.7**	----	**4.6**	**1.5**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	<50	<50
C15 - C28 Fraction	----	100	mg/kg	**120**	**1050**	----	<100	**580**
C29 - C36 Fraction	----	100	mg/kg	<100	**930**	----	<100	**330**
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	**120**	**1980**	----	<50	**910**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	----	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	**80**	----	<50	**80**
>C16 - C34 Fraction	----	100	mg/kg	**180**	**1730**	----	<100	**780**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_11_0.2	BH_11_1.0	BH_11_2.0	BH_15_0.5	BH_15_1.2
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-001	ES2219062-003	ES2219062-005	ES2219062-007	ES2219062-008
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	**460**	----	<100	**190**
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**180**	**2270**	----	<50	**1050**
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	**80**	----	<50	**80**
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	----	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**78.1**	**118**	----	**92.6**	**95.6**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**68.5**	**112**	----	**92.2**	**106**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**86.9**	**112**	----	**71.3**	**99.6**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**83.7**	**80.4**	----	**83.0**	**78.6**
2-Chlorophenol-D4	93951-73-6	0.5	%		**95.2**	**86.2**	----	**89.9**	**84.7**
2.4.6-Tribromophenol	118-79-6	0.5	%		**78.7**	**84.2**	----	**83.0**	**87.0**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**109**	**87.7**	----	**92.6**	**88.3**
Anthracene-d10	1719-06-8	0.5	%		**114**	**81.1**	----	**94.7**	**81.5**
4-Terphenyl-d14	1718-51-0	0.5	%		**98.7**	**81.8**	----	**90.6**	**84.7**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**104**	**97.3**	----	**117**	**123**
Toluene-D8	2037-26-5	0.2	%		**98.7**	**86.6**	----	**119**	**112**
4-Bromofluorobenzene	460-00-4	0.2	%		**81.8**	**82.5**	----	**96.2**	**93.9**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_15_1.7	BH_18_0.2	BH_18_0.5	BH_18_2.2	BH_14_0.2
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-009	ES2219062-010	ES2219062-011	ES2219062-014	ES2219062-015
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	6.7	----	----	6.8	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.022	----	----	0.021	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	14	----	----	13	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.36	----	----	0.24	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	73	----	----	48	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.12	----	----	0.08	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	----	----	1.5	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	<0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	<10	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	<1	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.02	----	----	0.02	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	14	----	----	13	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	1	----	----	<1	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	11.1	7.6	----	12.3
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	No	No	----	No
Asbestos (Trace)	1332-21-4	5	Fibres	----	No	No	----	No
Asbestos Type	1332-21-4	-	--	----	-	-	----	-
Synthetic Mineral Fibre	----	0.1	g/kg	----	No	No	----	No
Organic Fibre	----	0.1	g/kg	----	No	No	----	No
Sample weight (dry)	----	0.01	g	----	629	597	----	408
APPROVED IDENTIFIER:	----	-	--	----	A. SMYLIE	A. SMYLIE	----	A. SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	<5	<5	----	<5
Cadmium	7440-43-9	1	mg/kg	----	<1	<1	----	<1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_15_1.7	BH_18_0.2	BH_18_0.5	BH_18_2.2	BH_14_0.2
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-009	ES2219062-010	ES2219062-011	ES2219062-014	ES2219062-015
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		----	15	7	----	19
Copper	7440-50-8	5	mg/kg		----	12	21	----	10
Lead	7439-92-1	5	mg/kg		----	10	78	----	<5
Nickel	7440-02-0	2	mg/kg		----	15	5	----	18
Zinc	7440-66-6	5	mg/kg		----	31	124	----	28
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		----	<0.1	<0.1	----	<0.1
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		----	<0.1	<0.1	----	<0.1
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Endrin	72-20-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		----	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_15_1.7	BH_18_0.2	BH_18_0.5	BH_18_2.2	BH_14_0.2
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-009	ES2219062-010	ES2219062-011	ES2219062-014	ES2219062-015
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Fluorene	86-73-7	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		----	<0.5	**1.2**	----	<0.5
Anthracene	120-12-7	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		----	<0.5	**3.0**	----	<0.5
Pyrene	129-00-0	0.5	mg/kg		----	<0.5	**2.9**	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	<0.5	**1.3**	----	<0.5
Chrysene	218-01-9	0.5	mg/kg		----	<0.5	**1.3**	----	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		----	<0.5	**1.8**	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	<0.5	**0.8**	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	**1.9**	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	**1.0**	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	**1.3**	----	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	**16.5**	----	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	**2.4**	----	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	**0.6**	**2.7**	----	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	**1.2**	**2.9**	----	**1.2**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	<10	<10	----	<10
C10 - C14 Fraction	----	50	mg/kg		----	<50	<50	----	<50
C15 - C28 Fraction	----	100	mg/kg		----	<100	<100	----	<100
C29 - C36 Fraction	----	100	mg/kg		----	<100	**110**	----	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	<50	**110**	----	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	<10	<10	----	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	<10	<10	----	<10
>C10 - C16 Fraction	----	50	mg/kg		----	<50	<50	----	<50
>C16 - C34 Fraction	----	100	mg/kg		----	<100	**170**	----	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_15_1.7	BH_18_0.2	BH_18_0.5	BH_18_2.2	BH_14_0.2
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-009	ES2219062-010	ES2219062-011	ES2219062-014	ES2219062-015
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		----	<100	<100	----	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		----	<50	**170**	----	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		----	<50	<50	----	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
Toluene	108-88-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Naphthalene	91-20-3	1	mg/kg		----	<1	<1	----	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	**84.8**	**83.4**	----	**78.5**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	**87.4**	**79.2**	----	**88.4**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	**52.0**	**80.9**	----	**68.5**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	**80.8**	**83.0**	----	**82.2**
2-Chlorophenol-D4	93951-73-6	0.5	%		----	**87.2**	**90.0**	----	**88.1**
2.4.6-Tribromophenol	118-79-6	0.5	%		----	**76.7**	**79.8**	----	**77.8**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	**90.4**	**91.5**	----	**90.3**
Anthracene-d10	1719-06-8	0.5	%		----	**94.0**	**93.1**	----	**94.6**
4-Terphenyl-d14	1718-51-0	0.5	%		----	**89.6**	**90.1**	----	**89.4**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	**117**	**119**	----	**116**
Toluene-D8	2037-26-5	0.2	%		----	**117**	**119**	----	**110**
4-Bromofluorobenzene	460-00-4	0.2	%		----	**98.0**	**103**	----	**96.4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_14_0.5	BH_14_1.5	BH_14_2.0	BH_17_0.5	BH_17_1.5
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-016	ES2219062-018	ES2219062-019	ES2219062-021	ES2219062-023
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	----	9.3	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	<0.02	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	----	0.022	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	----	14	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	0.68	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	135	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.22	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	1.5	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	----	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	<10	----	----
Liming Rate	----	1	kg CaCO3/t	----	----	<1	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	----	0.02	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	----	14	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	----	1	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	11.2	10.3	----	13.2	19.5
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	----	No	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	----	No	No
Asbestos Type	1332-21-4	-	--	-	-	----	-	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	----	No	No
Organic Fibre	----	0.1	g/kg	No	No	----	No	No
Sample weight (dry)	----	0.01	g	453	433	----	352	710
APPROVED IDENTIFIER:	----	-	--	A. SMYLIE	A. SMYLIE	----	A. SMYLIE	A. SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	10	7	----	12	<5
Cadmium	7440-43-9	1	mg/kg	<1	1	----	2	<1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_14_0.5	BH_14_1.5	BH_14_2.0	BH_17_0.5	BH_17_1.5
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-016	ES2219062-018	ES2219062-019	ES2219062-021	ES2219062-023
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		9	10	----	5	6
Copper	7440-50-8	5	mg/kg		58	51	----	107	72
Lead	7439-92-1	5	mg/kg		217	111	----	114	182
Nickel	7440-02-0	2	mg/kg		13	11	----	17	8
Zinc	7440-66-6	5	mg/kg		181	549	----	438	89
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		0.2	0.1	----	0.1	0.5
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	<0.1	----	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_14_0.5	BH_14_1.5	BH_14_2.0	BH_17_0.5	BH_17_1.5
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-016	ES2219062-018	ES2219062-019	ES2219062-021	ES2219062-023
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	**4.8**	**0.7**	----	<0.5	**1.0**
Anthracene	120-12-7	0.5	mg/kg	**1.2**	<0.5	----	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	**8.7**	**1.0**	----	**1.1**	**1.4**
Pyrene	129-00-0	0.5	mg/kg	**7.6**	**0.9**	----	**1.2**	**1.4**
Benz(a)anthracene	56-55-3	0.5	mg/kg	**3.3**	**0.5**	----	**0.5**	**0.8**
Chrysene	218-01-9	0.5	mg/kg	**3.0**	**0.5**	----	**0.5**	**0.8**
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	**4.3**	<0.5	----	**0.8**	**0.8**
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	**1.6**	<0.5	----	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	**3.9**	<0.5	----	**0.7**	**0.7**
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	**2.0**	<0.5	----	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	**2.4**	<0.5	----	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	**42.8**	**3.6**	----	**4.8**	**6.9**
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	**5.1**	<0.5	----	**0.8**	**0.9**
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**5.3**	**0.6**	----	**1.1**	**1.2**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**5.6**	**1.2**	----	**1.4**	**1.5**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	<10	**23**
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	<50	<50
C15 - C28 Fraction	----	100	mg/kg	**180**	**280**	----	**110**	<100
C29 - C36 Fraction	----	100	mg/kg	**170**	**160**	----	**120**	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	**350**	**440**	----	**230**	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	<10	**13**
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	<10	**13**
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	**280**	**380**	----	**190**	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_14_0.5	BH_14_1.5	BH_14_2.0	BH_17_0.5	BH_17_1.5
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-016	ES2219062-018	ES2219062-019	ES2219062-021	ES2219062-023
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		**120**	<100	----	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		**400**	**380**	----	**190**	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	<50	----	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	----	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**93.9**	**70.9**	----	**82.0**	**85.8**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**101**	**56.6**	----	**81.7**	**99.6**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**86.3**	**61.0**	----	**90.4**	**95.9**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**80.2**	**83.7**	----	**66.6**	**79.5**
2-Chlorophenol-D4	93951-73-6	0.5	%		**86.7**	**90.0**	----	**72.8**	**85.7**
2.4.6-Tribromophenol	118-79-6	0.5	%		**77.2**	**81.2**	----	**65.2**	**80.9**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**87.0**	**88.3**	----	**88.0**	**86.1**
Anthracene-d10	1719-06-8	0.5	%		**88.2**	**87.1**	----	**87.4**	**84.3**
4-Terphenyl-d14	1718-51-0	0.5	%		**86.8**	**87.4**	----	**85.9**	**83.9**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**117**	**108**	----	**110**	**94.0**
Toluene-D8	2037-26-5	0.2	%		**113**	**99.9**	----	**101**	**90.0**
4-Bromofluorobenzene	460-00-4	0.2	%		**95.0**	**87.3**	----	**84.4**	**74.4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_17_2.0	BH_19_0.2	BH_19_1.0	BH_19_1.5	BH_12_0.2
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-024	ES2219062-025	ES2219062-027	ES2219062-028	ES2219062-029
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.4	----	----	9.4	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.020	----	----	0.022	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	13	----	----	14	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.59	----	----	0.36	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	117	----	----	71	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.19	----	----	0.11	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	----	----	1.5	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	<0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	<10	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	<1	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.02	----	----	0.02	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	13	----	----	14	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	----	----	1	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	----	----	11.4
Moisture Content	----	1.0	%	----	13.1	10.5	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	No	No	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	----	No	No	----	----
Asbestos Type	1332-21-4	-	--	----	-	-	----	----
Synthetic Mineral Fibre	----	0.1	g/kg	----	No	No	----	----
Organic Fibre	----	0.1	g/kg	----	No	No	----	----
Sample weight (dry)	----	0.01	g	----	430	393	----	----
APPROVED IDENTIFIER:	----	-	--	----	A. SMYLIE	A. SMYLIE	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	6	9	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_17_2.0	BH_19_0.2	BH_19_1.0	BH_19_1.5	BH_12_0.2
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-024	ES2219062-025	ES2219062-027	ES2219062-028	ES2219062-029
				Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued								
Cadmium	7440-43-9	1	mg/kg	----	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	----	**6**	**6**	----	----
Copper	7440-50-8	5	mg/kg	----	**22**	**108**	----	----
Lead	7439-92-1	5	mg/kg	----	**150**	**456**	----	----
Nickel	7440-02-0	2	mg/kg	----	**5**	**10**	----	----
Zinc	7440-66-6	5	mg/kg	----	**140**	**363**	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	**0.2**	**0.5**	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	<0.1	<0.1	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	<0.05	<0.05	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	<0.05	<0.05	----	----
beta-BHC	319-85-7	0.05	mg/kg	----	<0.05	<0.05	----	----
gamma-BHC	58-89-9	0.05	mg/kg	----	<0.05	<0.05	----	----
delta-BHC	319-86-8	0.05	mg/kg	----	<0.05	<0.05	----	----
Heptachlor	76-44-8	0.05	mg/kg	----	<0.05	<0.05	----	----
Aldrin	309-00-2	0.05	mg/kg	----	<0.05	<0.05	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	<0.05	<0.05	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	----	<0.05	<0.05	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	----	<0.05	<0.05	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	<0.05	<0.05	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	----	<0.05	<0.05	----	----
Dieldrin	60-57-1	0.05	mg/kg	----	<0.05	<0.05	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	----	<0.05	<0.05	----	----
Endrin	72-20-8	0.05	mg/kg	----	<0.05	<0.05	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	<0.05	<0.05	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	----	<0.05	<0.05	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	----	<0.05	<0.05	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	<0.05	<0.05	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	<0.05	<0.05	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	----	<0.2	<0.2	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	----	<0.05	<0.05	----	----
Methoxychlor	72-43-5	0.2	mg/kg	----	<0.2	<0.2	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_17_2.0	BH_19_0.2	BH_19_1.0	BH_19_1.5	BH_12_0.2
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-024	ES2219062-025	ES2219062-027	ES2219062-028	ES2219062-029
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	----	<0.05	<0.05	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	----	<0.05	<0.05	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	----	**2.9**	<0.5	----	<0.5
Anthracene	120-12-7	0.5	mg/kg	----	**0.7**	<0.5	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	----	**6.6**	**0.8**	----	<0.5
Pyrene	129-00-0	0.5	mg/kg	----	**6.2**	**0.7**	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	**2.1**	**0.5**	----	<0.5
Chrysene	218-01-9	0.5	mg/kg	----	**2.0**	<0.5	----	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	**2.6**	**0.7**	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	**1.1**	<0.5	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	**2.7**	**0.5**	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	**1.4**	<0.5	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	**1.8**	<0.5	----	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	**30.1**	**3.2**	----	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	**3.4**	**0.6**	----	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	----	**3.7**	**0.9**	----	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	----	**4.0**	**1.2**	----	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	<10	**25**	----	----
C10 - C14 Fraction	----	50	mg/kg	----	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg	----	**120**	**160**	----	----
C29 - C36 Fraction	----	100	mg/kg	----	<100	**110**	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	----	**120**	**270**	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	<10	**24**	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	----	<10	**21**	----	----
>C10 - C16 Fraction	----	50	mg/kg	----	<50	<50	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_17_2.0	BH_19_0.2	BH_19_1.0	BH_19_1.5	BH_12_0.2
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-024	ES2219062-025	ES2219062-027	ES2219062-028	ES2219062-029
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C16 - C34 Fraction	----	100	mg/kg		----	180	230	----	----
>C34 - C40 Fraction	----	100	mg/kg		----	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	180	230	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	<50	<50	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	2.2	----	----
Toluene	108-88-3	0.5	mg/kg		----	<0.5	0.8	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		----	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		----	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	3.0	----	----
^ Total Xylenes	----	0.5	mg/kg		----	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg		----	<1	<1	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	70.8	73.9	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	88.6	96.9	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	73.0	91.5	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	81.2	79.8	----	82.6
2-Chlorophenol-D4	93951-73-6	0.5	%		----	88.4	85.8	----	86.8
2.4.6-Tribromophenol	118-79-6	0.5	%		----	80.4	78.9	----	59.2
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	89.1	88.7	----	88.9
Anthracene-d10	1719-06-8	0.5	%		----	89.9	89.5	----	87.3
4-Terphenyl-d14	1718-51-0	0.5	%		----	88.1	87.4	----	81.2
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	118	98.4	----	----
Toluene-D8	2037-26-5	0.2	%		----	110	98.2	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		----	94.6	89.9	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_12_0.5	BH_12_2.0	BH_12_2.5	BH_16_0.2	BH_16_1.0
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-030	ES2219062-032	ES2219062-033	ES2219062-034	ES2219062-036
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	----	9.4	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	<0.02	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	----	0.025	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	----	16	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	1.72	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	344	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	0.55	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	1.5	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	----	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	<10	----	----
Liming Rate	----	1	kg CaCO3/t	----	----	<1	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	----	0.02	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	----	16	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	----	1	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	11.6	13.0	----	10.7	9.8
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	----	No	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	----	No	No
Asbestos Type	1332-21-4	-	--	-	-	----	-	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	----	No	No
Organic Fibre	----	0.1	g/kg	No	No	----	No	No
Sample weight (dry)	----	0.01	g	552	384	----	414	473
APPROVED IDENTIFIER:	----	-	--	A. SMYLIE	A. SMYLIE	----	A. SMYLIE	A. SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	43	----	10	6
Cadmium	7440-43-9	1	mg/kg	<1	2	----	<1	<1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_12_0.5	BH_12_2.0	BH_12_2.5	BH_16_0.2	BH_16_1.0
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-030	ES2219062-032	ES2219062-033	ES2219062-034	ES2219062-036
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		9	5	----	6	8
Copper	7440-50-8	5	mg/kg		15	114	----	25	22
Lead	7439-92-1	5	mg/kg		68	229	----	75	126
Nickel	7440-02-0	2	mg/kg		5	14	----	6	6
Zinc	7440-66-6	5	mg/kg		86	395	----	152	110
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		0.1	0.6	----	0.1	0.1
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	<0.1	----	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_12_0.5	BH_12_2.0	BH_12_2.5	BH_16_0.2	BH_16_1.0
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-030	ES2219062-032	ES2219062-033	ES2219062-034	ES2219062-036
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		**1.7**	<0.5	----	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		**6.9**	**2.5**	----	**3.4**	**1.1**
Anthracene	120-12-7	0.5	mg/kg		**2.8**	<0.5	----	**0.8**	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		**13.4**	**1.9**	----	**9.3**	**2.3**
Pyrene	129-00-0	0.5	mg/kg		**13.7**	**2.2**	----	**8.3**	**2.2**
Benz(a)anthracene	56-55-3	0.5	mg/kg		**7.4**	**1.2**	----	**3.4**	**1.0**
Chrysene	218-01-9	0.5	mg/kg		**6.5**	**1.2**	----	**3.3**	**0.9**
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		**6.7**	**1.4**	----	**4.8**	**1.2**
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		**2.9**	<0.5	----	**1.7**	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		**7.1**	**1.4**	----	**4.2**	**1.2**
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		**2.8**	**0.5**	----	**2.7**	**0.6**
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		**0.8**	<0.5	----	**0.5**	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		**3.2**	**0.8**	----	**3.4**	**0.6**
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		**75.9**	**13.1**	----	**45.8**	**11.1**
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg		**10.0**	**1.7**	----	**6.0**	**1.5**
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg		**10.0**	**2.0**	----	**6.0**	**1.8**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg		**10.0**	**2.3**	----	**6.0**	**2.0**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	**64**	----	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	**80**	----	<50	<50
C15 - C28 Fraction	----	100	mg/kg		**320**	**840**	----	**130**	<100
C29 - C36 Fraction	----	100	mg/kg		**220**	**360**	----	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg		**540**	**1280**	----	**130**	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	**44**	----	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg		<10	**44**	----	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	**140**	----	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		**480**	**1050**	----	**200**	**150**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_12_0.5	BH_12_2.0	BH_12_2.5	BH_16_0.2	BH_16_1.0
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-030	ES2219062-032	ES2219062-033	ES2219062-034	ES2219062-036
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		**120**	**200**	----	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		**600**	**1390**	----	**200**	**150**
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	**140**	----	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		**1.1**	<0.2	----	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		**1.0**	<0.5	----	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		**2.1**	<0.2	----	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	----	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**86.7**	**70.3**	----	**78.0**	**73.5**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**88.3**	**83.0**	----	**88.2**	**79.9**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**75.1**	**80.0**	----	**67.9**	**71.9**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**81.8**	**79.2**	----	**80.1**	**74.1**
2-Chlorophenol-D4	93951-73-6	0.5	%		**88.3**	**87.4**	----	**87.0**	**80.3**
2.4.6-Tribromophenol	118-79-6	0.5	%		**80.9**	**83.5**	----	**74.6**	**66.4**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**90.4**	**88.5**	----	**89.7**	**85.1**
Anthracene-d10	1719-06-8	0.5	%		**90.9**	**79.9**	----	**90.2**	**88.3**
4-Terphenyl-d14	1718-51-0	0.5	%		**91.0**	**83.4**	----	**87.4**	**83.5**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**111**	**105**	----	**114**	**94.9**
Toluene-D8	2037-26-5	0.2	%		**103**	**93.2**	----	**110**	**87.7**
4-Bromofluorobenzene	460-00-4	0.2	%		**89.9**	**79.2**	----	**94.3**	**76.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_16_2.6	BH_13_0.2	BH_13_0.5	BH_13_3.5	Duplicate 1
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-038	ES2219062-039	ES2219062-040	ES2219062-043	ES2219062-044
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	7.5	----	----	9.5	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.032	----	----	0.060	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	20	----	----	37	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.19	----	----	1.31	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	38	----	----	261	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.06	----	----	0.42	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	----	----	1.5	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	<0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	<10	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	<1	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.03	----	----	0.06	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	20	----	----	37	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	1	----	----	3	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	14.1	11.4	----	12.1
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	No	No	----	No
Asbestos (Trace)	1332-21-4	5	Fibres	----	No	No	----	No
Asbestos Type	1332-21-4	-	--	----	-	-	----	-
Synthetic Mineral Fibre	----	0.1	g/kg	----	No	No	----	No
Organic Fibre	----	0.1	g/kg	----	No	No	----	No
Sample weight (dry)	----	0.01	g	----	584	531	----	399
APPROVED IDENTIFIER:	----	-	--	----	A. SMYLIE	A. SMYLIE	----	A. SMYLIE
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	<5	<5	----	<5
Cadmium	7440-43-9	1	mg/kg	----	<1	<1	----	<1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_16_2.6	BH_13_0.2	BH_13_0.5	BH_13_3.5	Duplicate 1
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-038	ES2219062-039	ES2219062-040	ES2219062-043	ES2219062-044
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		----	4	6	----	20
Copper	7440-50-8	5	mg/kg		----	18	13	----	14
Lead	7439-92-1	5	mg/kg		----	53	70	----	8
Nickel	7440-02-0	2	mg/kg		----	4	4	----	19
Zinc	7440-66-6	5	mg/kg		----	98	74	----	30
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		----	<0.1	<0.1	----	<0.1
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		----	0.2	<0.1	----	<0.1
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Endrin	72-20-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		----	<0.05	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		----	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH_16_2.6	BH_13_0.2	BH_13_0.5	BH_13_3.5	Duplicate 1
			Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2219062-038	ES2219062-039	ES2219062-040	ES2219062-043	ES2219062-044
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	----	**0.6**	**1.4**	----	<0.5
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	----	**1.4**	**3.1**	----	<0.5
Pyrene	129-00-0	0.5	mg/kg	----	**1.4**	**2.9**	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	**0.6**	**1.4**	----	<0.5
Chrysene	218-01-9	0.5	mg/kg	----	**0.5**	**1.2**	----	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	**0.7**	**1.6**	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.5	**0.6**	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	**0.7**	**1.7**	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	<0.5	**0.8**	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	<0.5	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	**0.5**	**0.9**	----	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	**6.4**	**15.6**	----	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	**0.8**	**2.2**	----	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	----	**1.1**	**2.4**	----	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	----	**1.4**	**2.7**	----	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	<10	<10	----	<10
C10 - C14 Fraction	----	50	mg/kg	----	<50	<50	----	<50
C15 - C28 Fraction	----	100	mg/kg	----	<100	<100	----	<100
C29 - C36 Fraction	----	100	mg/kg	----	<100	<100	----	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	----	<50	<50	----	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	<10	<10	----	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	----	<10	<10	----	<10
>C10 - C16 Fraction	----	50	mg/kg	----	<50	<50	----	<50
>C16 - C34 Fraction	----	100	mg/kg	----	**100**	**110**	----	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH_16_2.6	BH_13_0.2	BH_13_0.5	BH_13_3.5	Duplicate 1
				Sampling date / time	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00	31-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2219062-038	ES2219062-039	ES2219062-040	ES2219062-043	ES2219062-044
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		----	<100	<100	----	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		----	**100**	**110**	----	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		----	<50	<50	----	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
Toluene	108-88-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		----	<0.2	<0.2	----	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		----	<0.5	<0.5	----	<0.5
Naphthalene	91-20-3	1	mg/kg		----	<1	<1	----	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	**75.0**	**74.4**	----	**61.1**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	**80.2**	**130**	----	**110**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	**72.6**	**85.7**	----	**66.0**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	**79.6**	**83.0**	----	**80.5**
2-Chlorophenol-D4	93951-73-6	0.5	%		----	**86.9**	**90.5**	----	**85.7**
2.4.6-Tribromophenol	118-79-6	0.5	%		----	**76.6**	**76.4**	----	**68.5**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	**87.5**	**94.5**	----	**88.8**
Anthracene-d10	1719-06-8	0.5	%		----	**90.3**	**96.6**	----	**94.2**
4-Terphenyl-d14	1718-51-0	0.5	%		----	**86.8**	**94.4**	----	**89.4**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	**99.9**	**106**	----	**116**
Toluene-D8	2037-26-5	0.2	%		----	**93.6**	**104**	----	**113**
4-Bromofluorobenzene	460-00-4	0.2	%		----	**84.2**	**89.9**	----	**98.4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	Duplicate 2	----	----	----	----
			Sampling date / time	31-May-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2219062-045	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	12.7	----	----	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	----	----	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	No	----	----	----	----
Asbestos Type	1332-21-4	-	--	-	----	----	----	----
Synthetic Mineral Fibre	----	0.1	g/kg	No	----	----	----	----
Organic Fibre	----	0.1	g/kg	No	----	----	----	----
Sample weight (dry)	----	0.01	g	391	----	----	----	----
APPROVED IDENTIFIER:	----	-	--	A. SMYLIE	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	38	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	2	----	----	----	----
Chromium	7440-47-3	2	mg/kg	10	----	----	----	----
Copper	7440-50-8	5	mg/kg	150	----	----	----	----
Lead	7439-92-1	5	mg/kg	626	----	----	----	----
Nickel	7440-02-0	2	mg/kg	19	----	----	----	----
Zinc	7440-66-6	5	mg/kg	887	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.5	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	Duplicate 2	----	----	----	----
				Sampling date / time	31-May-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2219062-045	--------	--------	--------	--------
					Result	----	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued									
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg		<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	----	----	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	----	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg		<0.05	----	----	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		**0.8**	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		**1.8**	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg		**1.8**	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		**0.9**	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg		**1.0**	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		**1.2**	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		**1.0**	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		**0.5**	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		**0.5**	----	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		**9.5**	----	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg		**1.3**	----	----	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg		**1.6**	----	----	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg		**1.8**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	Duplicate 2	----	----	----	----
				Sampling date / time	31-May-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2219062-045	--------	--------	--------	--------
					Result	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		**34**	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg		<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg		<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg		<100	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		**31**	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg		**29**	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg		<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		**140**	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		**140**	----	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		**1.6**	----	----	----	----
Toluene	108-88-3	0.5	mg/kg		**0.6**	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	----	----	----
^ **Sum of BTEX**	----	0.2	mg/kg		**2.2**	----	----	----	----
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	----	----	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**83.4**	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**72.8**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**91.0**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**82.5**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**91.9**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**72.7**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	Duplicate 2	----	----	----	----
				Sampling date / time	31-May-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2219062-045	--------	--------	--------	--------
					Result	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**114**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		**113**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		**103**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**114**	----	----	----	----
Toluene-D8	2037-26-5	0.2	%		**110**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		**105**	----	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Sample ID - Sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	BH_11_0.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_11_1.0 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_15_0.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_15_1.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_18_0.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_18_0.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_14_0.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_14_0.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_14_1.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_17_0.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_17_1.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_19_0.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_19_1.0 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_12_0.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_12_2.0 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_16_0.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_16_1.0 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_13_0.2 - 31-May-2022 00:00	Soil sample.
EA200: Description	BH_13_0.5 - 31-May-2022 00:00	Soil sample.
EA200: Description	Duplicate 1 - 31-May-2022 00:00	Soil sample.
EA200: Description	Duplicate 2 - 31-May-2022 00:00	Soil sample.

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EA033-B: Potential Acidity

(SOIL) EA033-C: Acid Neutralising Capacity

(SOIL) EA033-D: Retained Acidity

(SOIL) EA033-A: Actual Acidity

(SOIL) EA033-E: Acid Base Accounting

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(SOIL) EA200: AS 4964 - 2004 Identification of Asbestos in Soils

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2219062**	Page	: 1 of 18
Amendment	: **1**		
Client	: **SESL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: [redacted]	Contact	: [redacted]
Address	: 16 CHILVERS ROAD THORNLEIGH 2120	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +[redacted]
Project	: J003951	Date Samples Received	: 01-Jun-2022
Order number	: ----	Date Analysis Commenced	: 03-Jun-2022
C-O-C number	: ----	Issue Date	: 29-Jun-2022
Sampler	: Leo Ho		
Site	: Newcastle Foreshore Park NSW 2300		
Quote number	: SYBQ/404/21 SYDNEY BLANKET QUOTE		
No. of samples received	: 45		
No. of samples analysed	: 31		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alana Smylie	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4387248)									
ES2219056-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	34	# 58	53.6	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	57	60	6.1	0% - 20%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	91	79	14.4	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	42	60	36.7	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	109	# 177	47.1	0% - 20%
ES2219062-016	BH_14_0.5	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	9	12	23.4	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	13	11	16.9	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	10	8	24.1	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	58	47	20.7	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	217	187	15.2	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	181	178	2.0	0% - 20%
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4387250)									
ES2219062-039	BH_13_0.2	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	4	4	24.7	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	4	3	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	6	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	18	19	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	53	49	7.4	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	98	93	5.3	0% - 50%
ES2219105-007	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	5	6	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4387250) - continued									
ES2219105-007	Anonymous	EG005T: Nickel	7440-02-0	2	mg/kg	6	6	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	9	9	0.0	No Limit
EA033-A: Actual Acidity (QC Lot: 4392597)									
EB2216336-001	Anonymous	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	6.1	6.1	0.0	0% - 20%
ES2219062-028	BH_19_1.5	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	9.4	9.4	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 4392597)									
EB2216336-001	Anonymous	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.023	0.023	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	15	14	0.0	No Limit
ES2219062-028	BH_19_1.5	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.022	0.022	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	14	14	0.0	No Limit
EA033-C: Acid Neutralising Capacity (QC Lot: 4392597)									
ES2219062-028	BH_19_1.5	EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.36	0.32	11.2	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.11	0.10	11.2	0% - 50%
		EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	71	64	11.2	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4387256)									
ES2219056-005	Anonymous	EA055: Moisture Content	----	0.1	%	15.6	15.1	3.2	0% - 50%
ES2219062-021	BH_17_0.5	EA055: Moisture Content	----	0.1	%	13.2	15.4	15.5	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4387257)									
ES2219062-040	BH_13_0.5	EA055: Moisture Content	----	0.1	%	11.4	10.9	5.0	0% - 50%
ES2219105-009	Anonymous	EA055: Moisture Content	----	0.1	%	4.5	4.7	4.8	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4387249)									
ES2219056-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2219062-016	BH_14_0.5	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4387251)									
ES2219062-039	BH_13_0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2219105-007	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 4378934)									
ES2219062-001	BH_11_0.2	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 4378934) - continued									
ES2219062-023	BH_17_1.5	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 4379950)									
ES2219062-045	Duplicate 2	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2219426-001	Anonymous	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 4378933)									
ES2219062-001	BH_11_0.2	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
ES2219062-023	BH_17_1.5	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 4378933) - continued									
ES2219062-023	BH_17_1.5	EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 4379953)									
ES2219062-045	Duplicate 2	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
ES2219426-001	Anonymous	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 4379953) - continued									
ES2219426-001	Anonymous	EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4378932)									
ES2219062-001	BH_11_0.2	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	0.6	<0.5	23.3	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.7	1.6	7.2	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.6	1.6	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	0.8	0.8	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	0.7	0.8	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	1.0	0.9	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.0	1.0	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.6	0.6	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	8.5	7.3	15.2	0% - 50%
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	1.2	1.2	0.0	No Limit
ES2219062-023	BH_17_1.5	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	1.0	1.1	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.4	1.3	8.9	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.4	1.2	11.1	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	0.8	0.7	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4378932) - continued									
ES2219062-023	BH_17_1.5	EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	0.8	0.7	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	0.8	0.8	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	0.7	0.6	15.6	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	6.9	6.4	7.5	0% - 50%
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	0.9	0.8	13.7	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4379952)									
ES2219062-045	Duplicate 2	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	0.8	0.8	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.8	1.9	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.8	1.8	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	0.9	1.0	12.9	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	1.0	1.0	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	1.2	1.4	12.8	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.0	1.1	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	0.5	0.6	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.5	0.6	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	9.5	10.7	11.9	0% - 20%
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	1.3	1.5	13.9	No Limit
ES2219426-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4379952) - continued									
ES2219426-001	Anonymous	EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4424050)									
ES2222466-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4378931)									
ES2219062-001	BH_11_0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	120	120	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2219062-023	BH_17_1.5	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4379951)									
ES2219062-045	Duplicate 2	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2219426-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4380817)									
ES2219062-001	BH_11_0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES2219062-023	BH_17_1.5	EP080: C6 - C9 Fraction	----	10	mg/kg	23	20	13.2	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4380818)									
ES2219105-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES2219105-011	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4378931)									
ES2219062-001	BH_11_0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	180	160	10.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2219062-023	BH_17_1.5	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4379951)									
ES2219062-045	Duplicate 2	EP071: >C16 - C34 Fraction	----	100	mg/kg	140	130	13.8	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2219426-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4380817)									
ES2219062-001	BH_11_0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES2219062-023	BH_17_1.5	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	13	11	17.6	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4380818)									
ES2219105-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES2219105-011	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080: BTEXN (QC Lot: 4380817)									
ES2219062-001	BH_11_0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 4380817) - continued									
ES2219062-001	BH_11_0.2	EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES2219062-023	BH_17_1.5	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP080: BTEXN (QC Lot: 4380818)									
ES2219105-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES2219105-011	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4387248)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	88.2	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	107	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	98.5	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	106	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	97.9	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	97.0	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	97.2	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4387250)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	88.0	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	99.4	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	93.0	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	105	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	95.0	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	92.9	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	91.2	66.0	133
EA033-A: Actual Acidity (QCLot: 4392597)								
EA033: pH KCl (23A)	----	----	pH Unit	----	4.4 pH Unit	98.5	91.0	107
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	19 mole H+ / t	78.2	70.0	124
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity (QCLot: 4392597)								
EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	0.246 % S	98.6	77.0	121
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 4392597)								
EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	<0.01	10 % CaCO3	99.6	91.0	112
EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	<0.01	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4387249)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	85.6	70.0	125
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4387251)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	90.2	70.0	125
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4378934)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	107	62.0	126
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4379950)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4379950) - continued								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	74.2	62.0	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 4378933)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	93.6	69.0	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	88.1	65.0	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	95.9	67.0	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	105	68.0	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	81.1	65.0	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.4	67.0	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	104	69.0	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	81.4	62.0	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	88.2	63.0	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	87.4	66.0	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	79.4	64.0	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	102	66.0	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	106	67.0	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	106	67.0	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	106	69.0	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.6	69.0	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	78.7	56.0	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	93.8	62.0	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	94.8	66.0	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	88.2	64.0	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	90.8	54.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 4379953)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	102	69.0	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	93.8	65.0	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	91.8	67.0	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	95.8	68.0	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	91.5	65.0	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	86.5	67.0	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	91.7	69.0	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	97.8	62.0	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	98.0	63.0	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	98.0	66.0	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	95.0	64.0	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	96.1	66.0	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	95.3	67.0	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	85.6	67.0	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	102	69.0	115

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 4379953) - continued								
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	94.8	69.0	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	101	56.0	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	99.6	62.0	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	76.8	66.0	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	96.2	64.0	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	79.6	54.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4378932)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	111	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	109	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	100	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	108	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	108	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	95.4	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	112	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	110	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	101	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	106	75.0	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	97.8	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	108	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	108	70.0	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	105	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	103	62.0	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	104	63.0	121
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4379952)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	113	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	109	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	105	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	109	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	111	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	98.6	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	113	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	111	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	102	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	112	75.0	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	98.5	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	112	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	109	70.0	126

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4379952) - continued								
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	106	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	105	62.0	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	103	63.0	121
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4424050)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	104	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	101	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	101	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	104	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	107	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	97.7	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	109	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	110	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	99.1	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	102	75.0	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	97.3	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	103	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	109	70.0	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	110	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	112	62.0	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	107	63.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4378931)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	94.1	75.0	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	98.8	77.0	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	100	71.0	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4379951)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	86.1	75.0	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	93.5	77.0	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	96.0	71.0	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4380817)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	70.0	68.4	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4380818)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	105	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4378931)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	96.7	77.0	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	98.9	74.0	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	103	63.0	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4379951)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4379951) - continued								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	91.4	77.0	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	93.4	74.0	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	100	63.0	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4380817)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	68.4	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4380818)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	100	68.4	128
EP080: BTEXN (QCLot: 4380817)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	78.4	62.0	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	74.9	67.0	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	72.4	65.0	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	76.1	66.0	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	76.8	68.0	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	76.8	63.0	119
EP080: BTEXN (QCLot: 4380818)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	108	62.0	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	101	67.0	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	107	65.0	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	108	66.0	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	108	68.0	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	86.1	63.0	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4387248)							
ES2218897-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	101	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	90.0	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	# Not Determined	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	103	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4387248) - continued							
ES2218897-001	Anonymous	EG005T: Lead	7439-92-1	250 mg/kg	# Not Determined	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	98.3	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	# Not Determined	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4387250)							
ES2219062-036	BH_16_1.0	EG005T: Arsenic	7440-38-2	50 mg/kg	92.9	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	97.0	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	92.7	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	98.2	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	86.4	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	95.7	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	98.8	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4387249)							
ES2219056-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	89.9	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4387251)							
ES2219062-039	BH_13_0.2	EG035T: Mercury	7439-97-6	5 mg/kg	91.8	70.0	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4378934)							
ES2219062-001	BH_11_0.2	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	93.2	70.0	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 4379950)							
ES2219062-045	Duplicate 2	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	83.1	70.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 4378933)							
ES2219062-001	BH_11_0.2	EP068: gamma-BHC	58-89-9	0.5 mg/kg	107	70.0	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	116	70.0	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	76.1	70.0	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	108	70.0	130
		EP068: Endrin	72-20-8	2 mg/kg	103	70.0	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	108	70.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 4379953)							
ES2219062-045	Duplicate 2	EP068: gamma-BHC	58-89-9	0.5 mg/kg	90.1	70.0	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	88.9	70.0	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	80.9	70.0	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	102	70.0	130
		EP068: Endrin	72-20-8	2 mg/kg	94.1	70.0	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	113	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4378932)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4378932) - continued							
ES2219062-001	BH_11_0.2	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	93.9	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	129	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4379952)							
ES2219062-045	Duplicate 2	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	96.3	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	95.4	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4424050)							
ES2222466-001	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	102	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	114	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4378931)							
ES2219062-001	BH_11_0.2	EP071: C10 - C14 Fraction	----	480 mg/kg	109	73.0	137
		EP071: C15 - C28 Fraction	----	3100 mg/kg	113	53.0	131
		EP071: C29 - C36 Fraction	----	2060 mg/kg	117	52.0	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4379951)							
ES2219062-045	Duplicate 2	EP071: C10 - C14 Fraction	----	480 mg/kg	99.8	73.0	137
		EP071: C15 - C28 Fraction	----	3100 mg/kg	100	53.0	131
		EP071: C29 - C36 Fraction	----	2060 mg/kg	108	52.0	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4380817)							
ES2219062-001	BH_11_0.2	EP080: C6 - C9 Fraction	----	32.5 mg/kg	126	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4380818)							
ES2219062-045	Duplicate 2	EP080: C6 - C9 Fraction	----	32.5 mg/kg	76.7	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4378931)							
ES2219062-001	BH_11_0.2	EP071: >C10 - C16 Fraction	----	860 mg/kg	104	73.0	137
		EP071: >C16 - C34 Fraction	----	4320 mg/kg	116	53.0	131
		EP071: >C34 - C40 Fraction	----	890 mg/kg	112	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4379951)							
ES2219062-045	Duplicate 2	EP071: >C10 - C16 Fraction	----	860 mg/kg	85.7	73.0	137
		EP071: >C16 - C34 Fraction	----	4320 mg/kg	104	53.0	131
		EP071: >C34 - C40 Fraction	----	890 mg/kg	108	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4380817)							
ES2219062-001	BH_11_0.2	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	118	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4380818)							
ES2219062-045	Duplicate 2	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	87.0	70.0	130
EP080: BTEXN (QCLot: 4380817)							
ES2219062-001	BH_11_0.2	EP080: Benzene	71-43-2	2.5 mg/kg	118	70.0	130
		EP080: Toluene	108-88-3	2.5 mg/kg	114	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080: BTEXN (QCLot: 4380817) - continued							
ES2219062-001	BH_11_0.2	EP080: Ethylbenzene	100-41-4	2.5 mg/kg	122	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	125	70.0	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	123	70.0	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	96.7	70.0	130
EP080: BTEXN (QCLot: 4380818)							
ES2219062-045	Duplicate 2	EP080: Benzene	71-43-2	2.5 mg/kg	93.4	70.0	130
		EP080: Toluene	108-88-3	2.5 mg/kg	93.6	70.0	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	96.4	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	97.9	70.0	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	101	70.0	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	95.7	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2219062**	Page	: 1 of 10
Amendment	: **1**		
Client	: **SESL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: [redacted]	Telephone	: +[redacted]
Project	: J003951	Date Samples Received	: 01-Jun-2022
Site	: Newcastle Foreshore Park NSW 2300	Issue Date	: 29-Jun-2022
Sampler	: Leo Ho	No. of samples received	: 45
Order number	: ----	No. of samples analysed	: 31

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005(ED093)T: Total Metals by ICP-AES	ES2219056--001	Anonymous	**Chromium**	7440-47-3	53.6 %	0% - 20%	**RPD exceeds LOR based limits**
EG005(ED093)T: Total Metals by ICP-AES	ES2219056--001	Anonymous	**Zinc**	7440-66-6	47.1 %	0% - 20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EG005(ED093)T: Total Metals by ICP-AES	ES2218897--001	Anonymous	**Chromium**	7440-47-3	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005(ED093)T: Total Metals by ICP-AES	ES2218897--001	Anonymous	**Lead**	7439-92-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005(ED093)T: Total Metals by ICP-AES	ES2218897--001	Anonymous	**Zinc**	7440-66-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / **Container** / Client Sample ID(s)	*Extraction / Preparation*			*Analysis*		
	Date extracted	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA055: Moisture Content (Dried @ 105-110°C)						
Soil Glass Jar - Unpreserved						
BH_12_0.2	----	----	----	28-Jun-2022	14-Jun-2022	**14**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons						
Soil Glass Jar - Unpreserved						
BH_12_0.2	27-Jun-2022	14-Jun-2022	**13**	----	----	----

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Moisture Content	4	42	9.52	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity							
Snap Lock Bag - frozen on receipt at ALS (EA033)							
BH_11_2.0, BH_15_1.7, BH_18_2.2, BH_14_2.0, BH_17_2.0, BH_19_1.5, BH_12_2.5, BH_16_2.6, BH_13_3.5	**31-May-2022**	**13-Jun-2022**	31-May-2023	✓	**13-Jun-2022**	11-Sep-2022	✓
EA033-B: Potential Acidity							
Snap Lock Bag - frozen on receipt at ALS (EA033)							
BH_11_2.0, BH_15_1.7, BH_18_2.2, BH_14_2.0, BH_17_2.0, BH_19_1.5, BH_12_2.5, BH_16_2.6, BH_13_3.5	**31-May-2022**	**13-Jun-2022**	31-May-2023	✓	**13-Jun-2022**	11-Sep-2022	✓
EA033-C: Acid Neutralising Capacity							
Snap Lock Bag - frozen on receipt at ALS (EA033)							
BH_11_2.0, BH_15_1.7, BH_18_2.2, BH_14_2.0, BH_17_2.0, BH_19_1.5, BH_12_2.5, BH_16_2.6, BH_13_3.5	**31-May-2022**	**13-Jun-2022**	31-May-2023	✓	**13-Jun-2022**	11-Sep-2022	✓
EA033-D: Retained Acidity							
Snap Lock Bag - frozen on receipt at ALS (EA033)							
BH_11_2.0, BH_15_1.7, BH_18_2.2, BH_14_2.0, BH_17_2.0, BH_19_1.5, BH_12_2.5, BH_16_2.6, BH_13_3.5	**31-May-2022**	**13-Jun-2022**	31-May-2023	✓	**13-Jun-2022**	11-Sep-2022	✓
EA033-E: Acid Base Accounting							
Snap Lock Bag - frozen on receipt at ALS (EA033)							
BH_11_2.0, BH_15_1.7, BH_18_2.2, BH_14_2.0, BH_17_2.0, BH_19_1.5, BH_12_2.5, BH_16_2.6, BH_13_3.5	**31-May-2022**	**13-Jun-2022**	31-May-2023	✓	**13-Jun-2022**	11-Sep-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**----**	----	----	**08-Jun-2022**	14-Jun-2022	✓
Soil Glass Jar - Unpreserved (EA055)							
BH_12_0.2	**31-May-2022**	**----**	----	----	**28-Jun-2022**	14-Jun-2022	×
EA200: AS 4964 - 2004 Identification of Asbestos in Soils							
Snap Lock Bag - Friable Asbestos/PSD Bag (EA200)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**----**	----	----	**03-Jun-2022**	27-Nov-2022	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**09-Jun-2022**	27-Nov-2022	✓	**09-Jun-2022**	27-Nov-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BH_11_0.2,	BH_11_1.0,	**31-May-2022**	**09-Jun-2022**	28-Jun-2022	✓	**09-Jun-2022**	28-Jun-2022	✓
BH_15_0.5,	BH_15_1.2,							
BH_18_0.2,	BH_18_0.5,							
BH_14_0.2,	BH_14_0.5,							
BH_14_1.5,	BH_17_0.5,							
BH_17_1.5,	BH_19_0.2,							
BH_19_1.0,	BH_12_0.5,							
BH_12_2.0,	BH_16_0.2,							
BH_16_1.0,	BH_13_0.2,							
BH_13_0.5,	Duplicate 1,							
Duplicate 2								
EP066: Polychlorinated Biphenyls (PCB)								
Soil Glass Jar - Unpreserved (EP066)								
BH_11_0.2,	BH_11_1.0,	**31-May-2022**	**06-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	16-Jul-2022	✓
BH_15_0.5,	BH_15_1.2,							
BH_18_0.2,	BH_18_0.5,							
BH_14_0.2,	BH_14_0.5,							
BH_14_1.5,	BH_17_0.5,							
BH_17_1.5,	BH_19_0.2,							
BH_19_1.0,	BH_12_0.5,							
BH_12_2.0,	BH_16_0.2,							
BH_16_1.0,	BH_13_0.2,							
BH_13_0.5,	Duplicate 1,							
Duplicate 2								
EP068A: Organochlorine Pesticides (OC)								
Soil Glass Jar - Unpreserved (EP068)								
BH_11_0.2,	BH_11_1.0,	**31-May-2022**	**06-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	16-Jul-2022	✓
BH_15_0.5,	BH_15_1.2,							
BH_18_0.2,	BH_18_0.5,							
BH_14_0.2,	BH_14_0.5,							
BH_14_1.5,	BH_17_0.5,							
BH_17_1.5,	BH_19_0.2,							
BH_19_1.0,	BH_12_0.5,							
BH_12_2.0,	BH_16_0.2,							
BH_16_1.0,	BH_13_0.2,							
BH_13_0.5,	Duplicate 1,							
Duplicate 2								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**06-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	16-Jul-2022	✓
Soil Glass Jar - Unpreserved (EP075(SIM))							
BH_12_0.2	**31-May-2022**	**27-Jun-2022**	14-Jun-2022	×	**28-Jun-2022**	06-Aug-2022	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**05-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	14-Jun-2022	✓
Soil Glass Jar - Unpreserved (EP071)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**06-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	16-Jul-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**05-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	14-Jun-2022	✓
Soil Glass Jar - Unpreserved (EP071)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**06-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	16-Jul-2022	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
BH_11_0.2, BH_11_1.0, BH_15_0.5, BH_15_1.2, BH_18_0.2, BH_18_0.5, BH_14_0.2, BH_14_0.5, BH_14_1.5, BH_17_0.5, BH_17_1.5, BH_19_0.2, BH_19_1.0, BH_12_0.5, BH_12_2.0, BH_16_0.2, BH_16_1.0, BH_13_0.2, BH_13_0.5, Duplicate 1, Duplicate 2	**31-May-2022**	**05-Jun-2022**	14-Jun-2022	✓	**08-Jun-2022**	14-Jun-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chromium Suite for Acid Sulphate Soils	EA033	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	4	42	**9.52**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	5	41	**12.20**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	4	31	**12.90**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Chromium Suite for Acid Sulphate Soils	EA033	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	3	41	**7.32**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chromium Suite for Acid Sulphate Soils	EA033	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	3	41	**7.32**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	3	41	**7.32**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	In house: Referenced to Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3).
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.

Preparation Methods	Method	Matrix	Method Descriptions
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

CHAIN OF CUSTODY DOCUMENTATION

SESL AUSTRALIA

SESL Australia Pty Ltd	LABORATORY: ALS
16 Chilvers Rd, Thornleigh NSW 2120 Australia	LABORATORY ADDRESS:
ABN 70 106 810 709	SAMPLER: Leo HO
PROJECT LOCATION: Newcastle Foreshore Park NSW 2300	SAMPLER CONTACT No: 0431 075 936
PROJECT NUMBER: J003951	Email Reports to: Leo.h@sesl.com.au ; results@sesl.com.au; andres@sesl.com.au
PROJECT MANAGER: Leo HO	Email Invoices to: Leo.h@sesl.com.au ; payables@sesl.com.au
PM CONTACT No: 0431 075 936	

Turnaround Time (TAT): [X] Standard TAT; [ ] Non Standard or Urgent TAT; Required TAT:

COC Number: 1 of 5

COMMENTS OR ADDITIONAL DIRECTIONS

REQUESTED ANALYSIS

No.	Sample ID	Date & Time	Matrix (Soil, water, ACM, etc)	Containers and Preservatives	Suite S-8 (TRH, BTEXN, PAH, OCP, PCB, 8 Metals)	Asbestos in Soil (presence/absence)	Chromium Suite					Hold	Additional Information (Comment on any gross contamination or specific requirements)
1	BH_11_0.2	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
2	BH_11_0.5	31/05/2022	Soil	1 glass jar, 1 asb bag								●	
3	BH_11_1.0	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
4	BH_11_1.5	31/05/2022	Soil	1 glass jar, 1 asb bag								●	
5	BH_11_2.0	31/05/2022	Soil	1 glass jar, 1 asb bag			●						
6	BH_15_0.2	31/05/2022	Soil	1 glass jar, 1 asb bag								●	
7	BH_15_0.5	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
8	BH_15_1.2	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
9	BH_15_1.7	31/05/2022	Soil	1 glass jar, 1 asb bag			●						
10	BH_18_0.2	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							

Environmental Division Sydney
Work Order Reference
ES2219062

Telephone : - 61-2-8784 8555

E-MAILED

I attest that the proper field sampling procedur[redacted]

Relinquished By Sampler	[redacted]	Date / Time 31/5/2022 4:56 p.m.	Received by	[redacted]	Date / Time 01/06/ 5:24
Relinquished By RM	[redacted]	Date / Time 1/6/22 1100	Received by	Sign	Date / Time

Temperature Received: 2.5 ice

PP 1/6/22 1140

CHAIN OF CUSTODY DOCUMENTATION

SESL AUSTRALIA

SESL Australia Pty Ltd 16 Chilvers Rd, Thornleigh NSW 2120 Australia ABN 70 106 810 709	LABORATORY: ALS LABORATORY ADDRESS:
PROJECT LOCATION: Newcastle Foreshore Park NSW 2300	SAMPLER: Leo HO
PROJECT NUMBER: J003951	SAMPLER CONTACT No: 0431 075 936
PROJECT MANAGER: Leo HO	Email Reports to: Leo.h@sesl.com.au ; results@sesl.com.au; andres@sesl.com.au
PM CONTACT No: 0431 075 936	Email Invoices to: Leo.h@sesl.com.au ; payables@sesl.com.au

(TAT) 2 of 5

☒ Standard TAT

☐ Non Standard or Urgent TAT

Required TAT:

COMMENTS OR ADDITIONAL DIRECTIONS

REQUESTED ANALYSIS

No.	Sample ID	Date & Time	Matrix (Soil, water, ACM, etc)	Containers and Preservatives	Suite S-8 (TRH, BTEXN, PAH, OCP, PCB, 8 Metals)	Asbestos in Soil (presence/absence)	Chromium Suite					Hold	Additional Information *(Comment on any gross contamination or specific requirements)*
11	BH_18_0.5	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
12	BH_18_1.0	31/05/2022	Soil	1 glass jar, 1 asb bag								●	
13	BH_18_1.5	31/05/2022	Soil	1 glass jar, 1 asb bag								●	
14	BH_18_2.2	31/05/2022	Soil	1 glass jar, 1 asb bag			●						
15	BH_14_0.2	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
16	BH_14_0.5	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
17	BH_14_1.0	31/05/2022	Soil	1 glass jar, 1 asb bag								●	
18	BH_14_1.5	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
19	BH_14_2.0	31/05/2022	Soil	1 glass jar, 1 asb bag			●						
20	BH_17_0.2	31/05/2022	Soil	1 glass jar, 1 asb bag								●	

E-MAILED

I attest that the proper field sampling procedures were used during the collection of these samples.

Relinquished By Sampler	[redacted]	Date / Time 31/5/2022 4:56 p.m.	Received by	[redacted]	Date / Time 5:24
Relinquished By	[redacted]	Date / Time 1/6/22 1700	Received by	Sign	Date / Time
Relinquished By	[redacted]	Date / Time	Received by	Sign	Date / Time

Temperature Received: 2.5 ice

PP 1/6/22 2140

CHAIN OF CUSTODY DOCUMENTATION

SESL AUSTRALIA

SESL Australia Pty Ltd 16 Chilvers Rd, Thornleigh NSW 2120 Australia ABN 70 106 810 709	LABORATORY: ALS LABORATORY ADDRESS:
PROJECT LOCATION: Newcastle Foreshore Park NSW 2300	SAMPLER: Leo HO
PROJECT NUMBER: J003951	SAMPLER CONTACT No: 0431 075 936
PROJECT MANAGER: Leo HO	Email Reports to: Leo.h@sesl.com.au ; results@sesl.com.au; andres@sesl.com.au
PM CONTACT No: 0431 075 936	Email Invoices to: Leo.h@sesl.com.au ; payables@sesl.com.au

(TAT) | 3 of 5

☒ Standard TAT

☐ Non Standard or Urgent TAT

Required TAT:

COMMENTS OR ADDITIONAL DIRECTIONS

REQUESTED ANALYSIS

No.	Sample ID	Date & Time	Matrix (Soil, water, ACM, etc)	Containers and Preservatives	Suite S-8 (TRH, BTEXN, PAH, OCP, PCB, 8 Metals)	Asbestos in Soil (presence/absence)	Chromium Suite					Hold	Additional Information (Comment on any gross contamination or specific requirements)
21	BH_17_0.5	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
22	BH_17_1.0	31/05/2022	Soil	1 glass jar, 1 asb bag								●	
23	BH_17_1.5	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●	●						
24	BH_18_2.0	31/05/2022	Soil	1 glass jar, 1 asb bag								●	
25	BH_19_0.2	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
26	BH_19_0.5	31/05/2022	Soil	1 glass jar, 1 asb bag								●	
27	BH_19_1.0	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
28	BH_19_1.5	31/05/2022	Soil	1 glass jar, 1 asb bag			●						
29	BH_12_0.2	31/05/2022	Soil	1 glass jar, 1 asb bag								●	
30	BH_12_0.5	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							

LAB OF ORIGIN: NEWCASTLE

EMAILED

I attest that the proper field sampling procedures were used during the collection of these samples.

Relinquished By Sampler	[redacted]	Date / Time 31/5/2022 4:56 p.m.	Received by	[redacted]	Date / Time 01/06	Temperature Received:
Relinquished By	[redacted]	Date / Time 1/6/22 1700	Received by	Sign	Date / Time	2-5 ice
Relinquished By	[redacted]	Date / Time	Received by	Sign	Date / Time	

PP 1/6/22 1740

CHAIN OF CUSTODY DOCUMENTATION

SESL AUSTRALIA

SESL Australia Pty Ltd	
16 Chilvers Rd, Thornleigh NSW 2120 Australia	LABORATORY: ALS
ABN 70 106 810 709	LABORATORY ADDRESS:
PROJECT LOCATION: Newcastle Foreshore Park NSW 2300	SAMPLER: Leo HO
PROJECT NUMBER: J003951	SAMPLER CONTACT No: 0431 075 936
PROJECT MANAGER: Leo HO	Email Reports to: Leo.h@sesl.com.au ; results@sesl.com.au; andres@sesl.com.au
PM CONTACT No: 0431 075 936	Email Invoices to: Leo.h@sesl.com.au ; payables@sesl.com.au

(TAT) | 4 of 5

☒ Standard TAT

☐ Non Standard or Urgent TAT

Required TAT:

COMMENTS OR ADDITIONAL DIRECTIONS

REQUESTED ANALYSIS

No.	Sample ID	Date & Time	Matrix (Soil, water, ACM, etc)	Containers and Preservatives	Suite S-8 (TRH, BTEXN, PAH, OCP, PCB, 8 Metals)	Asbestos in Soil (presence/absence)	Chromium Suite					Hold	Additional Information (Comment on any gross contamination or specific requirements)
31	BH_12_1.0	31/05/2022	Soil	1 glass jar, 1 asb bag								●	
32	BH_12_2.0	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
33	BH_12_2.5	31/05/2022	Soil	1 glass jar, 1 asb bag			●						
34	BH_16_0.2	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
35	BH_16_0.5	31/05/2022	Soil	1 glass jar, 1 asb bag								●	
36	BH_16_1.0	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
37	BH_16_2.0	31/05/2022	Soil	1 glass jar, 1 asb bag								●	
38	BH_16_2.6	31/05/2022	Soil	1 glass jar, 1 asb bag			●						
39	BH_13_0.2	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							
40	BH_13_0.5	31/05/2022	Soil	1 glass jar, 1 asb bag	●	●							

LEFT FOR NEWCASTLE

EMAILED

I attest that the proper field sampling procedu

Relinquished By Sampler	[redacted]	Date / Time 31/5/2022 4:56 p.m	Received by	Sign [redacted]	Date / Time 01/06 5:24	Temperature Received:
Relinquished By		Date / Time 1/6/22 1700	Received by	Sign	Date / Time	2-5
Relinquished By		Date / Time	Received by	Sign	Date / Time	ice

PP 1/6/22 2240

CHAIN OF CUSTODY DOCUMENTATION

SESL AUSTRALIA

SESL Australia Pty Ltd 17 Chilvers Rd, Thornleigh NSW 2120 Australia ABN 70 106 810 710	LABORATORY: ALS LABORATORY ADDRESS:
PROJECT LOCATION: Newcastle Foreshore Park NSW 2301	SAMPLER: Leo HO
PROJECT NUMBER: J003952	SAMPLER CONTACT No: 0431 075 937
PROJECT MANAGER: Leo HO	Email Reports to: Leo.h@sesl.com.au ; results@sesl.com.au; andres@sesl.com.au
PM CONTACT No: 0431 075 937	Email Invoices to: Leo.h@sesl.com.au ; payables@sesl.com.au

(TAT) 5 of 5

☒ Standard TAT

☐ Non Standard or Urgent TAT

Required TAT:

COMMENTS OR ADDITIONAL DIRECTIONS

REQUESTED ANALYSIS

No.	Sample ID	Date & Time	Matrix (Soil, water, ACM, etc)	Containers and Preservatives	Suite S-8 (TRH, BTEXN, PAH, OCP, PCB, 8 Metals)	Asbestos in Soil (presence/absence)	Chromium Suite				Send to Eurofin for Intralab analysis	Hold	Additional Information *(Comment on any gross contamination or specific requirements)*
41	BH_13_1.0	31/05/2022	Soil	1 glass jar, 1 asb bag								⊕	
42	BH_13_2.0	31/05/2022	Soil	1 glass jar, 1 asb bag								⊕	
43	BH_13_3.5	31/05/2022	Soil	1 glass jar, 1 asb bag			⊕						
44	Duplicate 1	31/05/2022	Soil	1 glass jar, 1 asb bag	⊕	⊕							
~~45~~	Triplicate 1	31/05/2022	Soil	1 glass jar, 1 asb bag							⊕		send to eurofins for intra lab duplicate (B10-B) + Asb
45	Duplicate 2	31/05/2022	Soil	1 glass jar, 1 asb bag	⊕	⊕							
~~47~~	Triplicate 2	31/05/2022	Soil	1 glass jar, 1 asb bag							⊕		send to eurofins for intra lab duplicate (B10-B) + Asb

I attest that the proper field sampling procedures were used during the collection of these samples.

Relinquished By Sampler	[redacted]	Date / Time	31/5/2022 4:56 p.m.	Received by	Sig [redacted] 01/06	Date / Time 5:24
Relinquished By	Si [redacted]	Date / Time	1/6/22 1700	Received by	Sig	Date / Time
Relinquished By	Si [redacted]	Date / Time		Received by	Sign	Date / Time

Temperature Received: 2-5 ice

PP 1/6/22 1740

SESL AUSTRALIA
Environment & Soil Sciences

Appendix F

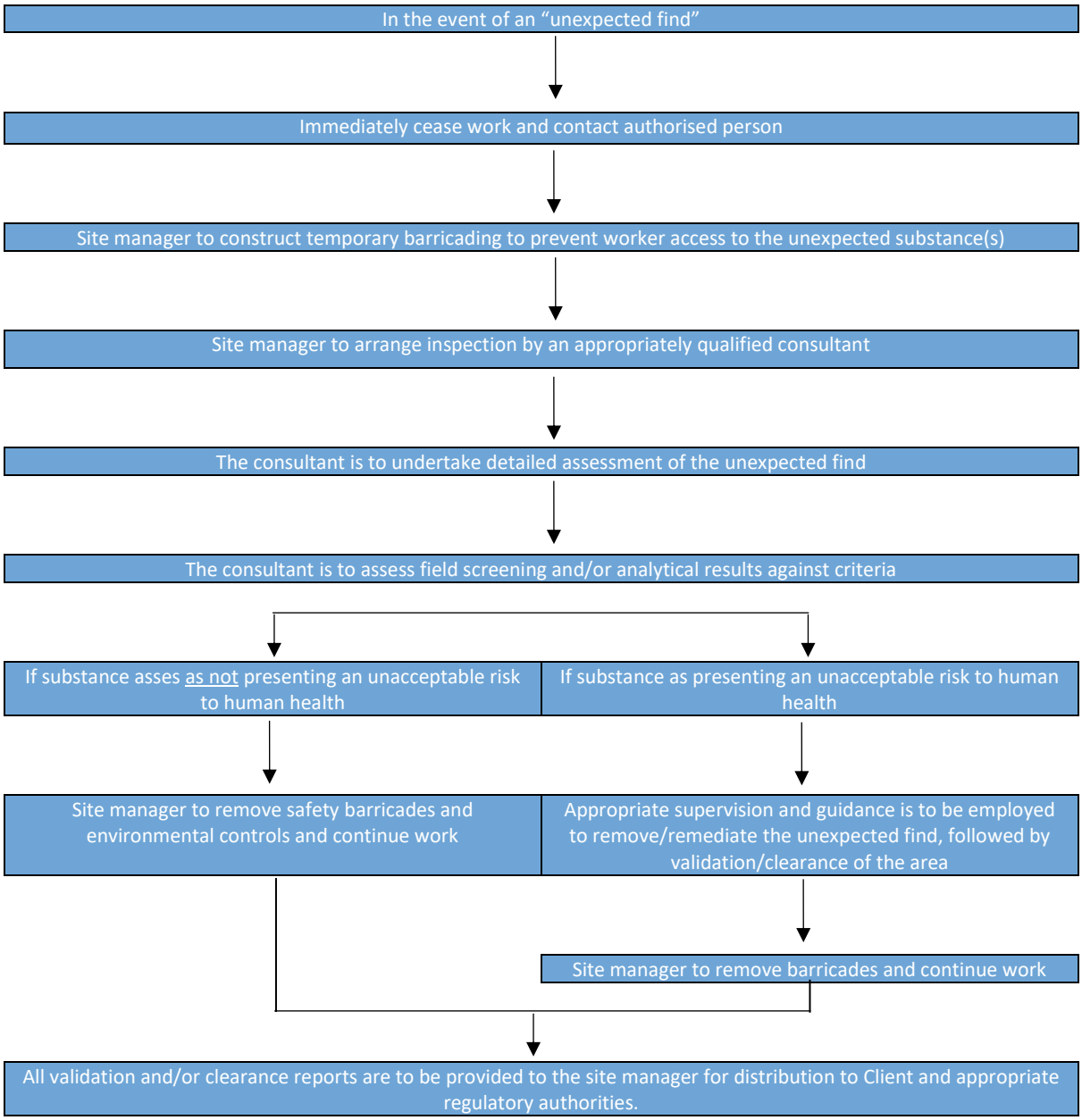
Analytes	BH14.0.2	Dup 1	RPD %	Trip 1	RPD %	BH19.1.0	Dup 2	RPD %	Trip 2	RPD %
Arsenic	<5	<5	0	2.5	0	9	38	123	47	135.7
Cadmium	<1	<1	0	<0.4	0	<1	2	66.7	2.1	71
Chromium (III+VI)	19	20	5.1	25	27.3	6	10	50	16	90.9
Copper	10	14	33.3	15	40	108	150	32.6	170	44.6
Lead	<5	8	46.2	12	82.3	456	626	31.4	690	40.8
Mercury	<0.1	<0.1	0	<0.1	0	0.5	0.5	0	0.5	0
Nickel	18	19	5.4	21	15.4	10	19	62	23	78.8
Zinc	28	30	6.9	36	25	363	887	83.4	770	71.8
C6-C9 Fraction	<10	<10	0	<20	0	25	34	30.5	<20	22
C10-C36 Fraction	<50	<50	0	<50	0	270	<50	137	452	50.4
Benzene	<0.2	<0.2	0	<0.1	0	2.2	1.6	31.6	0.5	125.9
Toluene	<0.5	<0.5	0	<0.1	0	0.8	0.6	28.6	0.2	120
Ethylbenzene	<0.5	<0.5	0	<0.1	0	<0.5	<0.5	0	<0.1	0
Xylene Total	<0.5	<0.5	0	<0.3	0	<0.5	<0.5	0	<0.3	0
Benzo(a) pyrene	<0.5	<0.5	0	<0.5	0	0.5	1.0	66.7	0.7	33.3
Benzo(a)pyrene TEQ	1.2	1.2	0	0.6	66.7	1.2	1.8	40	1.3	8
PAHs (Sum of total)	<0.5	<0.5	0	<0.5	0	3.2	9.5	99	7.7	82.6
PCBs (Sum of total)	<0.1	<0.1	0	<0.1	0	<0.1	<0.1	0	<1	0
4,4-DDE	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
a-BHC	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Aldrin	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Aldrin + Dieldrin	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
b-BHC	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Chlordane	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Chlordane (cis)	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Chlordane (trans)	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
d-BHC	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
DDD	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
DDT	<0.2	<0.2	0	<0.05	0	<0.2	<0.2	0	<0.5	0
DDT+DDE+DDD	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Dieldrin	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Endosulfan	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Endosulfan I	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Endosulfan II	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Endosulfan sulphate	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Endrin	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Endrin aldehyde	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Endrin ketone	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
g-BHC (Lindane)	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Heptachlor	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Heptachlor epoxide	<0.05	<0.05	0	<0.05	0	<0.05	<0.05	0	<0.5	0
Methoxychlor	<0.2	<0.2	0	<0.05	0	<0.2	<0.2	0	<0.5	0

SESL AUSTRALIA
Environment & Soil Sciences

Appendix G

Appendix G: Unexpected Finds Protocol

This procedure details the actions to be taken if potentially contaminated soil or material (including asbestos) not characterised in this report is suspected to have been encountered during excavation/construction activities:



SESL AUSTRALIA
Environment & Soil Sciences

Appendix H

Down to Earth
Geotechnical & Environmental

11/93-97, Newton Rd, WETHERILL PARK
NSW 2164. PO Box 115, COBBITTY NSW 2570
abn: 94 606 398 663 | acn: 606 398 663
ph. 0414 585 005 | lab. 02 9756 0404

DE-743_1
27th June 2022

Attention: SESL Australia

16 Chilvers Road
Thornleigh
NSW 2120

RE: Site Classification at Foreshore Park, Newcastle NSW 2300

This letter presents a geotechnical report on the inspection and testing services associated with the geotechnical investigation undertaken at the above project.

Should you have any questions related to this report please do not hesitate to contact the undersigned.

For and on behalf of D2E

[redacted]

Field Manager

Reviewed by:

[redacted]

Geotechnical Engineer

CONTENTS

1.0 Introduction 4
1.1. Proposed Development 4
2.0 Site Details 4
2.1. Geology 4
2.2. Site Description 5
3.0 Geotechnical Investigation 5
3.1. Soil Profiles 6
3.2. Laboratory Test Results 6
4.0 Recommendations 6
4.1. Site Classification 6
4.2. Footings – Bearing Capacity 8
4.3. Filling 9
4.4. Subgrade Preparation 10
4.5. Retaining Walls 10
5.0. Salinity Assessment 11
5.1. Asessment Creteria 11
5.2. Aggressivity Test Results 12
6.0. Acid Sulfate Screening 13
6.1. Asessment Criteria For Acid Soils 13
6.2. Discussion Of Results 14
6.3. Discussion Of SPOCAS Results 14
7.0. General Pavement Recommendations 15
8.0. Genral Recommedndations 15
8.1. Footing Design 15
9.0. Conditions Of The Recommendations 16
10.0 References 16

TABLES

TABLE 1: SITE DETAILS..... 4
TABLE 2: SUMMARY OF LABORATORY TEST RESULTS..... 6
TABLE 3: SUMMARY OF SITE CLASSIFICATIONS AS2870..... 7
TABLE 4: SUMMARY OF LOT CLASSIFICATION 7
TABLE 5: SOIL PARAMETERS 8
TABLE 6: SALINITY CRITERIA..... 11
TABLE 7: PH – CONCRETE STRUCTURES..... 11
TABLE 8: PH – STEEL STRUCTURES 11
TABLE 9: SULFATE - CONCRETE STRUCTURES 12
TABLE 10: CHLORIDE - STEEL STRUCTURES 12
TABLE 11: AFFRESSICITY TEST RESULTS 12
TABEL 12: ACID SULFATE ASESSMENT CRITERIA..... 13
TABLE 13: ACID SULFATE & SPOCAS RESULTS..... 14

APPENDICES

APPENDIX A

DE-743 Borehole Locations (Figure 1)

APPENDIX B

DE-743 Borehole Logs

APPENDIX C

CSIRO – Foundation Maintenance And Footing Performance

APPENDIX D

Important Information

APPENDIX D

Laboratory Test Results

1. Introduction

Down to Earth Geotechnical & Environmental Pty Ltd (D2E) has prepared this report to discuss the results of the geotechnical investigation undertaken for the proposed development at Foreshore Park, Newcastle NSW 2300 (herein referred to as the "site"). D2E was engaged to provide professional assistance for this component of the project.

1.1. Proposed Development

The proposed development includes the renewal of public infrastructure and parklands at Wharf Road and Argyle Street, Newcastle, including:

- Urban renewal to Wharf Road including shared pathway;
- Potential public utilities adjustments, but retention of overhead powerlines;
- New trees, landscape and streetscape features, public open space and street furniture – existing trees to be retained where practicable;
- Parkland renewal including a regional playspace;
- A cycleway connecting the broader cycleway network plan;
- New drainage infrastructure including water-sensitive urban design;
- Lighting upgrade and smart city upgrades.

2. Site Details

The following information, presented in Table 1, describes the site.

Table 1: Summary of Site Details

Site Address.	Foreshore Park, Newcastle
Prepared For.	SESL Australia
Council.	City of Newcastle

2.1. Geology

Reference to the 1:100 000 Newcastle Coalfield Regional Geology map indicates that the majority of the site is underlain by quaternary alluvium generally comprising gravel, sand, silt, and clay. The exception to this is the south-eastern and southern extents of the site within Foreshore Park, which is underlain by the Permian aged Lambton subgroup of the Newcastle Coal Measures, which generally comprises sandstone, siltstone, claystone, coal and tuff.

The regional groundwater flow regime is believed to be towards the Hunter River (Newcastle Harbour) located immediately adjacent to the north-western portion of the site and approximately 160 m northwest of the remainder of the site. This water body is considered to be the nearest sensitive receptor. Based on site topography the depth to groundwater is likely to be within approximately 2 m depth from the ground surface. It should be noted that groundwater levels are affected by climatic conditions and soil permeability and will therefore vary spatially, and with time.

2.2. Site Description

The site is situated at Foreshore Park, Newcastle which is located along wharf road in Newcastle.

3. Geotechnical Investigation

Fieldwork was undertaken on 30th & 31st of May 2022 which included augering twenty (20) boreholes using a trailer mounted, 100mm solid flight auger with a TC-Bit attachment to a maximum depth of 5.0m below existing surface levels. Boreholes were supplemented with Dynamic Cone Penetrometers to a depth of 1.9m below surface levels to assess shear strength, additionally California Bearing Ratio (CBR) samples were taken for investigation purposes. Other sampling undertaken at the time of inspection included electrical conductivity, aggressivity, pH & SPOCAS testing. Borehole logs and field observations are presented in Appendix B.

3.1 Soil Profiles

The boreholes indicated that the soil profile generally comprised of the following;

- UNIT 1, between 0.0m & 1.5m; Fill: sandy SILT, fine sand, dark grey, moist, low plasticity.
- UNIT 2, between 0.4m & 2.0m; Fill: Sandy GRAVEL, fine to medium gravel, fine to coarse sand, dark grey, moist, low plasticity.
- UNIT 3, between 0.7m & 5.0m; Natural: SAND, fine grained sand, light brown, Humid to wet, low plasticity.

Groundwater seepage was encountered during our investigation at between 3.5m & 5.0m below existing surface levels. However, it should be noted that no long-term ground water monitoring was conducted at the time of our investigation.

3.2 Laboratory Test Results

Seven (7) laboratory test for analysis of California Bearing Ratio (CBR, test method AS1289 6.1.1) were collected from the site and sent to our NATA accredited laboratory. The following information in table 2 summarises test results for California Bearing Ratio (CBR) and their location with results presented in Appendix E.

Table 2: Summary of Laboratory Test Results

Borehole	CBR %
BH5	30
BH9	14
BH19	20
BH2	20
BH15	15
BH16	14
BH20	20

4. Recommendations

4.1. Site Classification

Australian Standard AS 2870-2011 establishes performance requirements and specific designs for common foundation conditions as well as providing guidance on the design of footing systems using engineering principles. Site classifications as defined on Table 2.1 and 2.3 of AS2870 are presented on Table 2 below.

Table 3: Summary of Site Classifications AS2870

Site Classification	Foundation	Characteristic Surface Movement
A	Most sand and rock sites with little or no ground movement from moisture changes	
S	Slightly reactive clay sites, which may experience only slight ground movement from moisture changes	0-20mm
M	Moderately reactive clay or silt sites, which may experience moderate ground movement from moisture changes	20-40mm
H1	Highly reactive clay sites, which may experience high ground movement from moisture changes	40-60mm
H2	Highly reactive clay sites, which may experience very high ground movement from moisture changes	60-75mm
E	Extremely reactive sites, which may experience extreme ground movement from moisture changes	75mm+
A to P	Filled sites (refer to clause 2.4.6 of AS 2870)	
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise.	

In accordance with the AS2870-2011, the site in its existing condition and in the absence of abnormal moisture conditions would be classified as detailed in Table 4 below. It is noted that filling of unknow quality from a geotechnical perspective was encountered at depths greater than 400mm, therefore the following classification has been adopted (refer to table 4).

Table 4: Summary of Lot Classification

Location	**Recommended Site Classification**
Foreshore Park, Newcastle	Class P

4.2. Footings – Bearing Capacity

The primary geotechnical issue relates to settlement of the fill. The likely mechanisms include elastic settlement upon loading with the proposed development, and long-term creep settlement, which is the steady long-term movement which occurs under conditions of constant stress (ie. the self-weight of the fill) and moisture content. Creep settlements occur due to the gradual rearrangement of the soil particles due to failure of the contact points between particles. Creep settlements would occur in both the granular and clay fill. Differential settlements arising from the variable fill thicknesses are expected to be unacceptable. Such differential settlements would result in tilting of the proposed structures and slabs, and may cause negative gradients on drainage pipes, depending on their location and orientation. Based on the results of our investigation and existing literature, we expect that the maximum differential settlement across the site arising from only creep movements would be in the order of 2mm/year. We therefore recommend that the proposed play space be supported on piles which penetrate the filling material and are embedded into the natural sands at depth.

Based on the potential for differential settlements, we also recommend that rigid landscaping features (eg. low height retaining walls, etc.) should be avoided.

The soil parameters provided given in Table 3 below may be used for the design of pad footings and bored piles. To minimise the effects of differential settlement under the building loads, this office recommends that all footings are founded into the same consistent, natural in-situ soils of similar consistency of similar classification. Recommended Pad Footing and Pile Design Parameters are outlined within Table 4 below.

Table 5: Soil Parameters

Soil Type	Allowable Bearing Capacity (kPa)	Ultimate Vertical End Bearing Pressure (kPa)	Ultimate Shaft Adhesion in Compression (kPa)	Ultimate Shaft Adhesion in Tension (kPa)
Unit 1 FILL, Sandy SILT, brown	N/A	N/A	0	0
Unit 2 FILL, Sandy GRAVEL, dark grey	100	300	10	5
UNIT 3 Natural, SAND, light brown	100	300	10	5

Where deep footing systems are adopted, it is recommended that piers to be designed in accordance with AS 2159-2009 Piling – Design and Installation and design factors presented in clause 4.3 of this Standard should be applied.

For the design and construction of footings, it is also recommended that:

- No footings be founded on residual soil, buried floaters or boulders.
- The base of the footing excavations be cleaned so no soft, lose or wet soils are present.
- Before pouring concrete in the footings, an experienced geotechnical engineer to inspect the foundation and confirm the allowable bearing pressures (HOLD POINT). Concrete be placed within 24 hours of excavation to avoid deterioration of the weathered bedrock by prolonged exposure.

All footings for the proposed play areas are to be founded through any uncontrolled fill, silt, topsoil, slopewash, deleterious soils or uncontrolled fill and founded into the natural medium dense Silty SANDS.

Given the subsurface conditions encountered in the borehole, a piled foundation system is likely to be adopted, with the building fully supported by piles sufficiently founded into medium dense sandy soils underlying the site. Confirmation of the actual depth and thickness of the medium dense layer should be made during construction.

Bored piles should be socketed into the underlying medium dense sand for a length of about three pile diameters in order to mobilise both skin friction and the end bearing pressure. It should be noted that skin friction in the loose sand should be ignored. It should also be noted that the settlement behaviour, and pile and bearing capacities will vary significantly depending on the pile dimensions and actual depth of embedment, along with the method of installation. Temporary or permanent liners (i.e. casing) will be required due to groundwater inflow.

Due to groundwater being encountered during our investigation, or possible groundwater seepage during installation of bored piles, it is recommended that consideration be given to other piling methods such as Continuous Flight Auger (CFA) piles. It is also recommended that where piles penetrate expansive soils, which are susceptible to shrink and swell due to seasonal moisture, shaft adhesion be ignored due to the potential of shrinkage cracking.

The quality of the founding stratum in all footing excavations is to be assessed by a geotechnical professional to confirm that the design parameters recommended in this report are appropriate. Footing excavations are to be cleaned out, free of groundwater and inspected by a geotechnical professional prior to concrete placement.

4.3. Filling

Where filling is required for future retaining structures or during site regrading, the following recommended compaction targets should be considered:

- Place horizontal loose layers not more than 200mm loose thickness over the prepared subgrade.
- Compact to a minimum density ratio not less than 98% of the relative compaction for the building platforms.
- The moisture content during compaction should be maintained at ±2% of the Optimal Moisture Content (OMC).
- The upper 150mm of the subgrade should be compacted to a density ratio not less than 100% relative compaction.

Any soils which are imported onto the site for the purpose of filling and compaction of the excavated areas should be free of deleterious materials and contamination. The imported soils should also include appropriate validation documentation in accordance with current regulatory authority requirements. The design and construction of earthworks should be carried out in accordance with AS 3798-2007. Inspections of the prepared subgrade should be carried out by a geotechnical engineer and should include proof rolling as a minimum. These inspections should be established as “Hold Points”.

4.4. Subgrade Preparation

The following are general recommendations on subgrade preparation for earthworks, slab on ground constructions and pavements:

- Remove existing fill and topsoil, including all materials which are unsuitable from the site.
- Excavate natural soils.
- Excavated material may be used for engineered fill.
- Rock may be used for subgrade material underlying pavements.
- Any natural soils (predominately clayey soils) exposed at the bulk excavation level should be treated and have a moisture condition of 2% OMC. This should be followed by proof rolling and compaction of the upper 150mm layer.
- Any soft or loose areas should be removed and replaced with engineered or approved fill material.
- Ensure the foundations and excavated areas are free of water prior to concrete pouring.
- Areas which show visible heaving under compaction or proof rolling should be excavated at least 300mm and replaced with engineered or approved fill, and compacted to a minimum dry density ratio not less than 98% of the maximum dry density.

4.5. Retaining Walls

In order to avoid differential movements, we recommend that all retaining walls incorporated into the proposed development be supported on piles which penetrate the fill and are embedded into the deeper natural sand profile, and designed using the parameters provided in Section 4.4 above.

Low height independent retaining walls proposed to retain landscaped areas can be founded in the existing fill, and designed using the parameters provided below, subject to acceptance of differential settlements. As discussed in Section 4.2, rigid retaining walls should be avoided as the expected differential settlements will likely cause cracking. Our preference is for a flexible retention system, such as decorative stone Gabion walls and segmental block walls.

Low height cantilevered retaining walls supporting areas where some movement can be tolerated behind the walls (eg. landscaping areas, and assuming no movement sensitive buried services) and which are independent, should be designed using a triangular lateral earth pressure distribution and an ‘active’ earth pressure coefficient (Ka) of 0.33 for the soil profile, assuming a horizontal backfill surface. Low height cantilevered retaining walls supporting areas where movements are undesirable (eg. due to the presence of movement sensitive buried services, etc.), should be designed using a triangular lateral earth pressure distribution and an ‘at-rest’ earth pressure coefficient (K0) of 0.5 for the soil profile, assuming a horizontal backfill surface. A bulk unit weight of 20kN/m3 should be adopted for the soil profile.

On completion of excavating the retaining wall footings, a geotechnical engineer should inspect the founding material and carry out Dynamic Cone Penetration (DCP) testing to confirm that a satisfactory bearing stratum has been achieved. The footings should then be poured as soon as possible. If delays are envisaged in pouring, then we recommend that a concrete blinding layer be provided over the bases to reduce deterioration due to weathering.

5.0 Salinity Assessment

To determine whether there is a potential for salinity to be present at the site, reference was made to the NSW Office of Environment and Heritage (OEH), eSPADE map viewer. A review of the map indicated that the site is located in a moderately saline hydrogeological area (HGL) where a potential salinity hazard may exist but is also on the boundary of a very high saline hydrogeological area (HGL).

5.1 Assessment Criteria

The aggressiveness or erosion potential of an environment in building materials, particularly concrete and steel is dependent on the levels of pH and types of salts present. In order to determine the degree of aggressiveness, the test values obtained are compared to the following criteria.

- Site Investigation for Urban Salinity 2002, prepared by Department of Land and Water Conservation;
- Table 2 from the Cement Concrete & Aggregates Australia Publication "Guide to Residential Slabs and Footings in Saline Environments". The fundamental criteria for assessing soil salinity is based on electrical conductivity as detailed in table 6 below;
- Tables numbered 7, 8, 9 and 10 below refer to Australian Standard AS2159-2009 "Piling- Design and Installation" and for guidelines on protection of buried steel and concrete structures.

Table 6: Salinity Criteria

Class	EC_e (ds/m)	Comments
Non Saline	<2	Salinity effects negligible
Slightly Saline	2-4	Yields of very sensitive crops may be affected
Moderately Saline	4-8	Yields of many crops affected
Very Saline	8-16	Only tolerant crops yields satisfactorily
Highly Saline	>16	Few crops yield satisfactorily

Table 7: pH – Concrete Structures

Concrete Foundation	
pH	**Classification**
>5	Non-aggressive
4.5-5	Mild
4.0-4.5	Moderate
<4.0	Severe

Table 8: pH – Steel structures

Steel Structures	
pH	**Classification**
>4	Non-aggressive
3-4	Mild
<3	Moderate

Table 9: Sulfate - Concrete Structures

Concrete Foundation	
Sulfate (mgS04 /kg)	**Classification**
<5,000	Non-aggressive
5000-10,000	Mild
10,000 –	Moderate
>20,000	Severe

Table 10: Chloride - Steel Structures

Steel Structures	
Chloride (mgCl/kg)	**Classification**
<20,000	Non-aggressive
20,000-50,000	Mild
>50,000	Moderate

Table 11: Aggressivity Test Results

Sample number/Location/ Depth (m)	pH	EC dS/m	EC_e	Resistivity (ohm.cm)	Cl mg/kg	Sulfate mg/kg
BH14/1.5m	6.8	0.067	1.139**	18,000	6.6	6.6
BH12/2.5m	8.1	0.140	2.38**	7,400	27	21
BH19/1.5	8.3	0.091	1.547**	11,000	8.4	8.6
BH16/2.5m	7.6	0.120	2.04**	8,300	27	32
BH2/3.0m	8.1	0.100	1.7**	9,700	24	10
BH20/1.0m	7.2	0.067	1.139**	16,000	16	11
BH9/1.5m	7.3	0.048	0.816**	21,000	3.9	16
BH5/3.5m	7.2	0.068	1.156**	16,000	16	11

** multiplication factor of 17 adopted for sands

5.2 Aggressivity Test Results

In order to determine the degree of aggressiveness, the test values obtained are compared to tables 6.4.2 (C) and 6.5.2 (C) in AS2159 Piling Design and installation and tables 5.1 to 5.4 in AS2870-2011 “residential slabs and footings”. The following testing suite was undertaken with results thereof summarised within table 11 above:

- pH, Electrical Conductivity (EC dS/m), Chloride (mg/kg), Resistivity (ohm.cm); and Sulfates (mg/kg).

Based on test results detailed in table 11, the following can be concluded with regards to soil aggressivity in accordance with Site Investigation for Urban Salinity 2002, prepared by Department of Land and Water Conservation:

- The soil conditions are variable with regards to aggressivity. Six (6) Test results achieved a non-saline classification with the remaining samples classified as slightly to moderately saline;
- An exposure classification of B1 is considered appropriate based on sulfate and EC_e test results, in accordance with tables 5.1 to 5.4 in AS2870-2011 “residential slabs and footings”.

6.0 Acid Sulfate Screening

A total of eighteen (18) samples were screened for the possible presence of Actual Acid Sulfate Soil (AASS) or Potential Acid Sulfate Soil (PASS). These results were compared against the NSW Acid Sulphate Soils Management Advisory Committee (ASSMAC) Acid Sulfate Soils Assessment Guidelines (1998) guidance indicators, namely:

- pHF ≤ 4 strongly indicates oxidation has occurred in the past and that AASS are likely to be present;
- pHFOX < 3.5 (but preferably pHf <3), plus preferably one or more of a pHfox reading at least one pH unit below the corresponding pHf, a strong reaction with peroxide, change in soil colour from grey tones to brown tones or release of sulphurous gases, strongly indicates the presence of PASS.

6.1 Assessment Criteria for Acid Sulfate Soils (Laboratory)

The results of analysis for the soils are compared to the below ASSMAC assessment criteria. It is assumed that <1000 tonnes of material would be disturbed hence the action criteria for less than 1000 tonnes have been applied. Refer to table 12 below:

Table 12: Acid Sulfate Assessment Criteria

Type of Material Texture	Approx Clay Content (% <0.002mm)	Action Criteria <1000 tonnes Sulfur Trail Spos/SKCL/SP %	Action Criteria <1000 tonnes Acid Trail TPA/TSA/TAA pH 6.5 moles H+/tonne
Coarse e.g. sands	**< 5**	**0.03**	**18**
Sandy loams/light clays	5-40	0.06	36
Fine clays/silts	> 40	0.1	62

*NB - Action criteria highlighted bold

On the basis of the pH testing, selected ‘worst case’ samples (BH10 0.5m, BH10 2.0m & BH20 1.0m) were submitted to SGS for SPOCAS (Peroxide Oxidation Combined Acidity and Sulphate) testing. The results of analysis are summarised in Table 13 below and compared with action criteria detailed above as specified in ASSMAC Acid Sulfate Soils Assessment Guidelines (1998).

Table 13: Acid Sulfate & SPOCAS Results

Sample Number & Depth	pHF	pHFOX	pH Difference	Reaction Rate (pHfox)	TPA/TSA/TAA pH 6.5 Moles H+/tonne	Spos/SKCL/SP %w/w
BH2 4.0m	8.2	6.1	2.1	1		
BH10 2.5m	8.2	7.2	1.1	0		
BH10 1.0m	7.6	6.7	0.8	1		
BH10 1.5m	6.8	6.9	0.9	0		
BH10 0.5m	8.2	6.7	2.6	1	<5	0.006
BH10 2.0m	8.8	4.6	4.3	1	<5	0.006
BH20 0.5m	6.6	6.1	1.4	0		
BH20 2.0m	6.6	6.1	1.6	0		
BH20/1.5m	6.4	6.6	0.9	0		
BH20 1.0m	6.1	4.7	1.4	1	<5	0.024
BH19 0.5m	7.7	6.6	1.2	2		
BH19 1.0m	7.3	6.9	1.3	2		
BH19 1.5m	8.4	7.1	1.2	0		
BH18 1.0m	8.6	6.6	1.9	1		
BH18 0.5m	8.0	7.0	0.9	0		
BH18 1.5m	8.3	6.4	1.9	1		
BH18 2.5m	7.3	6.1	1.2	0		
BH18 2.0m	8.0	6.3	1.7	1		

6.2 Discussion of Results

The following assessment can be derived from table 2 above:

- As no samples taken show a pHF ≤ 4, AASS are not likely to be present;
- As no samples taken show a pHFOX < 3. PASS are not likely to be present.

6.3 Discussion of SPOCAS Results

There is no specific method to interpret the results of the SPOCAS test results. However, results from SPOCAS testing will provide guidance to identification of potential ASS or PASS issues. Results in table 3 above indicates that samples numbered BH10 2.0m (sampled 30-05-2022) are affected by potential acid sulfate soils.
Notes:

TAA Total Actual Acidity
TPA Total Potential Acidity
TSA Total Sulphidic Acidity (TPA-TAA)
SKCl KCl extractable sulphur
SP peroxide oxidation sulphur
SPOS Peroxide oxidisable sulphur
* ASSMAC Action Criteria for disturbance of 1 – 1000 tonnes of coarse textured material i.e. sands to loamy sands
** ASSMAC Action Criteria for disturbance of 1 – 1000 tonnes of medium textured material i.e. sandy loams to light clay
pHF non-oxidised pH
pHFOX oxidised pH

7.0 General Pavement Recommendations

Slab-on-grade construction for the proposed cycleway and footpath pavement are considered feasible provided the subgrade is prepared as discussed below. Slabs-on-grade and external concrete pavements should be constructed independent (ie. designed as 'floating' slabs) to permit relative movement. Slab joints should be designed to resist shear forces but not bending moments by providing dowelled or keyed joints.

- Strip existing topsoil materials and stockpile for re-use or removal from site.
- Excavate to design pavement subgrade levels.
- Compact exposed (subgrade) natural surfaces with a minimum of 7 passes of a 3-wheeled self-propelled roller or other approved device acceptable to Council. Proof rolling should then be carried out as directed by Council. The roller shall have rear rollers of at least 1200mm diameter and an intensity of loading of at least 7000kg per metre width of roller, unless otherwise approved by Council.
- Excavate areas of localised heaving to a depth of 300mm and replace with suitable granular fill, such as non-reactive well graded materials (eg. crushed sandstone), with maximum particle size not exceeding 75mm, compacted to a Minimum Dry Density Ratio (MDDR) of 100% Standard, with moisture variation maintained within 3% of Standard Optimum Moisture Content (SOMC).
- The proof rolling should be supervised by a suitably qualified Geotechnical Consultant.
- On certification of proof rolling, placement of the pavement materials may proceed. The following minimum dry density ratios (AS1289 5.4.1) must be achieved during pavement construction. Testing should be carried out by a NATA registered laboratory.
    - Base Course 98% Modified
    - Subbase 98% Modified
    - Subgrade 100% Standard
- Where filling/earthworks is required to reach design subgrade levels, CBR testing should be undertaken at subgrade level to ensure test values are consistent with design parameters outlined within table 3 of this report.
- Subgrade conditions exposing weathered bedrock material should be scarified to a depth of 300mm and re-compacted to 100% standard dry density (AS1289 5.4.1) with moisture variation maintained within 3% of Standard Optimum Moisture Content (SOMC).
- Carry out all earthworks in accordance with Newcastle Council specifications.

8.0 GENERAL RECOMMENDATIONS

8.1 Footing Design

- It is recommended that all footing excavations be inspected by a geotechnical engineer from D2E to confirm that founding conditions are consistent with design recommendations. The footing size and the founding level may need to be adjusted, if required founding material is not encountered at the design founding level.
- To reduce soil moisture variations near the footings, the builder should compact clean soil (without rubble or organic matter) around the footings to minimize water ingress around the footings.
- To reduce, but not eliminate, the possibility of damage to the footing, tree planting should be restricted to a distance from the structures of 1 x mature height of the trees.
- Good drainage is an important part of any footing design. The builder should prevent water accumulation near the building footings (even during

construction). It is recommended that sufficient ground clearance be created to accommodate paving which slopes a minimum of 1:20 away from the building. This slope should be achieved by excavation and not by building-up loose fill around the footings.

- The roof water should be diverted away from the footing as soon as the roof is constructed by using temporary pipes, if necessary. The surface water should also be provided by constructing surface gutters or grading the surface to divert the water away from the footing.
- During wet conditions machinery traffic will soften the soil on this site and may prevent footing construction to proceed.
- Any proposed footings which are close to an easement and/or other excavations, (including those in adjoining properties) should be founded below a line projected up at 30˚ to the horizontal (for Sand) and 40˚ to the horizontal (for firm/stiff Clay) and measured from the nearest base of the easement excavations.
- Avoid excavations close to footings since those founded on sandy soils can experience settlements while those founded in clayey soils can also move due to the shrinking and swelling of the clay. Plumbers and drainers should follow all the recommendations made in AS 2870 and other appropriate codes with respect to drainage works.

9.0 Conditions of the Recommendations

The adopted investigation scope was limited at the time of our investigation and by the investigation intent. Further geotechnical inspections should be carried out during the planning phase of the proposed park upgrade structures to confirm both the geotechnical model and the design parameters provided in this report.

Your attention is drawn to the document “Important Information”, 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. The document is not intended to reduce the level of responsibility accepted by Down to Earth Geotechnical & Environmental Pty Ltd, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

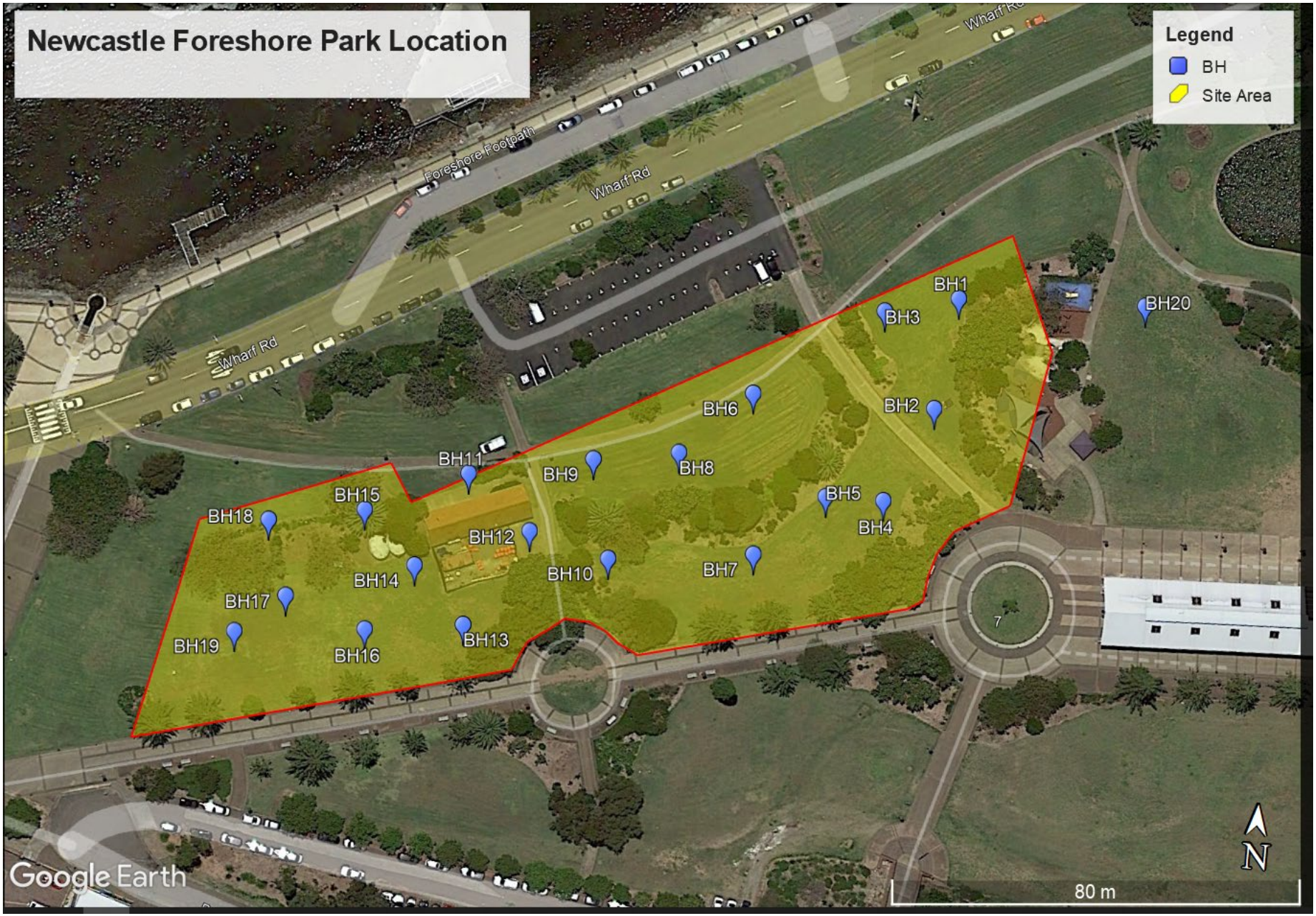
10.0 References

- AS2870 (2011), Residential Slab and Footings – Construction
- AS1726:2017, Geotechnical Site Investigations, Standards Australia.
- AS2159:2009, Piling – Design and Installation, Standards Australia.
- AS2870:2011, Residential Slabs and Footings, Standards Australia.
- AS3798:2007, Guidelines on Earthworks for Commercial and Residential Developments, Standards Australia
- NSW Planning, Industry & Environment eSPADE.
- NSW Department of Finance and Service, Spatial Information Viewer, maps.six.nsw.gov.au.
- Australian Road Research Board, Special Report No. 41 – A Structural. Design Guide for Flexible Residential Street Pavements, 1989,
- New South Wales Development Design specification D2 – Pavement Design,
- New South Wales Development Design specification 242 – Flexible Pavements,
- CA&CAA T51 “Guide to Residential Streets and Paths”

APPENDICES.

APPENDIX A

Figure 1



N	Approximate Borehole Location	**SESL Australia** Foreshore Park, Newcastle NSW 2134		Job No	DE-743
				Drawing No	DE-743_Figure 1
		Drawn By	MS	Ref No	Figure 1
		Approved By	NS	Scale	Not to scale

APPENDIX B

DE-735 Borehole Logs

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 1

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		OL	Sandy SILT, dark brown, low plasticity moist		1 7 6	Fill firm - very stiff
	0.5	GM	Sandy GRAVEL, grey, moist low plasticity		4 13 Refusal	Fill stiff - hard
		SM	Sandy SILT, dark grey, low plsticity moist			Fill
	1	SP	SAND, finely grained, light brown humid, low plasticity			Natural
	1.5					
	2					
	2.5					
	3		End Borehole 3.0m DCP Refusal due to gravel layer			
	3.5					

Method: *4WD mounted, 100mm solid flight auger*
Date : *30/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 2

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		OL	Sandy SILT, dark grey, moist low plasticity		1 3 9 13	Fill stiff hard
	0.5 1	GM	Sandy GRAVEL, dark brown moist, low plasticity		13 12 Refusal	Fill hard
	1.5	SM	Silty SAND, brown, humid low plasticity			Natural
	2 2.5	SP	SAND, finely grained, light brown wet, low plasticity			Natural
	3 3.5		End borehole 3.0m DCP Refusal due to gravel layer			

Method: *4WD mounted, 100mm solid flight auger*
Date : *30/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 3

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		OL	Sandy SILT, dark brown moist, low plasticity		1 4 15	Fill stiff hard
	0.5	GM	Sandy GRAVEL, dark brown moist, low plasticity		9 Refusal	Fill
	1 1.5	SP	SAND, finely grained, light brown wet, low plasticity			Natural
	2 2.5 3 3.5		End Borehole 2.0m *DCP Refusal due to gravel layer*			

Method: *4WD mounted, 100mm solid flight auger*
Date : *30/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 4

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		OL	Sandy SILT, dark brown moist, low plasticity		1 5 8 13 10 16 7	Fill stiff hard very stiff
	0.5					
		SP	SAND, finely grained, light brown humid to wet, low plasticity		6 5 7 13 14 16 16 20 Refusal	Natural medium dense dense
	1					
	1.5					
	2		End Borehole 2.0m *DCP Refusal due to dense sand*			
	2.5					
	3					
	3.5					

Method: *4WD mounted, 100mm solid flight auger*
Date : *30/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 5

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL	0.5	OL	Sandy SILT, dark grey, moist low plasticity		2 4 4 3 4 5 5	Fill stiff
	1	GM	Sandy GRAVEL, dark grey, moist low plasticity		5 4 3	Fill stiff
	1.5	SM	Sandy SILT, some gravel, dark grey moist, low plasticity		2 2 2 5 9 13 14 Refusal	Fill stiff hard
	2 2.5 3 3.5	SP	SAND, finely grained, light brown low plasticity			Natural
			End borehole 3.5m DCP Refusal due to hard fill			

Method: *4WD mounted, 100mm solid flight auger*
Date : *30/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 6

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		OL	Sandy SILT, dark brown moist, low plasticity		1 7 9	Fill very stiff - hard
	0.5	CL	Gravelly CLAY, brown, moist low-medium plasticity		10 6 Refusal	Fill very stiff - hard
	1	SM	Sandy SILT, dark grey moist, low plasticity			Fill
	1.5	CL	Silty CLAY, brown, moist low plastcity			Fill
	2	SP	SAND, finely grained, light brown wet, low plasticity			Natural
	2.5					
	3		End Borehole 3.0m DCP Refusal due to gravel within layer			
	3.5					

Method: *4WD mounted, 100mm solid flight auger*
Date : *30/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 7

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		OL	Sandy SILT, dark grey, moist low plasticity		1 4 6	Fill stiff - very stiff
	0.5	GM	Sandy GRAVEL, dark grey, moist low plasticity		8 Refusal	Fill
	1 1.5 2 2.5	SP	SAND, finely grained, light brown humid to wet, low plasticity			Natural
	3 3.5		End Borehole 3.0m DCP Refusal due to gravel layer			

Method: *4WD mounted, 100mm solid flight auger*
Date : *30/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 8

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		CL	Silty CLAY, some gravel, dark brown moist, low plasticity		1 1 4 12	Fill soft stiff
	0.5 1 1.5	GM	Sandy GRAVEL, brown, moist low plasticity		8 10 10 8 4 8 9 4 Refusal	Fill hard stiff - hard
	2 2.5	SP	SAND, finely grained, light brown wet, low plasticity			Natural
	3 3.5		End Borehole 3.0m DCP Refusal due to gravel layer			

Method: *4WD mounted, 100mm solid flight auger*
Date : *30/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 9

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		CL	Sandy CLAY, dark brown moist, low to medium plastciity		1 2 7 5 4	Fill firm very stiff stiff
	0.5	GM	Sandy GRAVEL, dark brown moist, low plasticity		9 2 Refusal	Fill
	1	CL	Sandy CLAY, brown, moist low to medium plasticity			Fill
	1.5	SP	SAND, finely grained, light brown humid to wet, low plasticity			Natural
	2					
	2.5					
	3		End borehole 3.0m DCP Refusal due to gravel layer			
	3.5					

Method: *4WD mounted, 100mm solid flight auger*
Date : *30/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 10

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		OL	Sandy SILT, dark grey, moist low plasticity		1 2 6 4 5	Fill soft - firm very stiff - stiff
	0.5	CL	Gravelly CLAY, brown, moist low plasticity		7 15 7 Refusal	FIll hard - very stiff
	1	SM	Sandy SILT, dark brown, moist low plasticity			Fill
		SP	SAND, finely grained, light brown humid to wet, low plasticity			Natural
	1.5					
	2					
	2.5					
	3		End borehole 3.0m DCP Refusal due to gravel within layer			
	3.5					

Method: *4WD mounted, 100mm solid flight auger*
Date : *30/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 11

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		OL	Sandy SILT, dark brown, moist low plasticity		1 3	Fill firm
		SM	Silty SAND, dark brown humid, low plasticity		10 8 13 15 12 4 3 14 12 8 6 5 5 6	FIll dense medium dense dense medium dense
	0.5 1 1.5					
		SP	SAND, finely grained, light brown humid to wet, low plasticity		15 13 Refusal	Natural dense
	2 2.5 3					
			End borehole 3.0m DCP Refusal due to dense sand			
	3.5					

Method: *4WD mounted, 100mm solid flight auger*
Date : *31/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 12

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		SM	Silty SAND, with some clay, brown wet, low to medium plasticity		1 4 6 9 7 4 2 2 2 8	Fill loose - medium dense loose medium dense
	0.5 1	GM	Sandy GRAVEL, dark grey traces coal dusk & ash moist, low plasticity		5 8 10 Refusal	Fill hard
	1.5 2	SP	SAND, brown, traces glass & tile moist, low plasticity			Fill
	2.5 3	SP	SAND, finely grained, light brown wet, low plasticity			Natural groundwater present 3.5m
	3.5		End borehole 3.6m, DCP Refusal due to gravel layer			

Method: *4WD mounted, 100mm solid flight auger*
Date : *31/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 13

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL	0.5	CL	Sandy CLAY, brown, wet low to medium plasticity		1 2 5 10 12 12 9 5 15 Refusal	Fill firm very stiff - hard
	1	GM	Sandy GRAVEL, grey moist, low plasticity			Fill
	1.5					
	2	SP	SAND, finely grained, light brown wet, low plasticity			Natural
	2.5					
	3					
	3.5		End borehole 3.5m DCP Refusal due to gravel layer			

Method: *4WD mounted, 100mm solid flight auger*
Date : *31/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 14

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		SM	Silty SAND, brown, humid low plasticity		1 2 9 12	Fill loose - medium dense
	0.5	GM	sandy GRAVEL, grey, moist low plasticity		Refusal	Fill
		SM	Sandy SILT, grey, moist low plasticity			Fill
	1					
	1.5	GM	Gravelly SAND (crushed sandstone) brown, low plasticity			Fill
		SP	SAND, finely grained, light brown humid to wet, low plasticity			Natural
	2					
	2.5					
	3					
	3.5		End borehole 3.5m DCP Refusal due to gravel layer			

Method: *4WD mounted, 100mm solid flight auger*
Date : *31/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 15

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL	0.5 1	SM	silty SAND, brown moist, low plasticity		1 2 5 8 12 13 Refusal	Fill loose - medium dense medium dense - dense
	1.5	GM	sandy GRAVEL (crushed sandstone), brown moist, low plasticity			Fill
	2 2.5 3 3.5	SP	SAND, finely grained, light brown humid to wet, low plasticity			Natural
			End Borehole 3.5m DCP Refusal due to dense sand			

Method: *4WD mounted, 100mm solid flight auger*
Date : *31/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 16

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		SM	Silty SAND, brown humid, low plasticity		1 3 4 4	Fill loose medium dense
	0.5	GM	Sandy GRAVEL, grey moist, low plastic		1 Refusal	loose
	1					
	1.5	CL	Sandy CLAY, brown, moist low plasticity			Fill
	2					
	2.5	SP	SAND, finely grained, light brown Humid, low plasticity			
	3					
	3.5					
			End borhole 5.0m, DCP Refusal due to gravel layer			groundwater present 5.0m

Method: *4WD mounted, 100mm solid flight auger*
Date : *31/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 17

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		SM	Sandy SILT, grey, moist low plasticity		1 2 6 8 13 10 19 14 13 14 14 10 6 5 6	Fill firm very stiff - hard very stiff
	0.5 1 1.5	SP	SAND, finely grained, light brown humid to wet		4 4 15 14 Refusal	Natural mdeium dense - dense
	2 2.5 3		End Borehole 3.0m DCP Refusal due to dense sand			
	3.5					

Method: *4WD mounted, 100mm solid flight auger*
Date : *31/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 18

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		SM	Silty SAND, brown, humid low plasticity		1 6 8 13 16 16	Fill loose - medium dense dense
	0.5	GM	Sandy GRAVEL, grey, dry low plasticity		Refusal	Fill
	1					
	1.5					
	2	SM	Silty SAND, humid low plasticity, dark grey			Natural
	2.5	SP	SAND, finely grained, light brown humid to wet, low plasticity			Natural
	3		End borehole 3.0m DCP Refusal due to gravel layer			
	3.5					

Method: *4WD mounted, 100mm solid flight auger*
Date : *31/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 19

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		SM	Silty SAND, brown, Humid low plasticity		1 2 2 1 12 Refusal	Fill loose dense
	0.5					
	1					
		SP	SAND, finely grained, light brown humid, low plasticity			
	1.5					
	2					
	2.5					
	3					
	3.5		End borehole 3.5m DCP Refusal due to dense sand			

Method: *4WD mounted, 100mm solid flight auger*
Date : *31/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

Down to Earth
Geotechnical & Environmental

SITE LOCATION: Foreshore Park, Newcastle

Borehole # 20

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION (*SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY*)	Sample	Dynamic Cone Penetrometer	REMARKS
NIL		OL	Sandy SILT, dark grey, low plasticity traces rootlets		3 6 8 9 9	Fill stiff - hard
	0.5	SP	SAND, finely grained, light brown non-plasticity, wet		8 9 9 Refusal	Natural medium dense
	1					
	1.5					
	2					
	2.5					
	3		End Borehole 3.0m DCP Refusal due to dense sand			
	3.5					

Method: *4WD mounted, 100mm solid flight auger*
Date : *30/05/2022*
Logged By: ***JG***
Penetration: *AS 1289 6.3.2 DCP*

APPENDIX C

CSIRO – Foundation Maintenance And Footing Performance

Foundation Maintenance and Footing Performance:
A Homeowner's Guide

CSIRO

BTF 18 replaces Information Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction
There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion
All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation
This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil
All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure
This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth
Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation
Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay
Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots
In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself
Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures
Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

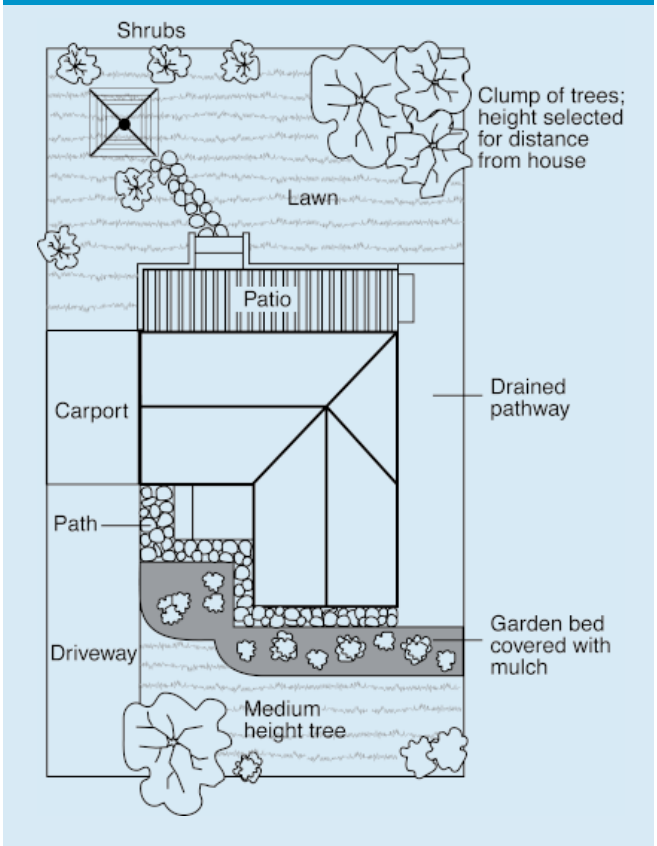
Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4

Gardens for a reactive site



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

The information in this and other issues in the series was derived from various sources and was believed to be correct when published.

The information is advisory. It is provided in good faith and not claimed to be an exhaustive treatment of the relevant subject.

Further professional advice needs to be obtained before taking any action based on the information provided.

Distributed by

CSIRO PUBLISHING PO Box 1139, Collingwood 3066, Australia

Freecall 1800 645 051 Tel (03) 9662 7666 Fax (03) 9662 7555 www.publish.csiro.au

Email: publishing.sales@csiro.au

© CSIRO 2003. Unauthorised copying of this Building Technology file is prohibited

APPENDIX D

IMPORTANT INFORMATION

Important Information

SCOPE OF SERVICES

The geotechnical report ("the report") has been prepared in accordance with the scope of services as set out in the contract, or as otherwise agreed, between the Client and Down to Earth Geotechnical & Environmental Pty Ltd (D2E). The scope of work may have been limited by a range of factors.

RELIANCE ON DATA

D2E has relied on data provided by the Client and other individuals and organizations, to prepare the report. Such data may include surveys, analyses, designs, maps and plans. D2E has not verified the accuracy or completeness of the data except as stated in the report. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations ("conclusions") are based in whole or part on the data, D2E will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to D2E.

GEOTECHNICAL ENGINEERING

Geotechnical engineering is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical engineering reports are prepared for a specific client, for a specific project and to meet specific needs, and may not be adequate for other clients or other purposes (e.g. a report prepared for a consulting civil engineer may not be adequate for a construction contractor). The report should not be used for other than its intended purpose without seeking additional geotechnical advice. Also, unless further geotechnical advice is obtained, the report cannot be used where the nature and/or details of the proposed development are changed.

LIMITATIONS OF SITE INVESTIGATION

The investigation programme undertaken is a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions. The data derived from the site investigation programme and subsequent laboratory testing are extrapolated across the site to form an inferred geological model, and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Despite investigation, the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. The engineering logs are the subjective interpretation of subsurface conditions at a particular location and time, made by trained personnel. The actual interface between materials may be more gradual or abrupt than a report indicates.

SUBSURFACE CONDITIONS ARE TIME DEPENDENT

Subsurface conditions can be modified by changing natural forces or man-made influences. The report is based on conditions that existed at the time of subsurface exploration. Construction operations adjacent to the site, and natural events such as floods, or ground water fluctuations, may also affect subsurface conditions, and thus the continuing adequacy of a geotechnical report. D2E should be kept appraised of any such events, and should be consulted to determine if any additional tests are necessary.

VERIFICATION OF SITE CONDITIONS

Where ground conditions encountered at the site differ significantly from those anticipated in the report, either due to natural variability of subsurface conditions or construction activities, it is a condition of the report that D2E be notified of any variations and be provided with an opportunity to review the recommendations of this report. Recognition of change of soil and rock conditions requires experience and it is recommended that a suitably experienced geotechnical engineer be engaged to visit the site with sufficient frequency to detect if conditions have changed significantly.

REPRODUCTION OF REPORTS

This report is the subject of copyright and shall not be reproduced either totally or in part without the express permission of this Company. Where information from the accompanying report is to be included in contract documents or engineering specification for the project, the entire report should be included in order to minimize the likelihood of misinterpretation from logs.

REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the Client and no other party. D2E assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of D2E or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own inquiries and obtain independent advice in relation to such matters.

OTHER LIMITATIONS

D2E will not be liable to update or revise the report to take into account any events or emergent circumstances or fact occurring or becoming apparent after the date of the report.

EXPLANATORY NOTES - DRILL & EXCAVATION LOGS

GENERAL

Information obtained from site investigations is recorded on log sheets. The "Cored Drill Hole Log" presents data from an operation where a core barrel has been used to recover material - commonly rock. The "Non-Core Drill Hole - Geological Log" presents data from an operation where coring has not been used and information is based on a combination of regular sampling and insitu testing. The material penetrated in non-core drilling is commonly soil but may include rock. The "Excavation - Geological Log" presents data and drawings from exposures of soil and rock resulting from excavtion of pits, trenches, etc.

The heading of the log sheets contains information on Project Identification, Hole or Pit Identification, Location and Elevation. The main section of the logs contains information on methods and conditions, material substance description and structure presented as a series of columns in relation to depth below the ground surface which is plotted on the left side of the log sheet. The common depth scale is 8m per drill log sheet and about 3-5m for excavation logs sheets.

As far as is practicable the data contained on the log sheets is factual. Some interpretation is inevitable in the identification of material boundaries in areas of partial sampling, the location of areas of core loss, description and classification of material, estimation of strength and identification of drilling induced fractures. Material description and classifications are based on SAA Site Investigation Code AS 1726 - 1993 with some modifications as defined below.

These notes contain an explanation of the terms and abbreviations commonly used on the log sheets.

DRILLING

Drilling & Casing

AS	Auger Screwing
AD/V	Auger Drilling with V-Bit
AD/T	Auger Drilling with TC Bit
WB	Wash-bore drilling
RR	Rock Roller
NMLC	NMLC core barrel
NQ	NQ core barrel
HMLC	HMLC core barrel
HQ	HQ core barrel

Drilling Fluid/Water

The drilling fluid used is identified and loss of return to the surface estimated as a percentage.

Drilling Penetration/Drill Depth

Core lifts are identified by a line and depth with core loss per run as a percentage. Ease of penetration in non-core drilling is abbreviated as follows:

VE	Very Easy
E	Easy
F	Firm
H	Hard
VH	Very Hard

Groundwater Levels

Date of measurement is shown.

Standing water level measured in completed borehole

Level taken during or immediately after drilling

Samples/Tests

D	Disturbed
U	Undisturbed
C	Core Sample
SPT	Standard Penetration Test
N	Result of SPT (*sample taken)
VS	Vane Shear Test
IMP	Borehole Impression Device
PBT	Plate Bearing Test
PZ	Piezometer Installation
HP	Hand Penetrometer Test

EXCAVATION LOGS

Explanatory notes are provided at the bottom of drill log sheets. Information about the origin, geology and pedology may be entered in the "Structure and other Observations" column. The depth of the base of excavation (for the logged section) at the appropriate depth in the "Material Description" column. Refusal of excavation plant is noted should it occur. A sketch of the exposure may be added.

MATERIAL DESCRIPTION - SOIL

Classification Symbol - In accordance with the Unified Classification System (AS 1726-1993, Appendix A, Table A1)

Material Description - In accordance with AS 1726-1993, Appendix A2.3

Moisture Condition

D	Dry, looks and feels dry
M	Moist, No free water on remoulding
W	Wet, free water on remoulding

Consistency - In accordance with AS 1726-1993, Appendix A2.5

VS	Very Soft	< 25kPa
S	Soft	25 - 50kPa
F	Firm	50 - 100kPa
St	Stiff	100 - 200kPa
VSt	Very Stiff	200 - 400kPa
H	Hard	≥ 400kPa

Strength figures quoted are the approximate range of Unconfined Compressive Strength for each class.

Density Index. (%) is estimated or is based on SPT results. Approximate N Value correlation is shown in right column.

VL	Very Loose	< 15%	0 - 4
L	Loose	15 - 35%	4 - 10
MD	Medium Dense	35 - 65%	10 - 30
D	Dense	65 - 85%	30 - 50
VD	Very Dense	> 85%	> 50

MATERIAL DESCRIPTION -ROCK

Material Description

Identification of rock type, composition and texture based on visual features in accordance with AS 1726-1993, Appendix A3.1-A3.3 and Tables A6a, A6b and A7.

Core Loss

Is shown at the bottom of the run unless otherwise indicated.

Bedding

Description	Spacing (mm)
Thinly Laminated	< 6
Laminated	6 - 20
Very Thinly Bedded	20 - 60
Thinly Bedded	60 - 200
Medium Bedded	200 - 600
Thickly Bedded	600 - 2000
Very Thickly Bedded	> 2000

Weathering - No distinction is made between weathering and alteration. Weathering classification assists in identification but does not imply engineering properties.

Fresh (F)	Rock substance unaffected by weathering
Slightly Weathered (SW)	Rock substance partly stained or discoloured. Colour and texture of fresh rock recognisable.
Moderately Weathered (MW)	Staining or discolouration extends throughout rock substance. Fresh rock colour not recognisable.
Highly Weathered (HW)	Stained or discoloured throughout. Signs of chemical or physical alteration. Rock texture retained.
Extremely Weathered (EW)	Rock texture evident but material has soil properties and can be remoulded.

Strength - The following terms are used to described rock strength:

Rock Strength Class	Abbreviation	Point Load Strength Index, Is(50) (MPa)
Extremely Low	EL	< 0.03
Very Low	VL	0.03 to 0.1
Low	L	0.1 to 0.3
Medium	M	0.3 to 1
High	H	1 to 3
Very High	VH	3 to 10
Extremely High	EH	≥ 10

Strengths are estimated and where possible supported by Point Load Index Testing of representative samples. Test results are plotted on the graphical estimated strength by using:

- ° Diametral Point Load Test
- • Axial Point Load Test

Where the estimated strength log covers more than one range it indicates the rock strength varies between the limits shown.

MATERIALS STRUCTURE/FRACTURES

ROCK

Natural Fracture Spacing - A plot of average fracture spacing excluding defects known or suspected to be due to drilling, core boxing or testing. Closed or cemented joints, drilling breaks and handling breaks are not included in the Natural Fracture Spacing.

Visual Log - A diagrammatic plot of defects showing type, spacing and orientation in relation to core axis.

Defects	————	Defects open in-situ or clay sealed
	- - - - - - -	Defects closed in-situ
	.....	Breaks through rock substance

Additional Data - Description of individual defects by type, orientation, in-filling, shape and roughness in accordance with AS 1726-1993, Appendix A Table A10, notes and Figure A2.

Type	BP	Bedding Parting
	JT	Joint
	SM	Seam
	FZ	Fracture Zone
	SZ	Shear Zone
	VN	Vein
	FL	Foliation
	CL	Cleavage
	DL	Drill Lift
	HB	Handling break
	DB	Drilling break

Orientation - angle relative to the plane normal to the core axis.

Infilling	CN	Clean
	X	Carbonaceous
	Clay	Clay
	KT	Chlorite
	CA	Calcite
	Fe	Iron Oxide
	Qz	Quartz
	MS	Secondary Mineral
	MU	Unidentified Mineral
Shape	PR	Planar
	CU	Curved
	UN	Undulose
	ST	Stepped
	IR	Irregular
	DIS	Discontinuous
Roughness	POL	Polished
	SL	Slickensided
	S	Smooth
	RF	Rough
	VR	Very Rough

SOIL

Structures - Fissuring and other defects are described in accordance with AS 1726-1993, Appendix A2.6, using the terminology for rock defects.

Origin - Where practicable an assessment is provided of the probable origin of the soil, eg fill, topsoil, alluvium, colluvium, residual soil.

APPENDIX E

Test Results

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	[redacted]
Client	DOWN TO EARTH GEOTECHNICAL AND ENVIRONMENTA
Address	PO BOX 115 COBBITTY NSW 2570
Telephone	[redacted]
Facsimile	(Not specified)
Email	[redacted]
Project	**DE-743_COC1**
Order Number	**DE-743_COC1**
Samples	26

LABORATORY DETAILS

Manager	[redacted]
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	[redacted]
Facsimile	
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE232701 R0**
Date Received	2/6/2022
Date Reported	9/6/2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES

[redacted]

Metals/Inorganics Team Leader

Inorganic/Metals Chemist

pH in soil (1:2) [AN101] Tested: 7/6/2022

PARAMETER	UOM	LOR	BH14 Agg 1.5m SOIL - 31/5/2022 SE232701.001	BH12 Agg 2.5m SOIL - 31/5/2022 SE232701.002	BH19 Agg 1.5m SOIL - 31/5/2022 SE232701.003	BH16 Agg 2.5m SOIL - 31/5/2022 SE232701.004	BH2 Agg 3.0m SOIL - 30/5/2022 SE232701.005
pH (1:2)	pH Units	-	6.8	8.1	8.3	7.6	8.1

PARAMETER	UOM	LOR	BH20 Agg 1.0m SOIL - 30/5/2022 SE232701.006	BH9 Agg 1.5m SOIL - 30/5/2022 SE232701.007	BH5 Agg 3.5m SOIL - 30/5/2022 SE232701.008
pH (1:2)	pH Units	-	7.2	7.3	7.2

Conductivity (1:2) in soil [AN106] Tested: 7/6/2022

PARAMETER	UOM	LOR	BH14 Agg 1.5m SOIL - 31/5/2022 SE232701.001	BH12 Agg 2.5m SOIL - 31/5/2022 SE232701.002	BH19 Agg 1.5m SOIL - 31/5/2022 SE232701.003	BH16 Agg 2.5m SOIL - 31/5/2022 SE232701.004	BH2 Agg 3.0m SOIL - 30/5/2022 SE232701.005
Conductivity (1:2) @25 C*	µS/cm	1	57	140	91	120	100
Resistivity (1:2)*	ohm cm	-	18000	7400	11000	8300	9700

PARAMETER	UOM	LOR	BH20 Agg 1.0m SOIL - 30/5/2022 SE232701.006	BH9 Agg 1.5m SOIL - 30/5/2022 SE232701.007	BH5 Agg 3.5m SOIL - 30/5/2022 SE232701.008
Conductivity (1:2) @25 C*	µS/cm	1	67	48	68
Resistivity (1:2)*	ohm cm	-	15000	21000	15000

Soluble Anions in Soil from 1:2 DI Extract by Ion Chromatography [AN245] Tested: 7/6/2022

PARAMETER	UOM	LOR	BH14 Agg 1.5m SOIL - 31/5/2022 SE232701.001	BH12 Agg 2.5m SOIL - 31/5/2022 SE232701.002	BH19 Agg 1.5m SOIL - 31/5/2022 SE232701.003	BH16 Agg 2.5m SOIL - 31/5/2022 SE232701.004	BH2 Agg 3.0m SOIL - 30/5/2022 SE232701.005
Chloride	mg/kg	0.25	6.5	27	8.4	27	24
Sulfate	mg/kg	0.5	6.6	21	8.5	32	10

PARAMETER	UOM	LOR	BH20 Agg 1.0m SOIL - 30/5/2022 SE232701.006	BH9 Agg 1.5m SOIL - 30/5/2022 SE232701.007	BH5 Agg 3.5m SOIL - 30/5/2022 SE232701.008
Chloride	mg/kg	0.25	16	3.9	15
Sulfate	mg/kg	0.5	11	15	11

Moisture Content [AN002] Tested: 6/6/2022

PARAMETER	UOM	LOR	BH14 Agg 1.5m SOIL - 31/5/2022 SE232701.001	BH12 Agg 2.5m SOIL - 31/5/2022 SE232701.002	BH19 Agg 1.5m SOIL - 31/5/2022 SE232701.003	BH16 Agg 2.5m SOIL - 31/5/2022 SE232701.004	BH2 Agg 3.0m SOIL - 30/5/2022 SE232701.005
% Moisture	%w/w	1	**11.1**	**18.1**	**5.3**	**3.2**	**18.2**

PARAMETER	UOM	LOR	BH20 Agg 1.0m SOIL - 30/5/2022 SE232701.006	BH9 Agg 1.5m SOIL - 30/5/2022 SE232701.007	BH5 Agg 3.5m SOIL - 30/5/2022 SE232701.008
% Moisture	%w/w	1	**19.4**	**5.3**	**13.0**

Field pH for Acid Sulphate Soil [AN104] Tested: 9/6/2022

PARAMETER	UOM	LOR	BH2 4.0m SOIL - 30/5/2022 SE232701.009	BH10 2.5m SOIL - 30/5/2022 SE232701.010	BH10 1.0m SOIL - 30/5/2022 SE232701.011	BH10 1.5m SOIL - 30/5/2022 SE232701.012	BH10 0.5m SOIL - 30/5/2022 SE232701.013
pHf	pH Units	-	8.2	8.2	7.5	6.8	8.2
pHfox	pH Units	-	6.1	7.2	6.7	5.9	5.7
Reaction Rate (pHfox)*	No unit	-	1	0	1	0	1
pH Difference*	pH Units	-10	2.1	1.1	0.8	0.9	2.5

PARAMETER	UOM	LOR	BH10 2.0m SOIL - 30/5/2022 SE232701.014	BH20 0.5m SOIL - 30/5/2022 SE232701.015	BH20 2.0m SOIL - 30/5/2022 SE232701.016	BH20 1.5m SOIL - 30/5/2022 SE232701.017	BH20 1.0m SOIL - 30/5/2022 SE232701.018
pHf	pH Units	-	8.8	6.5	6.5	6.4	6.1
pHfox	pH Units	-	4.5	5.1	5.1	5.5	4.7
Reaction Rate (pHfox)*	No unit	-	1	0	0	0	1
pH Difference*	pH Units	-10	4.3	1.4	1.5	0.9	1.4

PARAMETER	UOM	LOR	BH19 0.5m SOIL - 31/5/2022 SE232701.019	BH19 1.0m SOIL - 31/5/2022 SE232701.020	BH19 1.5m SOIL - 31/5/2022 SE232701.021	BH18 1.0m SOIL - 31/5/2022 SE232701.022	BH18 0.5m SOIL - 31/5/2022 SE232701.023
pHf	pH Units	-	7.7	7.3	8.4	8.5	8.0
pHfox	pH Units	-	6.5	5.9	7.1	6.6	7.0
Reaction Rate (pHfox)*	No unit	-	2	2	0	1	0
pH Difference*	pH Units	-10	1.2	1.3	1.2	1.9	0.9

PARAMETER	UOM	LOR	BH18 1.5m SOIL - 31/5/2022 SE232701.024	BH18 2.5m SOIL - 31/5/2022 SE232701.025	BH18 2.0m SOIL - 31/5/2022 SE232701.026
pHf	pH Units	-	8.3	7.3	8.0
pHfox	pH Units	-	6.4	6.1	6.3
Reaction Rate (pHfox)*	No unit	-	1	0	1
pH Difference*	pH Units	-10	1.9	1.2	1.7

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:2 and the pH determined and reported on the extract after 1 hour extraction (pH 1:2) or after 1 hour extraction and overnight aging (pH (1:2) aged). Reference APHA 4500-H+.
AN104	pHF is determined on an extract of approximately 2g of as received sample in approximately 10 mL of deionised water with pH determined after standing 30 minutes.
AN104	pHFox is determined on an extract of approximately 2g of as received sample with a few mLs of 30% hydrogen peroxide (adjusted to pH 4.5 to 5.5) with the extract reaction being rated from slight to extreme, with pH determined after reaction is complete and extract has cooled. Referenced to ASS Laboratory Methods Guidelines , method 23Af-Bf, 2004. 0 No Reaction 1 Slight Reaction 2 Moderate Reaction 3 Strong/High Reaction 4 Extreme/Vigorous Reaction (gas evolution and heat generation)
AN106	Conductivity : Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos /cm or µS/cm @ 25°C. For soils, an extract of as received sample with water is made at a ratio of 1:2 and the EC determined and reported on the extract basis after the 1 hour extraction (EC(1:2)) or after the 1 hour extraction and overnight aging (EC(1:2) aged). Reference APHA 2510 B.
AN106	Resistivity of the extract is reported on the extract basis and is the reciprocal of conductivity. Salinity and TDS can be calculated from the extract conductivity and is reported back to the soil basis.
AN245	Anions by Ion Chromatography: A water sample or extract is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		
***	Indicates that both * and ** apply.				

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.

STATEMENT OF QA/QC PERFORMANCE

SE232701 R0

CLIENT DETAILS

Contact	[redacted]
Client	DOWN TO EARTH GEOTECHNICAL AND ENVIRONMEN
Address	PO BOX 115 COBBITTY NSW 2570
Telephone	[redacted]
Facsimile	(Not specified)
Email	[redacted]
Project	**DE-743_COC1**
Order Number	**DE-743_COC1**
Samples	26

LABORATORY DETAILS

Manager	[redacted]
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	[redacted]
Facsimile	[redacted]
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE232701 R0**
Date Received	02 Jun 2022
Date Reported	09 Jun 2022

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	Conductivity (1:2) in soil	4 items
	pH in soil (1:2)	4 items
	Soluble Anions in Soil from 1:2 DI Extract by Ion Chromatography	4 items
Analysis Date	Conductivity (1:2) in soil	4 items

SAMPLE SUMMARY

HOLDING TIME SUMMARY

SE232701 R0

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the

Conductivity (1:2) in soil

Method: ME-(AU)-[ENV]AN106

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH14 Agg 1.5m	SE232701.001	LB250306	31 May 2022	02 Jun 2022	07 Jun 2022	07 Jun 2022	07 Jun 2022	07 Jun 2022
BH12 Agg 2.5m	SE232701.002	LB250306	31 May 2022	02 Jun 2022	07 Jun 2022	07 Jun 2022	07 Jun 2022	07 Jun 2022
BH19 Agg 1.5m	SE232701.003	LB250306	31 May 2022	02 Jun 2022	07 Jun 2022	07 Jun 2022	07 Jun 2022	07 Jun 2022
BH16 Agg 2.5m	SE232701.004	LB250306	31 May 2022	02 Jun 2022	07 Jun 2022	07 Jun 2022	07 Jun 2022	07 Jun 2022
BH2 Agg 3.0m	SE232701.005	LB250306	30 May 2022	02 Jun 2022	06 Jun 2022	07 Jun 2022†	06 Jun 2022	07 Jun 2022†
BH20 Agg 1.0m	SE232701.006	LB250306	30 May 2022	02 Jun 2022	06 Jun 2022	07 Jun 2022†	06 Jun 2022	07 Jun 2022†
BH9 Agg 1.5m	SE232701.007	LB250306	30 May 2022	02 Jun 2022	06 Jun 2022	07 Jun 2022†	06 Jun 2022	07 Jun 2022†
BH5 Agg 3.5m	SE232701.008	LB250306	30 May 2022	02 Jun 2022	06 Jun 2022	07 Jun 2022†	06 Jun 2022	07 Jun 2022†

Field pH for Acid Sulphate Soil

Method: ME-(AU)-[ENV]AN104

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH2 4.0m	SE232701.009	LB250521	30 May 2022	02 Jun 2022	27 Jun 2022	09 Jun 2022	27 Jun 2022	09 Jun 2022
BH10 2.5m	SE232701.010	LB250521	30 May 2022	02 Jun 2022	27 Jun 2022	09 Jun 2022	27 Jun 2022	09 Jun 2022
BH10 1.0m	SE232701.011	LB250521	30 May 2022	02 Jun 2022	27 Jun 2022	09 Jun 2022	27 Jun 2022	09 Jun 2022
BH10 1.5m	SE232701.012	LB250521	30 May 2022	02 Jun 2022	27 Jun 2022	09 Jun 2022	27 Jun 2022	09 Jun 2022
BH10 0.5m	SE232701.013	LB250521	30 May 2022	02 Jun 2022	27 Jun 2022	09 Jun 2022	27 Jun 2022	09 Jun 2022
BH10 2.0m	SE232701.014	LB250521	30 May 2022	02 Jun 2022	27 Jun 2022	09 Jun 2022	27 Jun 2022	09 Jun 2022
BH20 0.5m	SE232701.015	LB250521	30 May 2022	02 Jun 2022	27 Jun 2022	09 Jun 2022	27 Jun 2022	09 Jun 2022
BH20 2.0m	SE232701.016	LB250521	30 May 2022	02 Jun 2022	27 Jun 2022	09 Jun 2022	27 Jun 2022	09 Jun 2022
BH20 1.5m	SE232701.017	LB250521	30 May 2022	02 Jun 2022	27 Jun 2022	09 Jun 2022	27 Jun 2022	09 Jun 2022
BH20 1.0m	SE232701.018	LB250521	30 May 2022	02 Jun 2022	27 Jun 2022	09 Jun 2022	27 Jun 2022	09 Jun 2022
BH19 0.5m	SE232701.019	LB250521	31 May 2022	02 Jun 2022	28 Jun 2022	09 Jun 2022	28 Jun 2022	09 Jun 2022
BH19 1.0m	SE232701.020	LB250521	31 May 2022	02 Jun 2022	28 Jun 2022	09 Jun 2022	28 Jun 2022	09 Jun 2022
BH19 1.5m	SE232701.021	LB250521	31 May 2022	02 Jun 2022	28 Jun 2022	09 Jun 2022	28 Jun 2022	09 Jun 2022
BH18 1.0m	SE232701.022	LB250521	31 May 2022	02 Jun 2022	28 Jun 2022	09 Jun 2022	28 Jun 2022	09 Jun 2022
BH18 0.5m	SE232701.023	LB250521	31 May 2022	02 Jun 2022	28 Jun 2022	09 Jun 2022	28 Jun 2022	09 Jun 2022
BH18 1.5m	SE232701.024	LB250521	31 May 2022	02 Jun 2022	28 Jun 2022	09 Jun 2022	28 Jun 2022	09 Jun 2022
BH18 2.5m	SE232701.025	LB250521	31 May 2022	02 Jun 2022	28 Jun 2022	09 Jun 2022	28 Jun 2022	09 Jun 2022
BH18 2.0m	SE232701.026	LB250521	31 May 2022	02 Jun 2022	28 Jun 2022	09 Jun 2022	28 Jun 2022	09 Jun 2022

Moisture Content

Method: ME-(AU)-[ENV]AN002

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH14 Agg 1.5m	SE232701.001	LB250257	31 May 2022	02 Jun 2022	14 Jun 2022	06 Jun 2022	11 Jun 2022	07 Jun 2022
BH12 Agg 2.5m	SE232701.002	LB250257	31 May 2022	02 Jun 2022	14 Jun 2022	06 Jun 2022	11 Jun 2022	07 Jun 2022
BH19 Agg 1.5m	SE232701.003	LB250257	31 May 2022	02 Jun 2022	14 Jun 2022	06 Jun 2022	11 Jun 2022	07 Jun 2022
BH16 Agg 2.5m	SE232701.004	LB250257	31 May 2022	02 Jun 2022	14 Jun 2022	06 Jun 2022	11 Jun 2022	07 Jun 2022
BH2 Agg 3.0m	SE232701.005	LB250257	30 May 2022	02 Jun 2022	13 Jun 2022	06 Jun 2022	11 Jun 2022	07 Jun 2022
BH20 Agg 1.0m	SE232701.006	LB250257	30 May 2022	02 Jun 2022	13 Jun 2022	06 Jun 2022	11 Jun 2022	07 Jun 2022
BH9 Agg 1.5m	SE232701.007	LB250257	30 May 2022	02 Jun 2022	13 Jun 2022	06 Jun 2022	11 Jun 2022	07 Jun 2022
BH5 Agg 3.5m	SE232701.008	LB250257	30 May 2022	02 Jun 2022	13 Jun 2022	06 Jun 2022	11 Jun 2022	07 Jun 2022

pH in soil (1:2)

Method: ME-(AU)-[ENV]AN101

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH14 Agg 1.5m	SE232701.001	LB250306	31 May 2022	02 Jun 2022	07 Jun 2022	07 Jun 2022	08 Jun 2022	07 Jun 2022
BH12 Agg 2.5m	SE232701.002	LB250306	31 May 2022	02 Jun 2022	07 Jun 2022	07 Jun 2022	08 Jun 2022	07 Jun 2022
BH19 Agg 1.5m	SE232701.003	LB250306	31 May 2022	02 Jun 2022	07 Jun 2022	07 Jun 2022	08 Jun 2022	07 Jun 2022
BH16 Agg 2.5m	SE232701.004	LB250306	31 May 2022	02 Jun 2022	07 Jun 2022	07 Jun 2022	08 Jun 2022	07 Jun 2022
BH2 Agg 3.0m	SE232701.005	LB250306	30 May 2022	02 Jun 2022	06 Jun 2022	07 Jun 2022†	08 Jun 2022	07 Jun 2022
BH20 Agg 1.0m	SE232701.006	LB250306	30 May 2022	02 Jun 2022	06 Jun 2022	07 Jun 2022†	08 Jun 2022	07 Jun 2022
BH9 Agg 1.5m	SE232701.007	LB250306	30 May 2022	02 Jun 2022	06 Jun 2022	07 Jun 2022†	08 Jun 2022	07 Jun 2022
BH5 Agg 3.5m	SE232701.008	LB250306	30 May 2022	02 Jun 2022	06 Jun 2022	07 Jun 2022†	08 Jun 2022	07 Jun 2022

Soluble Anions in Soil from 1:2 DI Extract by Ion Chromatography

Method: ME-(AU)-[ENV]AN245

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH14 Agg 1.5m	SE232701.001	LB250309	31 May 2022	02 Jun 2022	07 Jun 2022	07 Jun 2022	05 Jul 2022	09 Jun 2022
BH12 Agg 2.5m	SE232701.002	LB250309	31 May 2022	02 Jun 2022	07 Jun 2022	07 Jun 2022	05 Jul 2022	09 Jun 2022
BH19 Agg 1.5m	SE232701.003	LB250309	31 May 2022	02 Jun 2022	07 Jun 2022	07 Jun 2022	05 Jul 2022	09 Jun 2022
BH16 Agg 2.5m	SE232701.004	LB250309	31 May 2022	02 Jun 2022	07 Jun 2022	07 Jun 2022	05 Jul 2022	09 Jun 2022
BH2 Agg 3.0m	SE232701.005	LB250309	30 May 2022	02 Jun 2022	06 Jun 2022	07 Jun 2022†	05 Jul 2022	09 Jun 2022
BH20 Agg 1.0m	SE232701.006	LB250309	30 May 2022	02 Jun 2022	06 Jun 2022	07 Jun 2022†	05 Jul 2022	09 Jun 2022
BH9 Agg 1.5m	SE232701.007	LB250309	30 May 2022	02 Jun 2022	06 Jun 2022	07 Jun 2022†	05 Jul 2022	09 Jun 2022
BH5 Agg 3.5m	SE232701.008	LB250309	30 May 2022	02 Jun 2022	06 Jun 2022	07 Jun 2022†	05 Jul 2022	09 Jun 2022

HOLDING TIME SUMMARY

SE232701 R0

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No surrogates were required for this job.

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Conductivity (1:2) in soil — Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result
LB250306.001	Conductivity (1:2) @25 C*	µS/cm	1	<1

Soluble Anions in Soil from 1:2 DI Extract by Ion Chromatography — Method: ME-(AU)-[ENV]AN245

Sample Number	Parameter	Units	LOR	Result
LB250309.001	Chloride	mg/kg	0.25	<0.25
	Sulfate	mg/kg	0.5	<0.5

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may

Conductivity (1:2) in soil

Method: ME-(AU)-[ENV]AN106

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE232701.008	LB250306.012	Conductivity (1:2) @25 C*	µS/cm	1	68	67	33	1
		Resistivity (1:2)*	ohm cm	-	15000	15000	30	1

Field pH for Acid Sulphate Soil

Method: ME-(AU)-[ENV]AN104

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE232701.018	LB250521.012	pHf	pH Units	-	6.1	6.2	30	1
		pHfox	pH Units	-	4.7	4.6	30	2
SE232701.026	LB250521.021	pHf	pH Units	-	8.0	7.9	30	1
		pHfox	pH Units	-	6.3	6.5	30	4

Moisture Content

Method: ME-(AU)-[ENV]AN002

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE232780.002	LB250257.011	% Moisture	%w/w	1	12.5	11.0	38	13
SE232780.005	LB250257.015	% Moisture	%w/w	1	13.1	12.9	38	1

pH in soil (1:2)

Method: ME-(AU)-[ENV]AN101

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE232701.008	LB250306.012	pH (1:2)	pH Units	-	7.2	7.2	31	1

Soluble Anions in Soil from 1:2 DI Extract by Ion Chromatography

Method: ME-(AU)-[ENV]AN245

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE232701.008	LB250309.012	Chloride	mg/kg	0.25	15	14	32	7
		Sulfate	mg/kg	0.5	11	10	49	4

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Conductivity (1:2) in soil

Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB250306.002	Conductivity (1:2) @25 C*	µS/cm	1	320	303	70 - 130	104

pH in soil (1:2)

Method: ME-(AU)-[ENV]AN101

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB250306.003	pH (1:2)	pH Units	-	7.4	7.415	98 - 102	100

Soluble Anions in Soil from 1:2 DI Extract by Ion Chromatography

Method: ME-(AU)-[ENV]AN245

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB250309.002	Chloride	mg/kg	0.25	38	40	70 - 130	95
	Sulfate	mg/kg	0.5	38	40	70 - 130	94

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub -sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spikes were required for this job.

MATRIX SPIKE DUPLICATES

SE232701 R0

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here: https://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
***	Indicates that both * and ** apply.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.
①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to relevant report comments for further information.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

This test report shall not be reproduced, except in full.

source: Sydney.pdf page: 1 SGS Ref: SE232701_COC

SGS

CHAIN OF CUSTODY & ANALYSIS REQUEST

SGS Environmental Services
Unit 16, 33 Maddox Street
Alexandria NSW 2015
Telephone No: (02) 85940400
Facsimile No: (02) 85940499
Email: au.samplereceipt.sydney@sgs.com

Company Name:	Down to Earth	Project Name/No:	DE-743_COC1
Address:	11/93-97 Newton Road, Wetherill Park	Purchase Order No:	
		Results Required By:	5 DAY TAT
		Telephone:	
Contact Name:		Facsimile:	
		Email Results:	[redacted]

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	ENM (excluding T276)	OCP/OPP/PCB	Asbestos ID	Aggressivity	pH & pHfox
BH14 Agg 1.5m	31/05/22	1		X		1				X	
BH12 Agg 2.5m	31/05/22	2		X		1				X	
BH19 Agg 1.5m	31/05/22	3		X		1				X	
BH16 Agg 2.5m	31/05/22	4		X		1				X	
BH2 Agg 3.0m	30/05/22	5		X		1				X	
BH20 Agg 1.0m	30/05/22	6		X		1				X	
BH9 Agg 1.5m	30/05/22	7		X		1				X	
BH5 Agg 3.5m	30/05/22	8		X		1				X	
BH2 4.0m	30/05/22	9		X		1					X

SGS EHS Sydney COC
SE232701

Relinquished By: MS	Date/Time: 01/06/22	Received By: [redacted]	Date/Time 02/06/22 @ 1.N
Relinquished By:	Date/Time:	Received By:	Date/Time
Samples Intact: Yes/ No	Temperature: Ambient / Chilled	Sample Cooler Sealed: Yes/ No	Laboratory Quotation No:
	Comments:		

CHAIN OF CUSTODY & ANALYSIS REQUEST

SGS Environmental Services
Unit 16, 33 Maddox Street
Alexandria NSW 2015
Telephone No: (02) 85940400
Facsimile No: (02) 85940499
Email: au.samplereceipt.sydney@sgs.com

Company Name:	Down to Earth	Project Name/No:	DE-743_COC1
Address:	11/93-97 Newton Road, Wetherill Park	Purchase Order No:	
		Results Required By:	5 DAY TAT
		Telephone:	
Contact Name:		Facsimile:	
		Email Results:	[redacted]

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	ENM (excluding T276)	OCP/OPP/PCB	Asbestos ID	pH & pHfox												
BH10 2.5m	30/05/22	10		X		1				X												
BH10 1.0m	30/05/22	11		X		1				X												
BH10 1.5m	30/05/22	12		X		1				X												
BH10 0.5m	30/05/22	13		X		1				X												
BH10 2.0m	30/05/22	14		X		1				X												
BH20 0.5m	30/05/22	15		X		1				X												
BH20 2.0m	30/05/22	16		X		1				X												
BH20 1.5m	30/05/22	17		X		1				X												
BH20 1.0m	30/05/22	18		X		1				X												

Relinquished By: MS	Date/Time: 01/06/22	Received By: [redacted]	Date/Time 02/06/22 @ 1m
Relinquished By:	Date/Time:	Received By:	Date/Time
Samples Intact: (Yes)/ No	Temperature: (Ambient) / Chilled	Sample Cooler Sealed: Yes/ No	Laboratory Quotation No:
	Comments:		

CHAIN OF CUSTODY & ANALYSIS REQUEST

SGS Environmental Services
Unit 16, 33 Maddox Street
Alexandria NSW 2015
Telephone No: (02) 85940400
Facsimile No: (02) 85940499
Email: au.samplereceipt.sydney@sgs.com

Company Name:	Down to Earth	Project Name/No:	DE-743_COC1
Address:	11/93-97 Newton Road, Wetherill Park	Purchase Order No:	
		Results Required By:	5 DAY TAT
		Telephone:	
Contact Name:		Facsimile:	
		Email Results:	[redacted]

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	ENM (excluding T276)	OCP/OPP/PCB	Asbestos ID	pH & pHfox
BH19 0.5m	31/05/22	19		X		1				X
BH19 1.0m	31/05/22	20		X		1				X
BH19 1.5m	31/05/22	21		X		1				X
BH18 1.0m	31/05/22	22		X		1				X
BH18 0.5m	31/05/22	23		X		1				X
BH18 1.5m	31/05/22	24		X		1				X
BH18 2.5m	31/05/22	25		X		1				X
BH18 2.0m	31/05/22	26		X		1				X

Relinquished By: MS	Date/Time: 01/06/22	Received By: [redacted]	Date/Time 02/06/22 @ 1.V
Relinquished By:	Date/Time:	Received By:	Date/Time
Samples Intact: Yes/ No	Temperature: Ambient / Chilled	Sample Cooler Sealed: Yes/ No	Laboratory Quotation No:
	Comments:		

SAMPLE RECEIPT ADVICE

SE232701

CLIENT DETAILS

Contact	[redacted]
Client	DOWN TO EARTH GEOTECHNICAL AND ENVIRONMENTAL
Address	PO BOX 115 COBBITTY NSW 2570
Telephone	[redacted]
Facsimile	(Not specified)
Email	[redacted]
Project	**DE-743_COC1**
Order Number	**DE-743_COC1**
Samples	26

LABORATORY DETAILS

Manager	[redacted]
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	[redacted]
Facsimile	[redacted]
Email	au.environmental.sydney@sgs.com
Samples Received	Thu 2/6/2022
Report Due	Thu 9/6/2022
SGS Reference	**SE232701**

SUBMISSION DETAILS

This is to confirm that 26 samples were received on Thursday 2/6/2022. Results are expected to be ready by COB Thursday 9/6/2022. Please quote SGS reference SE232701 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	Client	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	26 Soil
Date documentation received	2/6/2022	Type of documentation received	COC
Samples received in good order	Yes	Samples received without headspace	N/A
Sample temperature upon receipt	18.5°C	Sufficient sample for analysis	Yes
Turnaround time requested	Standard		

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

SAMPLE RECEIPT ADVICE

SE232701

CLIENT DETAILS

Client DOWN TO EARTH GEOTECHNICAL AND ENVIRONMENTAL PTY LTI Project DE-743_COC1

SUMMARY OF ANALYSIS

No.	Sample ID	Conductivity (1:2) in soil	Field pH for Acid Sulphate Soil	Moisture Content	pH in soil (1:2)	Soluble Anions in Soil from 1:2 DI Extract by Ion
001	BH14 Agg 1.5m	2	-	1	1	2
002	BH12 Agg 2.5m	2	-	1	1	2
003	BH19 Agg 1.5m	2	-	1	1	2
004	BH16 Agg 2.5m	2	-	1	1	2
005	BH2 Agg 3.0m	2	-	1	1	2
006	BH20 Agg 1.0m	2	-	1	1	2
007	BH9 Agg 1.5m	2	-	1	1	2
008	BH5 Agg 3.5m	2	-	1	1	2
009	BH2 4.0m	-	4	-	-	-
010	BH10 2.5m	-	4	-	-	-
011	BH10 1.0m	-	4	-	-	-
012	BH10 1.5m	-	4	-	-	-
013	BH10 0.5m	-	4	-	-	-
014	BH10 2.0m	-	4	-	-	-
015	BH20 0.5m	-	4	-	-	-
016	BH20 2.0m	-	4	-	-	-
017	BH20 1.5m	-	4	-	-	-
018	BH20 1.0m	-	4	-	-	-
019	BH19 0.5m	-	4	-	-	-
020	BH19 1.0m	-	4	-	-	-
021	BH19 1.5m	-	4	-	-	-
022	BH18 1.0m	-	4	-	-	-
023	BH18 0.5m	-	4	-	-	-
024	BH18 1.5m	-	4	-	-	-

CONTINUED OVERLEAF

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SAMPLE RECEIPT ADVICE

SE232701

CLIENT DETAILS

Client DOWN TO EARTH GEOTECHNICAL AND ENVIRONMENTAL PTY LTI Project DE-743_COC1

SUMMARY OF ANALYSIS

No.	Sample ID	Field pH for Acid Sulphate Soil
025	BH18 2.5m	4
026	BH18 2.0m	4

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	[redacted]
Client	DOWN TO EARTH GEOTECHNICAL AND ENVIRONMENTA
Address	PO BOX 115 COBBITTY NSW 2570
Telephone	[redacted]
Facsimile	(Not specified)
Email	[redacted]
Project	**DE-743_COC1 - Additional**
Order Number	**DE-743_COC1**
Samples	26

LABORATORY DETAILS

Manager	[redacted]
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	[redacted]
Facsimile	[redacted]
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE232701A R0**
Date Received	17/6/2022
Date Reported	22/6/2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES

Moisture Content [AN002] Tested: 22/6/2022

PARAMETER	UOM	LOR	BH10 0.5m SOIL - 30/5/2022 SE232701A.013	BH10 2.0m SOIL - 30/5/2022 SE232701A.014	BH20 1.0m SOIL - 30/5/2022 SE232701A.018
% Moisture	%w/w	1	**8.7**	**9.6**	**9.1**

TAA (Titratable Actual Acidity) [AN219] Tested: 22/6/2022

PARAMETER	UOM	LOR	BH10 0.5m SOIL - 30/5/2022 SE232701A.013	BH10 2.0m SOIL - 30/5/2022 SE232701A.014	BH20 1.0m SOIL - 30/5/2022 SE232701A.018
pH KCl*	pH Units	-	**6.4**	**6.5**	**6.0**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	<0.005	<0.005	<0.005
Calcium (CaKCl)	%w/w	0.005	<0.005	**0.032**	**0.094**
Magnesium (MgKCl)	%w/w	0.005	<0.005	<0.005	**0.013**

TPA (Titratable Peroxide Acidity) [AN218] Tested: 22/6/2022

PARAMETER	UOM	LOR	BH10 0.5m SOIL - 30/5/2022 SE232701A.013	BH10 2.0m SOIL - 30/5/2022 SE232701A.014	BH20 1.0m SOIL - 30/5/2022 SE232701A.018
Peroxide pH (pH Ox)	pH Units	-	**7.4**	**7.8**	**6.8**
TPA as kg H_2SO_4/tonne	kg H2SO4/T	0.25	<0.25	<0.25	<0.25
TPA as moles H+/tonne	moles H+/T	5	<5	<5	<5
TPA as S % W/W	%w/w S	0.01	<0.01	<0.01	<0.01
Titratable Sulfidic Acidity as moles H+/tonne	moles H+/T	5	<5	<5	<5
Titratable Sulfidic Acidity as kg H_2SO_4/tonne	kg H2SO4/T	0.25	<0.25	<0.25	<0.25
Titratable Sulfidic Acidity as S % W/W	%w/w S	0.01	<0.01	<0.01	<0.01
ANCE as % $CaCO_3$	% CaCO3	0.01	**0.20**	**0.20**	<0.01
ANCE as moles H+/tonne	moles H+/T	5	**40**	**40**	<5
ANCE as S % W/W	%w/w S	0.01	**0.06**	**0.06**	<0.01
Peroxide Oxidisable Sulphur (Spos)*	%w/w	0.005	**0.006**	**0.005**	**0.020**
Peroxide Oxidisable Sulphur as moles H+/tonne*	moles H+/T	5	<5	<5	**13**
Sulphur (Sp)	%w/w	0.005	**0.006**	**0.006**	**0.024**
Calcium (Cap)	%w/w	0.005	**0.15**	**0.042**	**0.13**
Reacted Calcium (CaA)*	%w/w	0.005	**0.14**	**0.010**	**0.035**
Reacted Calcium (CaA)*	moles H+/T	5	**72**	**5**	**17**
Magnesium (Mgp)	%w/w	0.005	**0.020**	<0.005	**0.024**
Reacted Magnesium (MgA)*	%w/w	0.005	**0.018**	<0.005	**0.011**
Reacted Magnesium (MgA)*	moles H+/T	5	**15**	<5	**9**
Net Acid Soluble Sulphur as % w/w*	%w/w	0.005	-	-	-
Net Acid Soluble Sulphur as moles H+/tonne*	moles H+/T	5	-	-	-

SPOCAS Net Acidity Calculations [AN220] Tested: 22/6/2022

PARAMETER	UOM	LOR	BH10 0.5m SOIL - 30/5/2022 SE232701A.013	BH10 2.0m SOIL - 30/5/2022 SE232701A.014	BH20 1.0m SOIL - 30/5/2022 SE232701A.018
s-Net Acidity	%w/w S	0.005	<0.005	<0.005	**0.026**
a-Net Acidity	moles H+/T	5	<5	<5	**16**
Liming Rate*	kg CaCO3/T	0.1	<0.1	<0.1	NA
Verification s-Net Acidity*	%w/w S	-20	**-0.04**	**-0.04**	**0.01**
a-Net Acidity without ANCE*	moles H+/T	5	**5**	<5	**16**
Liming Rate without ANCE*	kg CaCO3/T	0.1	NA	<0.1	NA

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN218	Soil samples are subjected to extreme oxidising conditions using hydrogen peroxide. Continuous application of heat and peroxide ensure all sulfide is converted to sulfuric acid. Excess peroxide is broken down by a copper catalyst prior to titration for acidity. Calcium, magnesium, and sulfur are determined by ICP-OES. Also included is a carbonate modification step which, depending on pH after the initial oxidation, gives a measure of ANC.
AN219	Dried pulped sample is extracted for 4 hours in a 1 M KCl solution. The ratio of sample to solution is 1:40. The extract is titrated for acidity. Calcium, magnesium, and sulfur are determined by ICP-AES.
AN220	SPOCAS Suite: Scheme for the calculation of net acidities and liming rates using a Fineness Factor of 1.5.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		
***	Indicates that both * and ** apply.				

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-qb/environment-health-and-safety.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or

STATEMENT OF QA/QC PERFORMANCE

SE232701A R0

CLIENT DETAILS

Contact	[redacted]
Client	DOWN TO EARTH GEOTECHNICAL AND ENVIRONMEN
Address	PO BOX 115 COBBITTY NSW 2570
Telephone	[redacted]
Facsimile	(Not specified)
Email	[redacted]
Project	**DE-743_COC1 - Additional**
Order Number	**DE-743_COC1**
Samples	26

LABORATORY DETAILS

Manager	[redacted]
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	[redacted]
Facsimile	[redacted]
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE232701A R0**
Date Received	17 Jun 2022
Date Reported	22 Jun 2022

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met (within the SGS Alexandria Environmental laboratory).

SAMPLE SUMMARY

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	Client	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	3 Soil
Date documentation received	17/6/2022@3:18PM	Type of documentation received	Email
Samples received in good order	Yes	Samples received without headspace	N/A
Sample temperature upon receipt	18.5°C	Sufficient sample for analysis	Yes
Turnaround time requested	Three Days		

HOLDING TIME SUMMARY

SE232701A R0

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the

No holding time data is available for this job.

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No surrogates were required for this job.

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

No method blanks were required for this job.

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may

No duplicates were required for this job.

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

No laboratory control standards were required for this job.

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub -sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spikes were required for this job.

MATRIX SPIKE DUPLICATES

SE232701A R0

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here: https://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
***	Indicates that both * and ** apply.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.
①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to relevant report comments for further information.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

This test report shall not be reproduced, except in full.

source: SE_Autoscan.pdf page: 1 SGS Ref: SE232701A_COC

Yin, Emily (Sydney)

From: [redacted]
Sent: Friday, 17 June 2022 3:18 PM
To: [redacted]
Subject: [EXTERNAL] SPOCAS testing & ESKY pickup
Attachments: DE-699_10 COC1.pdf

*** WARNING: this message is from an EXTERNAL SENDER. Please be cautious, particularly with links and attachments. ***

14 18 13

Hey there, in reference to certificate number SE232701, our job number is DE-743, could we please get SPOCAS testing on BH10 2.0m, BH20 1.0m & BH10 0.5m? could we also get an esky picked up from our lab on Monday morning, attached is the COC. There is asbestos fragments in sealed bags inside the ESKY.

[redacted]
Field Technician

Down to Earth
Geotechnical & Environmental

ph. 0457 585 000
lab. 02 9756 0404
fax. 02 4653 1747
email. [redacted]

11/93-97, Newton Rd, WETHERILL PARK NSW 2164
PO Box 115, COBBITTY NSW 2570
abn: 94 606 398 663 | acn: 606 398 663

SGS EHS Alexandria Laboratory
SE232701A COC
Received: 17 – Jun – 2022

SAMPLE RECEIPT ADVICE

SE232701A

CLIENT DETAILS

Contact	[redacted]
Client	DOWN TO EARTH GEOTECHNICAL AND ENVIRONMENTAL
Address	PO BOX 115 COBBITTY NSW 2570
Telephone	[redacted]
Facsimile	(Not specified)
Email	[redacted]
Project	**DE-743_COC1 - Additional**
Order Number	**DE-743_COC1**
Samples	26

LABORATORY DETAILS

Manager	[redacted]
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	[redacted]
Facsimile	[redacted]
Email	au.environmental.sydney@sgs.com
Samples Received	Fri 17/6/2022
Report Due	Wed 22/6/2022
SGS Reference	**SE232701A**

SUBMISSION DETAILS

This is to confirm that 26 samples were received on Friday 17/6/2022. Results are expected to be ready by COB Wednesday 22/6/2022. Please quote SGS reference SE232701A when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	Client	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	3 Soil
Date documentation received	17/6/2022@3:18PM	Type of documentation received	Email
Samples received in good order	Yes	Samples received without headspace	N/A
Sample temperature upon receipt	18.5°C	Sufficient sample for analysis	Yes
Turnaround time requested	Three Days		

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

SPOCAS subcontracted to SGS Cairns, 2/58 Comport St, Portsmith QLD 4870, NATA Accreditation Number: 2562, Site Number: 3146.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

SAMPLE RECEIPT ADVICE

SE232701A

CLIENT DETAILS

Client DOWN TO EARTH GEOTECHNICAL AND ENVIRONMENTAL PTY LTI Project DE-743_COC1 - Additional

SUMMARY OF ANALYSIS

No.	Sample ID	Moisture Content	SPOCAS Net Acidity Calculations	TAA (Titratable Actual Acidity)	TPA (Titratable Peroxide Acidity)
013	BH10 0.5m	1	6	7	21
014	BH10 2.0m	1	6	7	21
018	BH20 1.0m	1	6	7	21

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Admin
Client	SGS I&E SYDNEY
Address	5058 201 I&E HSE SYDNEY (EX 5258) UNIT 16 33 MADDOX STREET ALEXANDRIA NSW 2015
Telephone	[redacted]
Facsimile	[redacted]9
Email	au.environmental.sydney@sgs.com
Project	**DE-743_COC1 - Additional**
Order Number	**SE232701A**
Samples	3

LABORATORY DETAILS

Manager	[redacted]
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	[redacted]
Facsimile	[redacted]
Email	AU.Environmental.Cairns@sgs.com
SGS Reference	**CE159997 R0**
Date Received	20 Jun 2022
Date Reported	22 Jun 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

SIGNATORIES

[redacted]

Operations Manager

Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE159997.013 Soil 30 May 2022 SE232701A.013	CE159997.014 Soil 30 May 2022 SE232701A.014
Moisture Content Method: AN002 Tested: 20/6/2022					
% Moisture	%w/w	0.5		**8.7**	**9.6**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 21/6/2022					
pH KCl	pH Units	-		**6.4**	**6.5**
Titratable Actual Acidity	kg H2SO4/T	0.25		<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5		<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01		<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005		<0.005	<0.005
Calcium (CaKCl)	%w/w	0.005		<0.005	**0.032**
Magnesium (MgKCl)	%w/w	0.005		<0.005	<0.005
TPA (Titratable Peroxide Acidity) Method: AN218 Tested: 21/6/2022					
Peroxide pH (pH Ox)	pH Units	-		**7.4**	**7.8**
TPA as kg H_2SO_4/tonne	kg H2SO4/T	0.25		<0.25	<0.25
TPA as moles H+/tonne	moles H+/T	5		<5	<5
TPA as S % W/W	%w/w S	0.01		<0.01	<0.01
Titratable Sulfidic Acidity as moles H+/tonne	moles H+/T	5		<5	<5
Titratable Sulfidic Acidity as kg H_2SO_4/tonne	kg H2SO4/T	0.25		<0.25	<0.25
Titratable Sulfidic Acidity as S % W/W	%w/w S	0.01		<0.01	<0.01
ANCE as % $CaCO_3$	% CaCO3	0.01		**0.20**	**0.20**
ANCE as moles H+/tonne	moles H+/T	5		**40**	**40**
ANCE as S % W/W	%w/w S	0.01		**0.06**	**0.06**
Peroxide Oxidisable Sulphur (Spos)	%w/w	0.005		**0.006**	**0.005**
Peroxide Oxidisable Sulphur as moles H+/tonne	moles H+/T	5		<5	<5
Sulphur (Sp)	%w/w	0.005		**0.006**	**0.006**
Calcium (Cap)	%w/w	0.005		**0.15**	**0.042**
Reacted Calcium (CaA)	%w/w	0.005		**0.14**	**0.010**
Reacted Calcium (CaA)	moles H+/T	5		**72**	**5**
Magnesium (Mgp)	%w/w	0.005		**0.020**	<0.005
Reacted Magnesium (MgA)	%w/w	0.005		**0.018**	<0.005
Reacted Magnesium (MgA)	moles H+/T	5		**15**	<5
Net Acid Soluble Sulphur as % w/w	%w/w	0.005		-	-
Net Acid Soluble Sulphur as moles H+/tonne	moles H+/T	5		-	-
SPOCAS Net Acidity Calculations Method: AN220 Tested: 22/6/2022					
s-Net Acidity	%w/w S	0.005		<0.005	<0.005
a-Net Acidity	moles H+/T	5		<5	<5
Liming Rate	kg CaCO3/T	0.1		<0.1	<0.1
Verification s-Net Acidity	%w/w S	-20		**-0.04**	**-0.04**
a-Net Acidity without ANCE	moles H+/T	5		**5**	<5
Liming Rate without ANCE	kg CaCO3/T	0.1		NA	<0.1

Parameter	Units	LOR	Sample Number CE159997.018 Sample Matrix Soil Sample Date 30 May 2022 Sample Name SE232701A.018
Moisture Content Method: AN002 Tested: 20/6/2022			
% Moisture	%w/w	0.5	**9.1**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 21/6/2022			
pH KCl	pH Units	-	**6.0**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	<0.005
Calcium (CaKCl)	%w/w	0.005	**0.094**
Magnesium (MgKCl)	%w/w	0.005	**0.013**
TPA (Titratable Peroxide Acidity) Method: AN218 Tested: 21/6/2022			
Peroxide pH (pH Ox)	pH Units	-	**6.8**
TPA as kg H_2SO_4/tonne	kg H2SO4/T	0.25	<0.25
TPA as moles H+/tonne	moles H+/T	5	<5
TPA as S % W/W	%w/w S	0.01	<0.01
Titratable Sulfidic Acidity as moles H+/tonne	moles H+/T	5	<5
Titratable Sulfidic Acidity as kg H_2SO_4/tonne	kg H2SO4/T	0.25	<0.25
Titratable Sulfidic Acidity as S % W/W	%w/w S	0.01	<0.01
ANCE as % $CaCO_3$	% CaCO3	0.01	<0.01
ANCE as moles H+/tonne	moles H+/T	5	<5
ANCE as S % W/W	%w/w S	0.01	<0.01
Peroxide Oxidisable Sulphur (Spos)	%w/w	0.005	**0.020**
Peroxide Oxidisable Sulphur as moles H+/tonne	moles H+/T	5	**13**
Sulphur (Sp)	%w/w	0.005	**0.024**
Calcium (Cap)	%w/w	0.005	**0.13**
Reacted Calcium (CaA)	%w/w	0.005	**0.035**
Reacted Calcium (CaA)	moles H+/T	5	**17**
Magnesium (Mgp)	%w/w	0.005	**0.024**
Reacted Magnesium (MgA)	%w/w	0.005	**0.011**
Reacted Magnesium (MgA)	moles H+/T	5	**9**
Net Acid Soluble Sulphur as % w/w	%w/w	0.005	-
Net Acid Soluble Sulphur as moles H+/tonne	moles H+/T	5	-

Parameter	Units	LOR	Sample Number CE159997.018 Sample Matrix Soil Sample Date 30 May 2022 Sample Name SE232701A.018
SPOCAS Net Acidity Calculations Method: AN220 Tested: 22/6/2022			
s-Net Acidity	%w/w S	0.005	**0.026**
a-Net Acidity	moles H+/T	5	**16**
Liming Rate	kg CaCO3/T	0.1	NA
Verification s-Net Acidity	%w/w S	-20	**0.01**
a-Net Acidity without ANCE	moles H+/T	5	**16**
Liming Rate without ANCE	kg CaCO3/T	0.1	NA

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

TAA (Titratable Actual Acidity) **Method: ME-(AU)-[ENV]AN219**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH KCl	LB104126	pH Units	-	5.9	16%	101%
Titratable Actual Acidity	LB104126	kg H2SO4/T	0.25	<0.25	10%	NA
Titratable Actual Acidity (TAA) moles H+/tonne	LB104126	moles H+/T	5	<5	10%	105%
Titratable Actual Acidity (TAA) S%w/w	LB104126	%w/w S	0.01	<0.01	10%	106%
Sulphur (SKCl)	LB104126	%w/w	0.005	0.008	2%	87%
Calcium (CaKCl)	LB104126	%w/w	0.005	0.009	1%	102%
Magnesium (MgKCl)	LB104126	%w/w	0.005	0.010	1%	97%

TPA (Titratable Peroxide Acidity) **Method: ME-(AU)-[ENV]AN218**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Peroxide pH (pH Ox)	LB104127	pH Units	-	6.5	0%	91%
TPA as kg H_2SO_4/tonne	LB104127	kg H2SO4/T	0.25	<0.25	4%	99%
TPA as moles H+/tonne	LB104127	moles H+/T	5	<5	4%	99%
TPA as S % W/W	LB104127	%w/w S	0.01	<0.01	4%	99%
ANCE as % $CaCO_3$	LB104127	% CaCO3	0.01	<0.01	0%	
ANCE as moles H+/tonne	LB104127	moles H+/T	5	<5	0%	
ANCE as S % W/W	LB104127	%w/w S	0.01	<0.01	0%	
Sulphur (Sp)	LB104127	%w/w	0.005	<0.005	8%	97%
Calcium (Cap)	LB104127	%w/w	0.005	<0.005	4%	99%
Magnesium (Mgp)	LB104127	%w/w	0.005	<0.005	3%	101%

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN218	Soil samples are subjected to extreme oxidising conditions using hydrogen peroxide. Continuous application of heat and peroxide ensure all sulfide is converted to sulfuric acid. Excess peroxide is broken down by a copper catalyst prior to titration for acidity. Calcium, magnesium, and sulfur are determined by ICP-OES. Also included is a carbonate modification step which, depending on pH after the initial oxidation, gives a measure of ANC.
AN219	Dried pulped sample is extracted for 4 hours in a 1 M KCl solution. The ratio of sample to solution is 1:40. The extract is titrated for acidity. Calcium, magnesium, and sulfur are determined by ICP-AES.
AN220	SPOCAS Suite: Scheme for the calculation of net acidities and liming rates using a Fineness Factor of 1.5.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.

Material Test Report

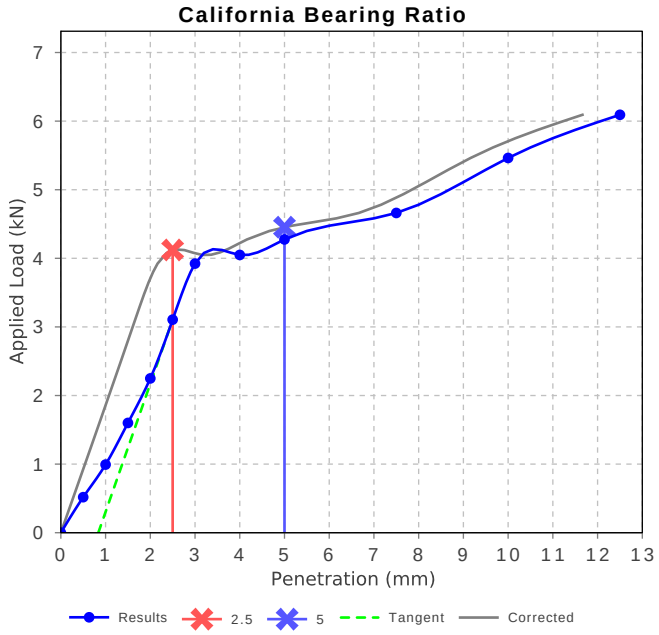
Report Number: DE-743-1
Issue Number: 1
Date Issued: 28/06/2022
Client: SESL
16 Chilvers Road, Thornleigh, NSW 2120
Project Number: DE-743
Project Name: Foreshore Park
Project Location: Wharf Road, Newcastle
Contractor: SESL
Work Request: 1316
Sample Number: S-1316A
Date Sampled: 30/05/2022
Dates Tested: 31/05/2022 - 16/06/2022
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and preparation of soils
Remarks: Sampling method not covered by accreditation.
Sample Location: **BH5 (Refer To Plan)**
Material: Fine grained sands, some silt, traces gravel, brown in colour

Down to Earth Geotechnical & Environmental Pty Ltd
Sydney Laboratory
11/93-97 Newton Road Wetherill Park NSW 2570
Phone: (02) 9756 0404
Email: jesse@d2egeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Jesse Gao
Assistant Lab Manager
NATA Accredited Laboratory Number: 19788

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**30**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	visually		
Maximum Dry Density (t/m^3)	1.68		
Optimum Moisture Content (%)	16.0		
Laboratory Density Ratio (%)	100.5		
Laboratory Moisture Ratio (%)	100.0		
Moisture Content at Placement (%)	15.8		
Moisture Content Top 30mm (%)	16.2		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	1.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)			



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

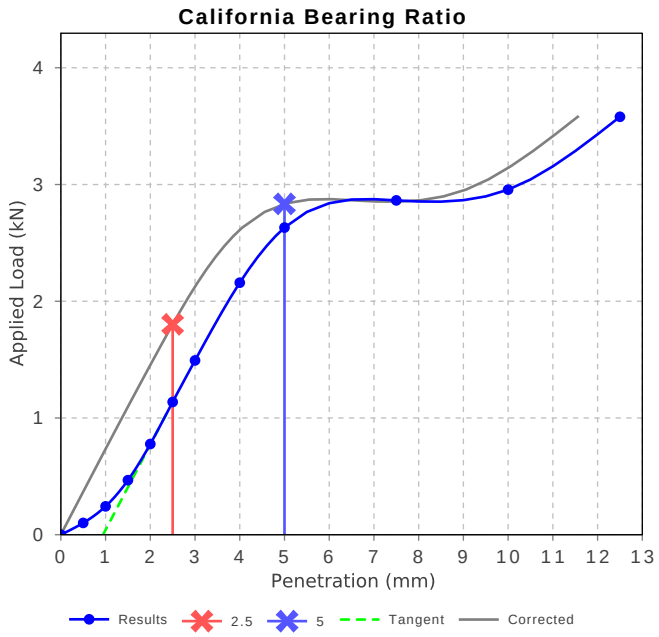
Report Number: DE-743-1
Issue Number: 1
Date Issued: 28/06/2022
Client: SESL
16 Chilvers Road, Thornleigh, NSW 2120
Project Number: DE-743
Project Name: Foreshore Park
Project Location: Wharf Road, Newcastle
Contractor: SESL
Work Request: 1316
Sample Number: S-1316B
Date Sampled: 30/05/2022
Dates Tested: 31/05/2022 - 16/06/2022
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and preparation of soils
Remarks: Sampling method not covered by accreditation.
Sample Location: **BH9 (Refer To Plan)**
Material: Fine grained sands, some silt, traces gravel, brown in colour

Down to Earth Geotechnical & Environmental Pty Ltd
Sydney Laboratory
11/93-97 Newton Road Wetherill Park NSW 2570
Phone: (02) 9756 0404
Email: jesse@d2egeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Jesse Gao
Assistant Lab Manager
NATA Accredited Laboratory Number: 19788

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**14**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	visually		
Maximum Dry Density (t/m^3)	1.78		
Optimum Moisture Content (%)	10.0		
Laboratory Density Ratio (%)	99.0		
Laboratory Moisture Ratio (%)	100.5		
Moisture Content at Placement (%)	10.2		
Moisture Content Top 30mm (%)	18.5		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	2.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)			



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

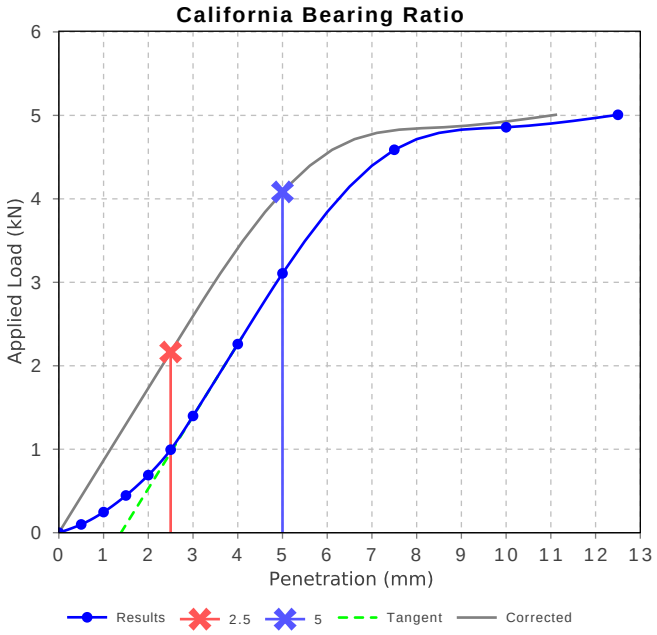
Report Number: DE-743-1
Issue Number: 1
Date Issued: 28/06/2022
Client: SESL
16 Chilvers Road, Thornleigh, NSW 2120
Project Number: DE-743
Project Name: Foreshore Park
Project Location: Wharf Road, Newcastle
Contractor: SESL
Work Request: 1316
Sample Number: S-1316C
Date Sampled: 31/05/2022
Dates Tested: 31/05/2022 - 16/06/2022
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and preparation of soils
Remarks: Sampling method not covered by accreditation.
Sample Location: **BH19 (Refer To Plan)**
Material: Fine grained sands, some silt, traces gravel, brown in colour

Down to Earth Geotechnical & Environmental
Down to Earth Geotechnical & Environmental Pty Ltd
Sydney Laboratory
11/93-97 Newton Road Wetherill Park NSW 2570
Phone: (02) 9756 0404
Email: jesse@d2egeo.com.au
Accredited for compliance with ISO/IEC 17025 - Testing

NATA WORLD RECOGNISED ACCREDITATION

Approved Signatory: Jesse Gao
Assistant Lab Manager
NATA Accredited Laboratory Number: 19788

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**20**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	visually		
Maximum Dry Density (t/m^3)	1.61		
Optimum Moisture Content (%)	21.5		
Laboratory Density Ratio (%)	101.0		
Laboratory Moisture Ratio (%)	100.0		
Moisture Content at Placement (%)	21.3		
Moisture Content Top 30mm (%)	22.6		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	0.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)			



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Report Number: **DE-743-1**
Issue Number: 1
Date Issued: 28/06/2022
Client: SESL
16 Chilvers Road, Thornleigh, NSW 2120
Project Number: DE-743
Project Name: Foreshore Park
Project Location: Wharf Road, Newcastle
Contractor: SESL
Work Request: 1316
Sample Number: S-1316D
Date Sampled: 30/05/2022
Dates Tested: 31/05/2022 - 16/06/2022
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and preparation of soils
Remarks: Sampling method not covered by accreditation.
Sample Location: **BH2 (Refer To Plan)**
Material: Fine grained sands, some silt, traces gravel, brown in colour

Giving you the foundation to build on

Down to Earth
Geotechnical & Environmental

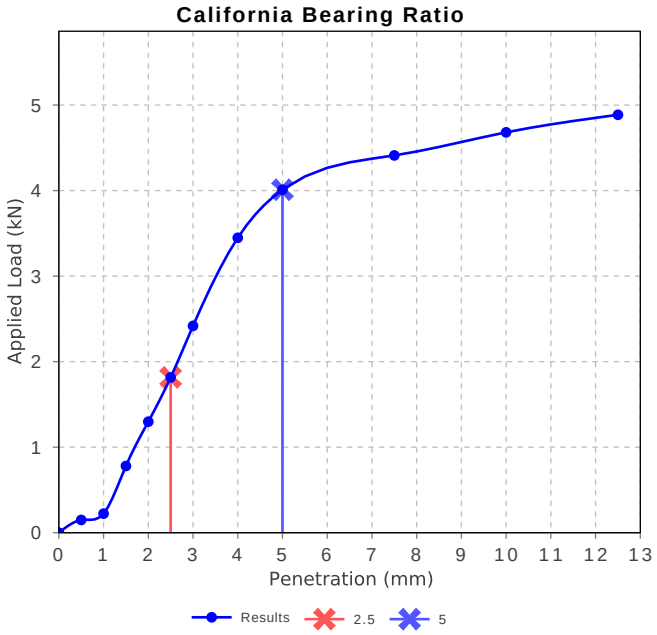
Down to Earth Geotechnical & Environmental Pty Ltd
Sydney Laboratory
11/93-97 Newton Road Wetherill Park NSW 2570
Phone: (02) 9756 0404
Email: jesse@d2egeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

NATA
WORLD RECOGNISED ACCREDITATION

Approved Signatory: Jesse Gao
Assistant Lab Manager
NATA Accredited Laboratory Number: 19788

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**20**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	visually		
Maximum Dry Density (t/m^3)	1.63		
Optimum Moisture Content (%)	16.5		
Laboratory Density Ratio (%)	99.0		
Laboratory Moisture Ratio (%)	100.0		
Moisture Content at Placement (%)	16.3		
Moisture Content Top 30mm (%)	17.5		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	0.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)			



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

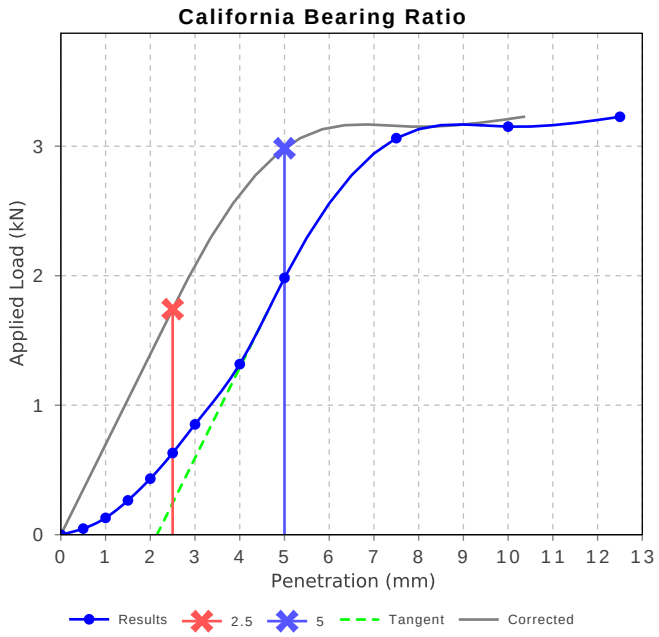
Report Number: DE-743-1
Issue Number: 1
Date Issued: 28/06/2022
Client: SESL
16 Chilvers Road, Thornleigh, NSW 2120
Project Number: DE-743
Project Name: Foreshore Park
Project Location: Wharf Road, Newcastle
Contractor: SESL
Work Request: 1316
Sample Number: S-1316E
Date Sampled: 31/05/2022
Dates Tested: 31/05/2022 - 16/06/2022
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and preparation of soils
Remarks: Sampling method not covered by accreditation.
Sample Location: **BH15 (Refer To Plan)**
Material: Fine grained sands, some silt, traces gravel, brown in colour

Down to Earth Geotechnical & Environmental
Down to Earth Geotechnical & Environmental Pty Ltd
Sydney Laboratory
11/93-97 Newton Road Wetherill Park NSW 2570
Phone: (02) 9756 0404
Email: jesse@d2egeo.com.au
Accredited for compliance with ISO/IEC 17025 - Testing

NATA WORLD RECOGNISED ACCREDITATION

Approved Signatory: Jesse Gao
Assistant Lab Manager
NATA Accredited Laboratory Number: 19788

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**15**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.67		
Optimum Moisture Content (%)	16.5		
Laboratory Density Ratio (%)	99.5		
Laboratory Moisture Ratio (%)	100.0		
Moisture Content at Placement (%)	16.4		
Moisture Content Top 30mm (%)	16.5		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	2.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)			



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

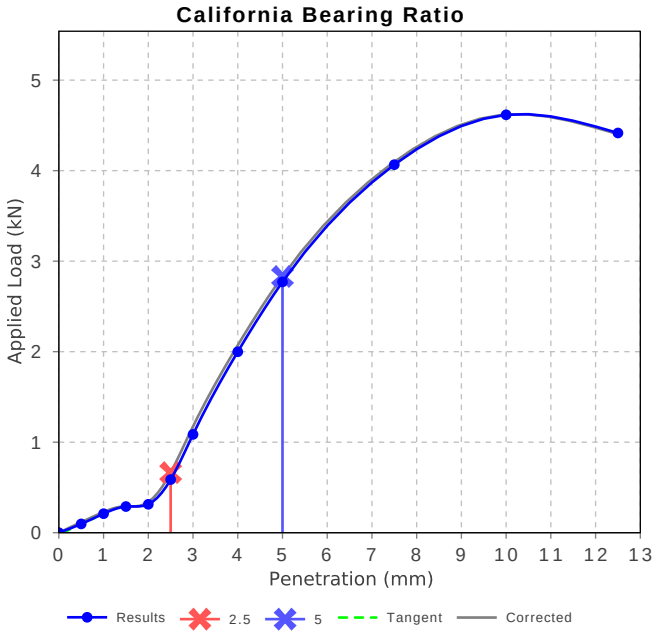
Report Number: DE-743-1
Issue Number: 1
Date Issued: 28/06/2022
Client: SESL
16 Chilvers Road, Thornleigh, NSW 2120
Project Number: DE-743
Project Name: Foreshore Park
Project Location: Wharf Road, Newcastle
Contractor: SESL
Work Request: 1316
Sample Number: S-1316F
Date Sampled: 31/05/2022
Dates Tested: 31/05/2022 - 16/06/2022
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and preparation of soils
Remarks: Sampling method not covered by accreditation.
Sample Location: **BH16 (Refer To Plan)**
Material: Fine grained sands, some silt, traces gravel, brown in colour

Down to Earth Geotechnical & Environmental Pty Ltd
Sydney Laboratory
11/93-97 Newton Road Wetherill Park NSW 2570
Phone: (02) 9756 0404
Email: jesse@d2egeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Jesse Gao
Assistant Lab Manager
NATA Accredited Laboratory Number: 19788

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**14**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.66		
Optimum Moisture Content (%)	22.5		
Laboratory Density Ratio (%)	101.0		
Laboratory Moisture Ratio (%)	100.0		
Moisture Content at Placement (%)	22.3		
Moisture Content Top 30mm (%)	22.6		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	2.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)			



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

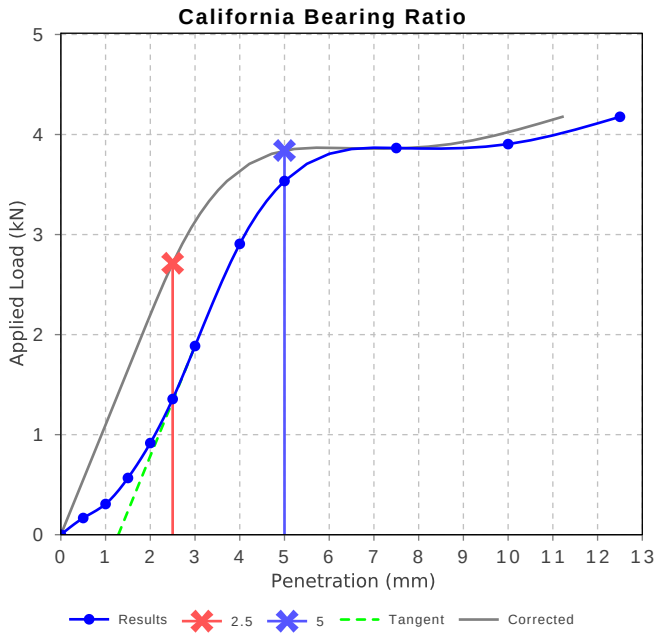
Report Number: **DE-743-1**
Issue Number: 1
Date Issued: 28/06/2022
Client: SESL
16 Chilvers Road, Thornleigh, NSW 2120
Project Number: DE-743
Project Name: Foreshore Park
Project Location: Wharf Road, Newcastle
Contractor: SESL
Work Request: 1316
Sample Number: S-1316G
Date Sampled: 30/05/2022
Dates Tested: 31/05/2022 - 16/06/2022
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and preparation of soils
Remarks: Sampling method not covered by accreditation.
Sample Location: **BH20 (Refer To Plan)**
Material: Fine grained sands, some silt, traces gravel, brown in colour

Down to Earth Geotechnical & Environmental Pty Ltd
Sydney Laboratory
11/93-97 Newton Road Wetherill Park NSW 2570
Phone: (02) 9756 0404
Email: jesse@d2egeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Jesse Gao
Assistant Lab Manager
NATA Accredited Laboratory Number: 19788

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**20**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	visually		
Maximum Dry Density (t/m^3)	1.65		
Optimum Moisture Content (%)	20.5		
Laboratory Density Ratio (%)	99.0		
Laboratory Moisture Ratio (%)	100.0		
Moisture Content at Placement (%)	20.6		
Moisture Content Top 30mm (%)	21.8		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	2.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)			



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Appendix E

Lighting Plan

Electro Light

NEWCASTLE FORESHORE PLAYSPACE

LIGHTING DESIGN DOCUMENTATION

COVER PAGE

LIST OF DRAWINGS

SCHEDULES & LEGENDS				
NUMBER	NAME	SCALE	ISSUE DATE	REVISION
3034-900P	Luminaire Schedule - Playspace	N/A	16.08.24	04
3034-910P	Lighting Specification - Playspace	N/A	16.08.24	03
3034-920P	Lighting Control Functionality Brief - Playspace	N/A	16.08.24	03

LAYOUTS				
NUMBER	NAME	SCALE	ISSUE DATE	REVISION
3034-000	Cover Page & Drawing List	N/A	16.08.24	02
3034-001	Lighting D&C Package Delineation Plan	NTS	16.08.24	03
3034-100	External Lighting Layout - General Landscape Works Scope	1:200	16.08.24	06
3034-100D&C	External Lighting Layout - D&C Scope	1:200	16.08.24	01
3034-101	External Lighting Layout - General Landscape Works Scope	1:200	16.08.24	06
3034-101D&C	External Lighting Layout -D&C Scope	1:200	16.08.24	01
3034-400	External Lighting Details	As Shown	16.08.24	01

Note: The contractor is to refer to the Landscape Architect Specification and the Lighting D&C Package Delineation Plan for details of the following separable portions:
-External Playspace- General landscape works
-External Playspace- D&C Play structures (Industrial Play, Awabakal & Water Play)

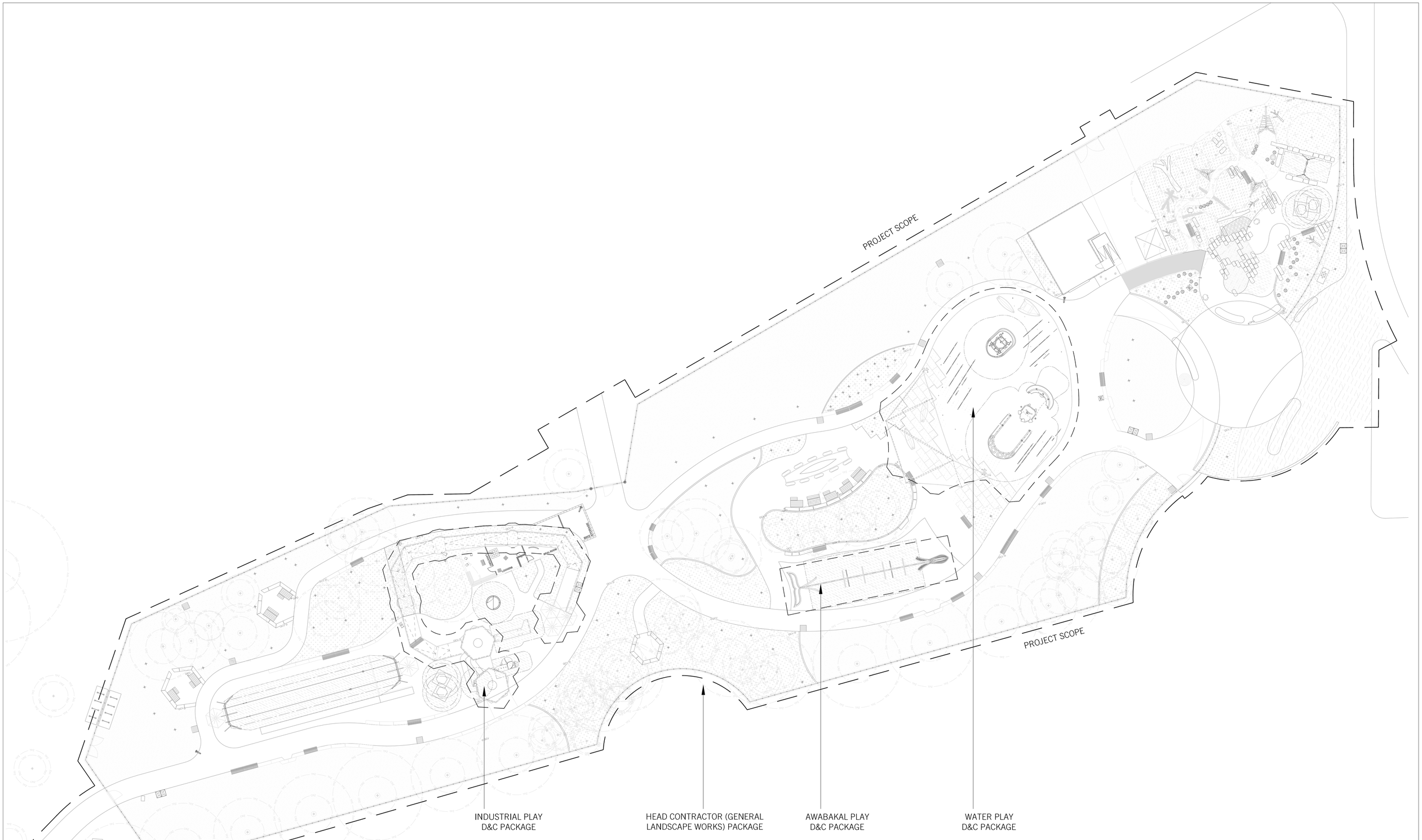
ELECTRO LIGHT
Electrolight
australia@electrolight.com
www.electrolight.com
L2, 373 Little Bourke St
Melbourne VIC 3000
T +61 3 9670 2694
4/414 Bourke Street
Surry Hills NSW 2010
T +61 2 9267 4777
© COPYRIGHT

NOTES:

REV.	DATE	ISSUE	DRAWN	CHECKED
01	15.03.24	75% Documentation Issue	HB	JP
02	16.08.24	100% Documentation Issue	HB	JP

CLIENT: City of Newcastle Council
PROJECT: Newcastle Foreshore Playspace
ARCHITECT: TCL
DRAWING TITLE: Cover Page & Drawing List

PROJECT No.	DRAWING No.	REVISION	SCALE @A1
3034	3034-000	02	NTS



ELECTRO LIGHT

Electrolight
australia@electrolight.com
www.electrolight.com

L2, 373 Little Bourke St
Melbourne VIC 3000
T +61 3 9670 2694

4/414 Bourke Street
Surry Hills NSW 2010
T +61 2 9267 4777

© COPYRIGHT

NOTES:

REV.	DATE	ISSUE	DRAWN	CHECKED
02	15.03.24	75% Documentation Issue	HB	JP
03	16.08.24	100% Documentation Issue	HB	JP

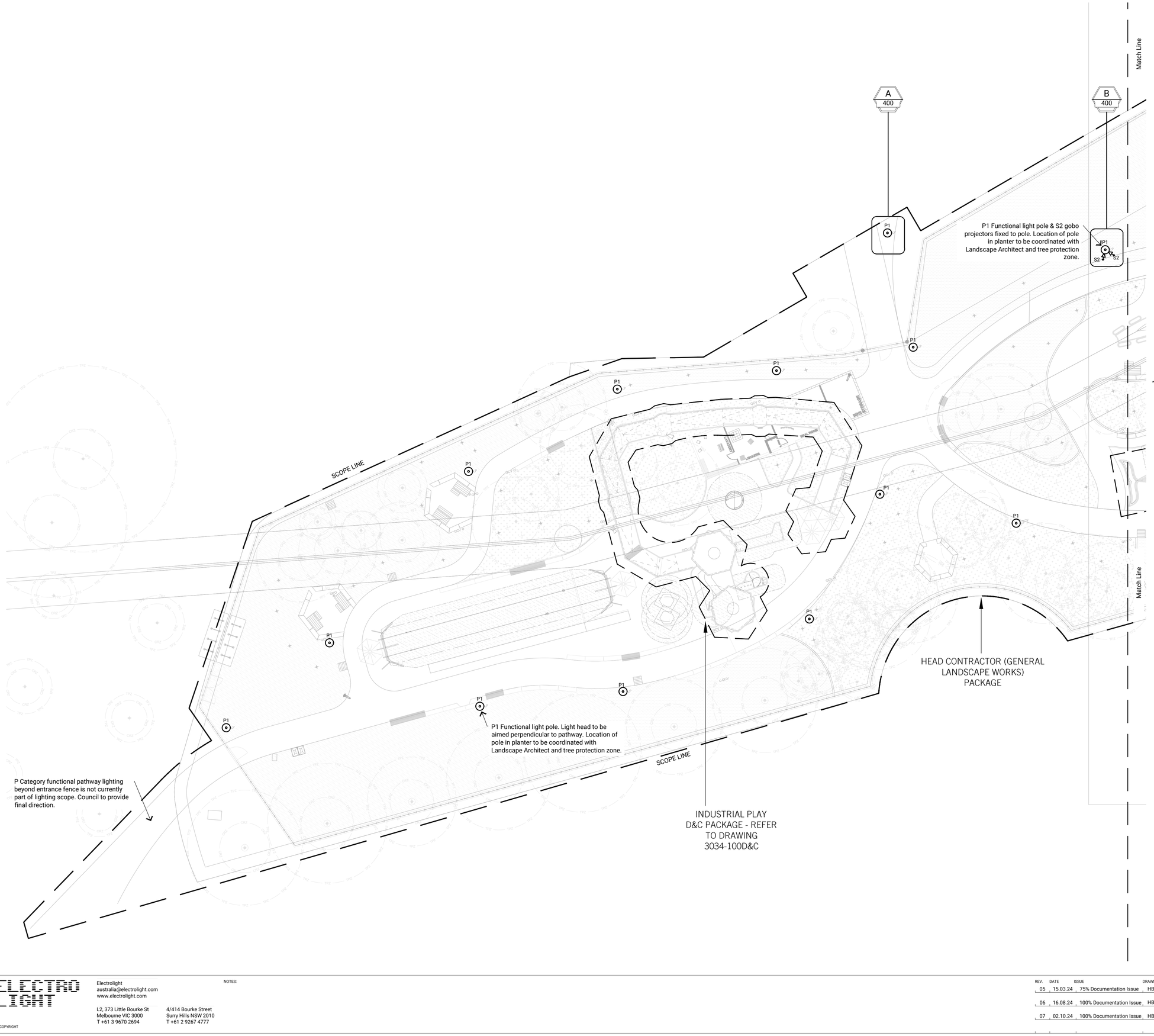
CLIENT
City of Newcastle Council

PROJECT
Newcastle Foreshore Playspace

ARCHITECT
TCL

DRAWING TITLE
Lighting D&C Package Delineation Plan

PROJECT No.	DRAWING No.	REVISION	SCALE @A1
3034	3034-001	03	NTS



ELECTRO LIGHT

Electrolight
australia@electrolight.com
www.electrolight.com

L2, 373 Little Bourke St
Melbourne VIC 3000
T +61 3 9670 2694

4/414 Bourke Street
Surry Hills NSW 2010
T +61 2 9267 4777

© COPYRIGHT

NOTES:

REV.	DATE	ISSUE	DRAWN	CHECKED
05	15.03.24	75% Documentation Issue	HB	JP
06	16.08.24	100% Documentation Issue	HB	JP
07	02.10.24	100% Documentation Issue	HB	JP

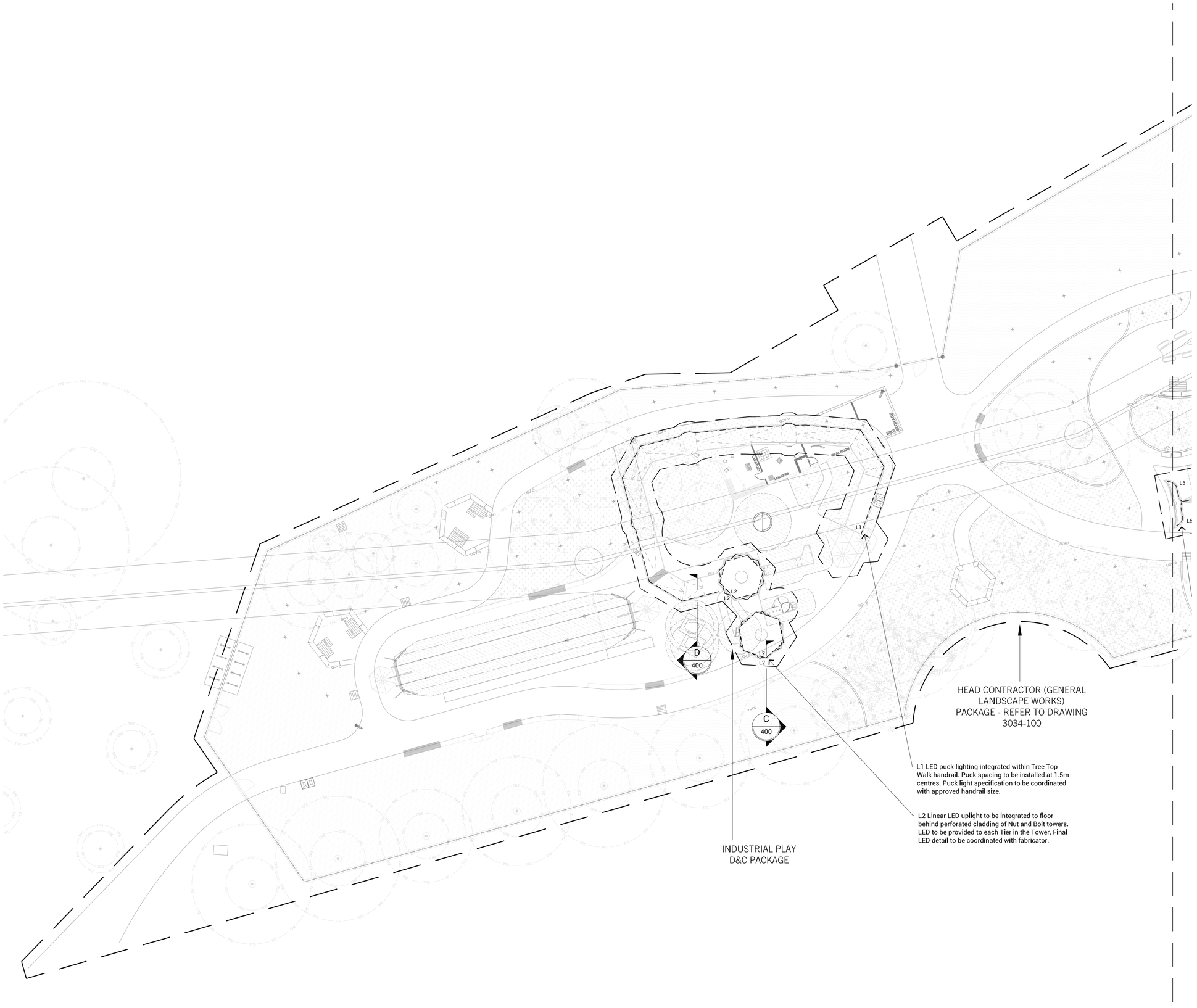
CLIENT: City of Newcastle Council

PROJECT: Newcastle Foreshore Playspace

ARCHITECT: TCL

DRAWING TITLE: External Lighting Layout - General Landscape Works Scope

PROJECT No.	DRAWING No.	REVISION	SCALE @A1
3034	3034-100	07	1:200



ELECTRO LIGHT

Electrolight
australia@electrolight.com
www.electrolight.com

L2, 373 Little Bourke St
Melbourne VIC 3000
T +61 3 9670 2694

4/414 Bourke Street
Surry Hills NSW 2010
T +61 2 9267 4777

© COPYRIGHT

NOTES:

REV.	DATE	ISSUE	DRAWN	CHECKED
01	16.08.24	100% Documentation Issue	HB	JP

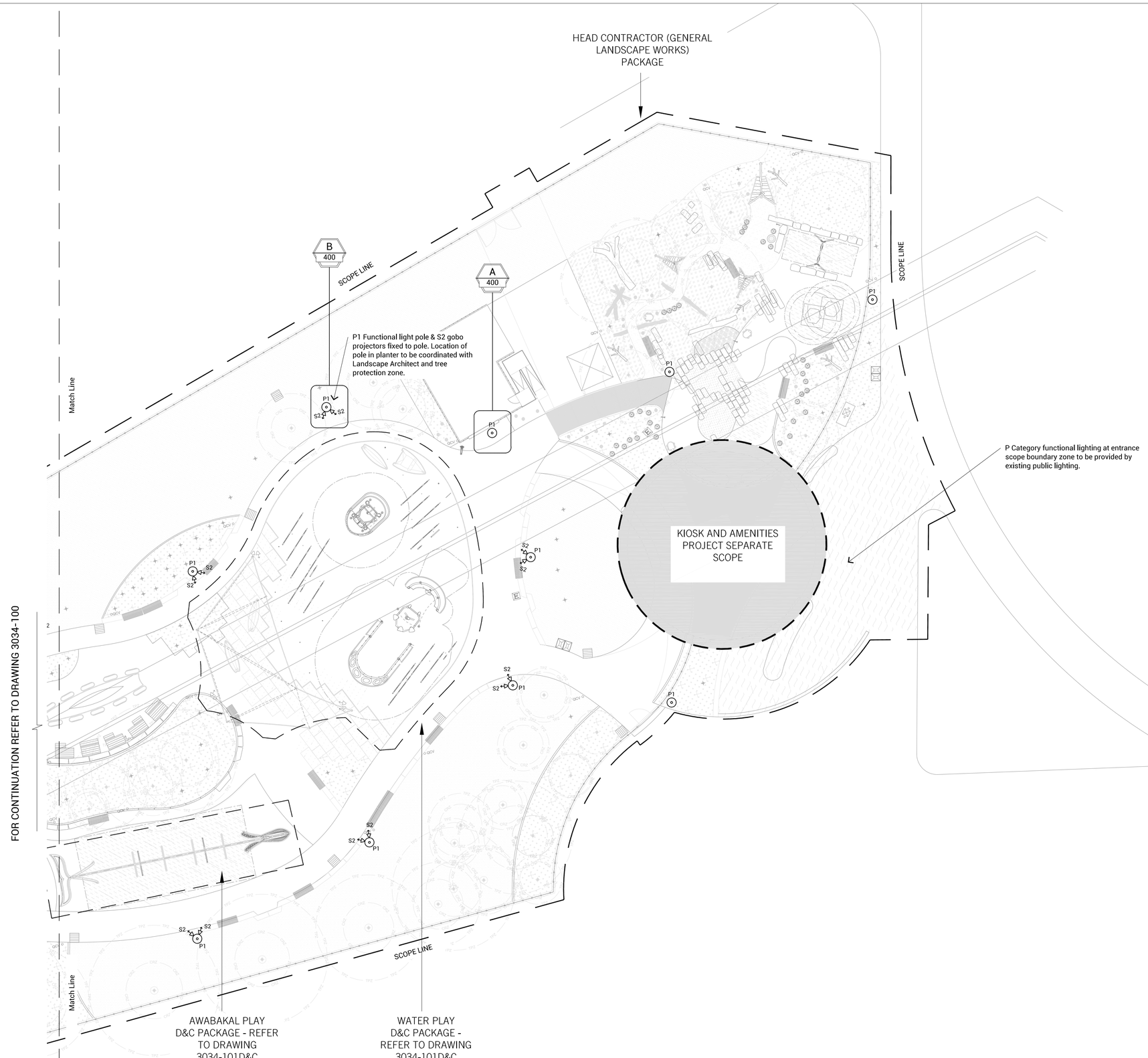
CLIENT: City of Newcastle Council

PROJECT: Newcastle Foreshore Playspace

ARCHITECT: TCL

DRAWING TITLE: External Lighting Layout - D&C Scope

PROJECT No.	DRAWING No.	REVISION	SCALE @A1
3034	3034-100D&C	01	1:200



ELECTRO LIGHT
Electrolight
australia@electrolight.com
www.electrolight.com
L2, 373 Little Bourke St
Melbourne VIC 3000
T +61 3 9670 2694
4/414 Bourke Street
Surry Hills NSW 2010
T +61 2 9267 4777

© COPYRIGHT

NOTES:

REV.	DATE	ISSUE	DRAWN	CHECKED
05	15.03.24	75% Documentation Issue	HB	JP
06	16.08.24	100% Documentation Issue	HB	JP

CLIENT: City of Newcastle Council

PROJECT: Newcastle Foreshore Playspace

ARCHITECT: TCL
Tonkin Zulaikha Greer

DRAWING TITLE: External Lighting Layout - General Landscape Works Scope

PROJECT No.	DRAWING No.	REVISION	SCALE @A1
3034	3034-101	06	1:200

HEAD CONTRACTOR (GENERAL LANDSCAPE WORKS) PACKAGE - REFER TO DRAWING 3034-101

U2.1 Inground uplights located beside Tug Dipper columns to uplight structure. U2.1 uplight incorporating narrow beam angle to be oriented towards structure to minimise waste uplight. Final setouts to be coordinated with Playspace fabricator.
Uplight to be installed with the manufacturer supplied installation blockout- the contractor is to liaise with the lighting supplier to determine the required recess depth.

Council and DDA/Access consultant to make determination whether inground uplight locations pose a fall risk due to uplight being a hard element in the ground.

S1 spotlights fixed to shade canopy columns to provide uplight effect. Mounting height of spotlights to be approximately 2500-3000mm AFFL to be coordinated with Landscape Architect and shade canopy fabricator shop drawings.

KIOSK AND AMENITIES PROJECT SEPARATE SCOPE

FOR CONTINUATION REFER TO DRAWING 3034-100

AWABAKAL PLAY D&C PACKAGE

WATER PLAY D&C PACKAGE

U2.2 Inground uplights located at base of Ground Tug Boat. Inground uplights to be fully flush with finish floor level.
Uplight to be installed with the manufacturer supplied installation blockout- the contractor is to liaise with the lighting supplier to determine the required recess depth.

U2.2 uplight incorporates asymmetric beam angle and is to be oriented towards structure to minimise waste uplight.
Final setouts to be coordinated with Playspace fabricator.

Council and DDA/Access consultant to make determination whether inground uplight locations pose a fall risk due to uplight being a hard element in the ground.

L5 linear LED integrated within underside of whale bone swing structure. Detail and extent of LED to be coordinated with approved swing structure shop drawings.
Lighting detail to achieve minimised upward waste light to night sky.

NOTES:

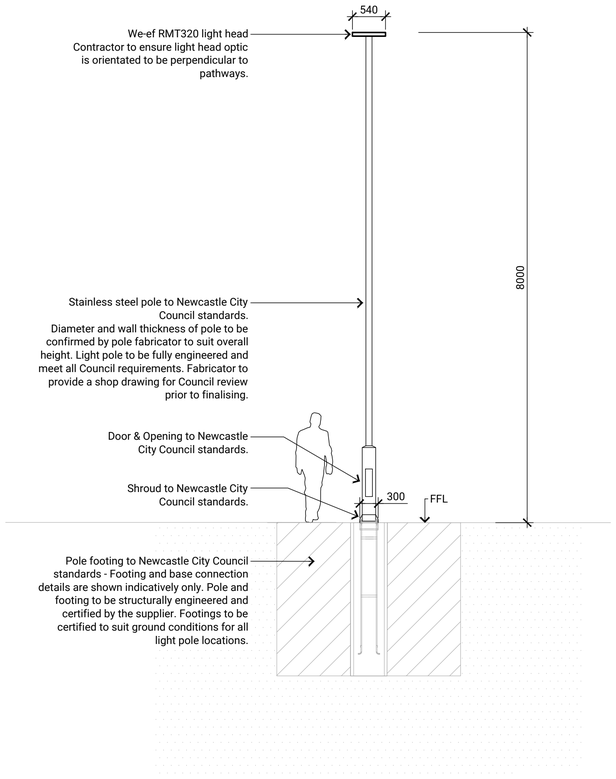
ELECTRO LIGHT
Electrolight
australia@electrolight.com
www.electrolight.com
L2, 373 Little Bourke St
Melbourne VIC 3000
T +61 3 9670 2694
4/414 Bourke Street
Surry Hills NSW 2010
T +61 2 9267 4777

© COPYRIGHT

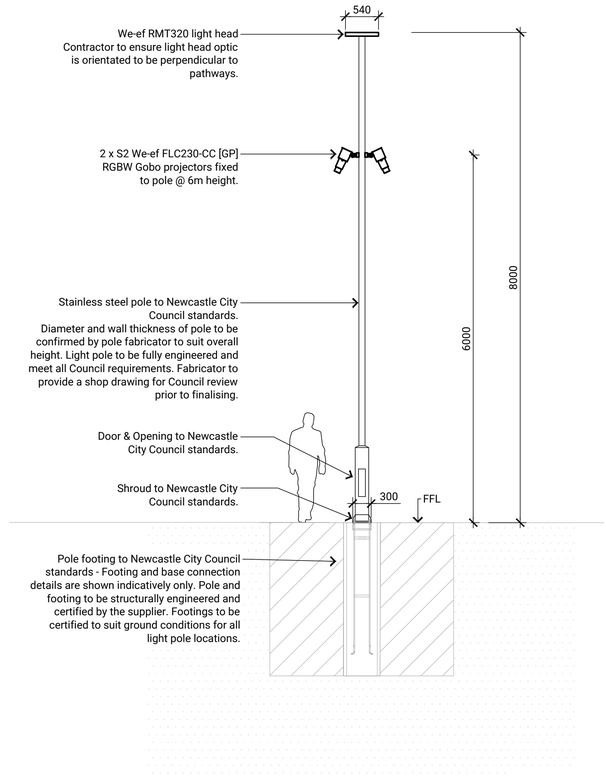
REV.	DATE	ISSUE	DRAWN	CHECKED
01	16.08.24	100% Documentation Issue	HB	JP

CLIENT: City of Newcastle Council
PROJECT: Newcastle Foreshore Playspace
ARCHITECT: TCL
DRAWING TITLE: External Lighting Layout D&C Scope

PROJECT No.	DRAWING No.	REVISION	SCALE @A1
3034	3034-101D&C	01	1:200



A Typical P1 Light Pole Detail
1:50



B Typical P1 & S2 Light Pole Detail
1:50

ELECTRO LIGHT

Electrolight
australia@electrolight.com
www.electrolight.com

L2, 373 Little Bourke St
Melbourne VIC 3000
T +61 3 9670 2694

4/414 Bourke Street
Surry Hills NSW 2010
T +61 2 9267 4777

© COPYRIGHT

NOTES:

REV.	DATE	ISSUE	DRAWN	CHECKED
01	16.08.24	100% Documentation Issue	HB	JP
02	20.08.24	100% Documentation Issue	HB	JP
03	02.10.24	100% Documentation Issue	HB	JP

CLIENT: City of Newcastle Council

ARCHITECT: TCL

PROJECT: Newcastle Foreshore Playspace

DRAWING TITLE: External Lighting Details - General Landscape Works Scope

PROJECT No.	DRAWING No.	REVISION	SCALE @A1
3034	3034-400	03	As Shown

NEWCASTLE FORESHORE PLAYSPACE
LUMINAIRE SCHEDULE

PROJECT 3034

DOCUMENT 3034-900P

REVISION 04 100% Documentation Issue

16 August 2024

Electrolight
Melbourne | Sydney | San Francisco
australia@electrolight.com
www.electrolight.com

Melbourne Studio
L2, 373 Little Bourke Street
Melbourne VIC 3000
+ 61 3 9670 2694

GENERAL NOTES

1. Luminaire Schedule should be read in conjunction with Lighting Documentation and the Architectural & Services drawings
2. Before ordering, it is the Contractor's responsibility to ensure lead times of luminaires are within programme
3. Catalogue Numbers / Order codes are indicative only. Where there is a discrepancy between the specified luminaire information and the catalogue number provided clarification must be sought from Electrolight before ordering.
4. All luminaire finishes to be confirmed by Architect before ordering.
5. Any changes to the document are shown highlighted in yellow in bold text.

SPECIFIC NOTES

6. Lengths to be measured on site prior to ordering. Lengths shown on drawing are indicative only.
7. Contractor to liaise with supplier to determine qty of mounting channel required to achieve a secure and uniform installation without droops.
8. Contractor to install LED lengths such that there are no gaps or shadows. To achieve the design intent of a continuous line of light.
9. Drivers to be located in remote accessible locations concealed from view.
10. Inground uplight to be IP68 suitable for both wet conditions with continual immersion in shallow water, and dry conditions when wet play is not in use. Uplights to be suitable for both wet and dry operations. Uplight to be trafficable- Landscape Architect to confirm trafficable weight requirements. Uplight drivers to be located remote. Design team including Landscape Architect, Play consultant and safety in design consultant to review specification of uplight prior to finalising.
11. Specification of light head, pole and pole footing to be Council approved type. Light pole shop drawing to be provided by lighting supplier for review and approval prior to finalising. Fixings and outreach arms to be incorporated into a finalised shop drawing. All footings to be structurally engineered to be suitable for all pole site conditions. Finishes to be approved by landscape Architect and Council.
12. LED strip bend type (horizontal or vertical) to be coordinated with approved lighting details prior to finalising.

Reference	Image	Description	Manufacturer / Supplier	Type / Specification	Finish	Dimensions (mm)	Light Source / CRI / MacAdam Steps	Source Wattage	Luminaire Output	Optic	Colour Temp	IP Rating	Control Gear	Accessories	Mounting Details	Notes
B1		NOT IN USE														
L1		Elevated Walkway Handrail Lighting	KLIK Systems - Jason Hammer (03)99188500	Integrated Handrail LEDPod Size TBC with handrail fabricator	Stainless Steel	TBC with handrail fabricator	LED CRI 85 2 Step	2W		Asymmetric	3000K	IP66	Relay On/Off	Mounting accessories for installation within handrail	Integrated into handrail	
L2		LED Linear Profile High Output - Playspace Nut and Bolt Towers	Vuelite / Lite Source - Matt Roworth - (03) 8393 9361	Neon SQ Side - Bend Type TBC See Note 12	N/A	24mm height x 24mm width plus brackets	LED CRI 90 3 Step	24W/m			RGBW	IP67	Remote DMX Driver	Mounting accessories for recessed installation within tower floor zone.	Concealed	
L3		NOT IN USE														
L4		NOT IN USE														
L5		LED strip - Playspace whale bone swing structure	Vuelite / Lite Source - Matt Roworth - (03) 8393 9361	Neon-110 - Bend Type TBC See Note 12	N/A	17mm H x 16mm W plus brackets	LED CRI 90 3 Step	16W/m			RGBW	IP68	Remote DMX Driver	Mounting accessories for recessed installation within whale bone swing structure.	Concealed	
P1		Functional Light head and Pole - Council Approved	Light head: We-ef / Buckford Illumination Group Sam Davey (03) 9646 8201 Light Pole: Council nominated custom fabricator	Light head: We-ef RMT320 One-sided Council Approved Light Pole: Council nominated stainless steel 8m pole	Stainless Steel Pole, Light head finish- TBC Landscape Architect & Council	540D x 60H x 8000 H pole	LED CRI 80 3 Step	36W	4651lm	One-sided R65	4000K	IP66	Relay On/Off	Council approved 8m stainless steel pole, rag bolts, shroud & suitable footing	Surface Mounted	See Note 11
P2		NOT IN USE														

Reference	Image	Description	Manufacturer / Supplier	Type / Specification	Finish	Dimensions (mm)	Light Source / CRI / MacAdam Steps	Source Wattage	Luminaire Output	Optic	Colour Temp	IP Rating	Control Gear	Accessories	Mounting Details	Notes
S1		Spotlight - Playspace sunshade structure	We-ef / Buckford Illumination Group Darren Bucknall (03) 9646 8201	FLC220 with Snoot	TBC with Landscape Architect	190 DIA x 138 H	LED CRI 80 3 Step	26W		25 Deg	3000K	IP66	Relay On/Off	Snoot	Surface Mounted	See Note 11
S2		Gobo projector - Playspace	We-ef / Buckford Illumination Group Darren Bucknall (03) 9646 8201	FLC230-CC [GP] RGBW Gobo System fixed to P1 pole @ 6m height.	TBC with Landscape Architect	116 x 397mm	LED CRI 80 3 Step	48W		TBC	RGBW	IP66	DMX	Supplied with selection of Gobos. Council to approve final Gobo selections	Pole Mounted	See Note 11
U1		NOT IN USE														
U2.1		Inground Uplight - Water Play Tug Dipper	Griven / Form and Light Walter Wendel 02 8824 7940	Dune Mk3 RGBW IP68 IK10 Cool Touch & Anti-slip coating TBC Council	Stainless Steel	306mm DIA x 230m H plus blockout	LED CRI 80 3 Step	27W		Narrow	RGBW	IP68	Remote DMX Driver	Installation blockout, glare shield, Anti-slip coating	Ground Recessed	See Note 10
U2.2		Inground Uplight - Water Play Ground Tug	Griven / Form and Light Walter Wendel 02 8824 7940	Dune Mk3 RGBW IP68 IK10 Cool Touch & Anti-slip coating TBC Council	Stainless Steel	306mm DIA x 230m H plus blockout	LED CRI 80 3 Step	27W		Asymmetric	RGBW	IP68	Remote DMX Driver	Installation blockout, glare shield, Anti-slip coating	Ground Recessed	See Note 10

NEWCASTLE PLAYSPACE
LIGHTING SPECIFICATION

PROJECT 3034

DOCUMENT 3034-901P

DRAFTED: HB | REVIEWED: JP

REVISION 03 100% DOCUMENTATION ISSUE

16 AUGUST 2024

Electrolight
Melbourne | Sydney | San Francisco
australia@electrolight.com
www.electrolight.com

Melbourne Studio
L2, 373 Little Bourke Street
Melbourne VIC 3000
+61 3 9670 2694

CONTENTS

1. INTRODUCTION 5

2. SCOPE OF WORKS 6

2.1 SCOPE OF WORKS 6

2.2 LIGHTING 6

2.3 WORKS BY BUILDER 7

2.4 WORK PRACTICES 7

2.5 QUALITY ASSURANCE AND PROJECT HANDOVER 7

2.6 COMPLIANCE WITH CODES AND AUTHORITIES 8

2.7 TENDER DOCUMENTATION 8

3. GENERAL SPECIFICATION ITEMS 9

3.1 SET OUT OF LIGHTING EQUIPMENT 9

3.2 LIGHTING CONTROL SYSTEM 9

3.4 DOCUMENTATION LIST 9

4. GENERAL LIGHTING ITEMS 10

4.1 GENERAL 10

4.2 LIGHTING CALCULATIONS – ILLUMINATION DESIGN INTENT & AVAILABLE DATA 11

4.3 LAMP QUALITY AND INSTALLATION 11

4.4 LED LUMINAIRES 11

4.5 CONTROL GEAR 12

5. EXTERIOR LIGHTING 13

6. SHOP DRAWINGS 14

8. SAMPLE LUMINAIRES 15

8. LIGHTING CONTROL SYSTEMS 16

8.1 GENERAL 16

8.2 SYSTEM DESCRIPTION 16

8.3 INSTALLATION 16

8.4 SENSORS 16

9. OPERATING AND MAINTENANCE MANUAL 17

9.1 GENERAL 17

9.2 OPERATING AND MAINTENANCE MANUAL 17
9.3 LUMINAIRE MAINTENANCE AND REPAIR INSTRUCTIONS 18
9.4 LIGHTING CONTROL SYSTEM OPERATING INSTRUCTIONS 18
9.5 “AS-BUILT” DRAWINGS 18
10. TESTING AND COMMISSIONING 19
10.1 SCOPE 19
10.2 LIGHTING 19
10.3 INSPECTION PRIOR TO CLOSING OF CEILING 19
10.4 COMPREHENSIVE DEFECTS LIST 19
11. MEANS OF ASSESSING “EQUAL AND APPROVED” 21
11.1 GENERAL 21
11.2 PHOTOMETRIC EQUALITY 21
11.3 BUILDING REGULATIONS – LIGHTING ENERGY CONSUMPTION 21
11.4 CONSTRUCTION AND ROBUSTNESS 21
11.5 AESTHETIC ACCEPTANCE 21
11.6 ELECTRICAL AND THERMAL EQUALITY 22
11.7 EQUALITY OF OTHER TECHNICAL PROPERTIES 22
11.8 MAINTENANCE 22
11.9 ADDITIONAL CRITERIA FOR LED 22
11.10 BENEFIT 22

1. INTRODUCTION

This document contains specification information for the specialist lighting to the Newcastle Playspace project.

The works to be executed consist of but are not necessarily limited to the manufacture, supply, installation, testing and commissioning of the following:

- External Playspace- General landscape works
- External Playspace- D&C Play structures (Industrial Play, Awabakal & Water Play)

Refer to the following Scope of Works section for more information.

This document shall be read in conjunction with all Electrolight Drawings, Documents, Specifications and Schedules. Reference shall also be made to all other consultants Drawings, Documentation, Specifications and Schedules including but not limited to Architectural, Interior Design, Landscape, Electrical, Mechanical, Civil, Structural and other disciplines.

2. SCOPE OF WORKS

2.1 SCOPE OF WORKS

The Works detailed in this Specification comprise the supply, installation, testing, warranty maintenance and defects liability of labour, materials and equipment for the specialist lighting installation, including all minor and incidental works necessary for the proper completion of the work and design intent detailed in the Contract Documents.

The Works to be executed consist of but are not necessarily limited to all areas within Electrolight scope as defined by the contract and or agreed fee proposal. Refer to the Introduction for the extent of the project scope.

Works outside of the scope of this document include:

- Emergency and exit lighting
- Temporary Event Lighting and infrastructure
- Engineering of Lighting Control System (refer Electrical Engineering Specification for details)

The Contractor shall visit the site and become conversant with the existing site conditions and scope of works and make all the required allowances to complete the Works.

The Contractor shall provide all manufactured items, materials, labour, cartage, tools, plant, appliances and fixings necessary for the proper execution of the Works, including associated charges and all minor and incidental works.

Equipment and materials provided for the Project shall be new unless otherwise specified in this Specification or on the associated Lighting Layout Drawings and Luminaire Schedule.

The sequence of works will be guided by the Schedule of Works provided by the Superintendent. The Contractor shall provide a proposed programme for all works associated with this contract. This program shall be reviewed and approved by the Superintendent.

Nothing in this Specification will limit, modify or alter the extent or description of the Works set out in detail elsewhere in the Contract Documents. The Contractor will carry out a detailed site survey to determine any conflicts of interest to existing infrastructure, luminaire mounting heights or installations and advise the Lighting Designer and Superintendent of any such conflicts.

2.2 LIGHTING

The Contractor shall:

- Supply and install all luminaires, conduits and wiring to nominated areas
- Provide fully detailed assembly, installation and Shop Drawings as required
- Provide appropriate protection of all equipment and provide clear and accurate labelling of all equipment
- Conduct comprehensive testing, commissioning with the Lighting Designer present
- Make provision for the demonstration and training of all lighting systems to the Building Facilities Manager/s
- Provide detailed Operating and Maintenance Manuals including “As-Built” drawings. Details of Operating and Maintenance Manual and Instructions are provided in Section 9 of this Specification
- Make provision of warranties for all equipment
- Ensure compliance with all relevant Standards, Codes and Authorities
- Ensure compliance with all relevant OH & S regulations. Where design elements appear to conflict with these requirements, take appropriate steps to ensure compliance, and notify the Superintendent /Project Manager

2.3 WORKS BY BUILDER

In addition to the electrical contractor's scope, Builder's works associated with the installation of the lighting system are required and shall be agreed with the head-contractor (builder) or allowed for in the tender / costing of the works. It is the responsibility of the electrical contractor to coordinate these requirements with the head-contractor (builder) to ensure all requirements are allowed. The Works to be executed consist of, but are not necessarily limited to, the following:

- Fixing and Plastering of trimless luminaires (or frames) and painting the finished surfaces as necessary
- Supply and installation of structural members for support / fixing of luminaires to the ceiling and/or wall
- Modifications to joinery elements, including routing or cavities for concealment of the lighting / luminaires and cabling
- Construction of access panels required for remote drivers

The list above is not exhaustive and the contractor is to provide all necessary additional works as required for the successful installation of the lighting system.

2.4 WORK PRACTICES

The Contractor shall:

- Provide a safe working environment at all times
- Make provision for temporary hoardings, barriers and signage as necessary
- Deliver and position in place all lighting equipment and materials
- Provide the appropriate supports, such as scaffolding, hoisting and lifting equipment, as required for the proper installation of all lighting equipment and materials in a safe manner
- Progressively remove from the site all rubbish, debris, material cuttings and other redundant materials, which result from the works. In particular packaging, redundant cabling, and obsolete equipment shall be disconnected and removed from the site
- Ensure all required penetrations in ceilings, walls and floors are made good, and paint all exposed electrical services such as cable trays and conduits as specified by the Architect
- The Contractor must ensure that wiring is concealed from view and that appropriate conduits are used for all wiring. Wiring must be installed to the requirements of AS/NZS 3000 and any other relevant standards. Refer to the Electrical Specification (by others) for details
- All works must comply with both the relevant state regulations covering the Health and Safety Act.

Any external excavations need to be barricaded throughout the duration of work. Appropriate signage must be displayed at all times. Any material and equipment left on site must be secured and is the responsibility of the Contractor. All spoil from excavations must be removed by the Contractor and all reinstatement must match existing surfaces and be free of trip hazards.

2.5 QUALITY ASSURANCE AND PROJECT HANDOVER

The Contractor is responsible for providing all relevant certification and copies of approvals to the Superintendent at completion of installation at which point all works must have been tested to comply with all relevant Standards and be fully operational.

The Contractor shall explain the operation of all luminaires, lighting equipment and lighting control systems to the Superintendent and reference the information to the "As-Built" Drawings and Operating and Maintenance Manual and Instructions. .

The Contractor must notify the Superintendent of a suitable time for a Defects Inspection to be carried out post installation.

All works nominated for rectification in the Defects Report must be actioned within timelines nominated by the Superintendent.

Prior to the issue of the notice of completion, the Contractor shall spend sufficient time with the Client or appointed representative to show the location of all luminaires, lighting equipment and lighting control systems which require maintenance and/or adjustment during the life of the installation.

Training on each luminaire, lighting equipment and lighting control system must be conducted by a suitably qualified and skilled person.

The Contractor shall provide a copy of the Operating and Maintenance Manual including "As-Built" Drawings and Operating Instructions for highlighting of systems during training.

2.6 COMPLIANCE WITH CODES AND AUTHORITIES

Two (2) copies of certificates showing satisfactory completion of the work shall be obtained from the Authorities concerned and furnished to the Superintendent at the completion of the work. Underground or enclosed work shall not be covered up or concealed from view until it has been duly tested, inspected and passed by the Authorities concerned and the Superintendent.

All work shall be carried out in accordance with all relevant Australian Standards. In addition, works shall comply with the requirements of all relevant authorities having jurisdiction over the works.

2.7 TENDER DOCUMENTATION

As part of the Tender submission the contractor shall provide a schedule of rates outlining:

- Unit Supply cost of each luminaire Type
- Unit Installation cost of each luminaire Type (per metre if linear fitting)
- Hourly rate for additional work/s

3. GENERAL SPECIFICATION ITEMS

3.1 SET OUT OF LIGHTING EQUIPMENT

The set out of lighting equipment is detailed in principle in the Lighting Layout Drawings. Final set out of luminaires shall be as per the coordinated architectural reflected ceiling plans, elevations, sections, floor plans and details. Should discrepancies exist, advice must be sort from the Lighting Designer prior to proceeding.

No alterations may be made to the set out of lighting equipment or its installation without the consent of the Lighting Designer and prior written approval from the Superintendent.

Lighting Layout Drawings shall be read in conjunction with the Luminaire Schedule, and in conjunction with the architectural reflected ceiling plans, elevations, sections, floor plans and details.

The contractor shall liaise with all other trades on the site and coordinate the electrical installation where it affects other trades. The interconnection of these works with existing or new works provided by others shall be coordinated to eliminate discontinuities.

3.2 LIGHTING CONTROL SYSTEM

The control of the lighting shall be via a lighting control system unless otherwise noted. Refer to the Electrical Control Schematic (by others) and the Electrical Specification regarding lighting control systems (by others). Refer to Section 8 Lighting Control Systems for further information.

3.4 DOCUMENTATION LIST

Refer to lighting documentation cover page and/or documentation transmittal for all of the current documents.

4. GENERAL LIGHTING ITEMS

4.1 GENERAL

All lighting equipment including luminaires, lamps, control gear and lighting controls must be in exact accordance with the Lighting Design Documentation including the Lighting Layout Drawings, Luminaire Schedule and this Specification. Alternatives will not be considered unless directed by the Project Manager and Lighting Designer (refer Section 11).

The Contractor shall supply and install new luminaires in the locations as shown on the Lighting Layout Drawings to provide a complete lighting system.

Operational samples of luminaires (excluding custom pieces) shall be provided for approval by the Lighting Designer prior to ordering. The Contractor shall confirm with the Lighting Designer which luminaire types require sample approval. Luminaires shall be provided to the Superintendent for sign off. All samples shall be provided with the correct colour finish, beam distribution and lamp as specified, and shall be operational to allow the fitting to be switched on and the optical performance inspected prior to approval. Details are provided in Section 7 of this Specification.

Final locations and colour selection of all fittings, accessories and components shall be in accordance with the requirements of this Specification, Lighting Layout Drawings and Luminaire Schedule. All locations shall be confirmed by the architect prior to rough in.

The Contractor shall confirm the colour and finish of all fittings with the Lighting Designer and Architect prior to ordering fittings.

The Contractor shall ensure that no structural member is weakened or overloaded by the weight of any lighting equipment or materials to be installed or their method of attachment.

Unless otherwise specified by the Lighting Designer one transformer or ballast will be supplied and installed for each luminaire (for those luminaires where transformers or ballasts are required).

The Contractor shall install all luminaires in accordance with the manufacturer's recommended components and methods.

The Contractor shall ensure that all necessary mounting and/or fixing accessories are ordered with the Luminaires to suit the mounting method.

The Contractor shall confirm all luminaire dimensions with the relevant supplier / manufacturer. Particular attention shall be paid to cut-out sizes for recessed luminaires prior to cutting holes.

The Contractor shall verify that sufficient ceiling depth exists for the mounting of each luminaire prior to cutting holes in ceilings. All discrepancies shall be reported to the superintendent.

Equipment shall be located with due allowance for air ventilation around the equipment in accordance with AS 3000. In each case consideration shall be given to the heat generated by the luminaire, and the process of lamp changing.

Luminaires shall be provided complete with lamps, starters, ballasts, diffusers, suspensions and fixing brackets.

In the case of suspended fittings, suspension points are to be as per the manufacturer's recommendations.

All electrical and wiring reticulation is to be concealed where possible, if it must be exposed it is to be placed in suitable electrical ducting (located in a discrete location) that is painted to match the finish of the surface it is mounted on.

All remote electronic control / drivers shall be concealed from direct view. If this is not possible, they are to be painted to match the finish of the surface they are mounted on (with painted masking tape to cover labelling information)

Where applicable lighting accessories (light switches, control panels, PIRs etc.) shall be of the same type, series and manufacturer.

Reflectors, diffusers and louvres shall be cleaned to eliminate all dust or finger marks. All luminaires shall be cleaned at Practical Completion.

Luminaires shall be delivered to site suitably packaged in sealed cases or cartons. The Contractor shall remove all packaging, rubbish and debris from site associated with the works and recycle where appropriate.

Aiming of all relevant luminaires and the commissioning of all lighting control system shall be carried out by the Contractor, in conjunction with and in the presence of the Lighting Designer. The Contractor shall nominate a suitable time and date on which aiming of all relevant fittings and commissioning may be carried out and shall provide the Lighting Designer with at least two weeks notice given of this date. The Contractor shall provide the necessary man power and equipment to permit such procedures.

The Contractor shall allow sufficient time for the complete aiming and commissioning of the entire lighting installation in the presence of the lighting designer. Refer to the Lighting Control Functionality Brief for further information

4.2 LIGHTING CALCULATIONS – ILLUMINATION DESIGN INTENT & AVAILABLE DATA

In order to produce the documented lighting design, the lighting designer has used information provided during the preliminary stages of this project to perform relevant lighting calculations. These calculations have informed the design process and where appropriate demonstrate legal compliance.

Design variations made after the preliminary stage could have significant impact on the illumination design. Changes in surface reflectance, geometry, luminaire location and luminaire specification could critically impact the lighting design and invalidate calculations already performed.

All calculations for the project have been based on the luminaires within the Luminaire Schedule issued by Electrolight.

The following installation maintenance assumptions are outlined below:

- Cleaning of luminaires and housings, including lens and reflectors yearly.
- 50,000hr operational hours for LED (to 70% lumen depreciation)

4.3 LAMP QUALITY AND INSTALLATION

The Contractor shall refer to the luminaire Schedule for lamp specifications. Final set out of luminaires shall be as per the coordinated architectural reflected ceiling plans, elevations and floor plans

4.4 LED LUMINAIRES

LED luminaires shall be supplied with the beam angle and colour temperature as specified in the Luminaire Schedule. All LEDs shall have a rated life of a minimum 45,000 hours to 70% lumen depreciation, with a minimum 2 year warranty provided by the supplier. All white luminaire light sources are to have a minimum CRI80.

LED lighting shall be installed with due care to moisture and temperature restrictions. LED lamps shall not be installed within areas without adequate air flow. Contractor is to ensure that every precaution is taken to prevent electrostatic discharge injury.

Transformers for the LED fittings shall be installed fixed within the ceiling or joinery, and not left resting on ceiling or suspended tiles. Transformers shall be mounted clear of insulation with adequate air circulation. Transformers shall be mounted such that they are accessible for future maintenance without damage to the ceiling or walls. Transformers shall be fully enclosed and complete with 1.5m flex and a 10 Amp plug and shall provide automatic protection for short circuit as well as thermal overload. Refer to Control Gear section for additional details.

4.5 CONTROL GEAR

Electronic control gear shall be used unless otherwise stated. All Control Gear is to be A1 DALI dimmable or A2 switched via relay by the DALI Lighting Control System, refer Luminaire Specification for further details.

LED Converters shall be equal to Tridonic, Osram or Philips with the minimum performance characteristics:

- Compliant to AS/NZ 61347.1 and IEC 61347.2.
- AC Voltage range 220 -240V min
- Efficiency >85%
- Power factor >0.95
- Minimum 50,000 rated life span
- Over temperature protection – automatic shutdown if the temperature limit is exceeded, automatic restart if the temperature drops below the limit - Intelligent Temperature Guard
- Overload protection – automatic shutdown if the maximum output current is exceeded, automatic restart if the current is below the limit
- Short circuit shutdown with automatic restart
- Dimmable via DALI and switchDIM (where nominated)
- Dimming range 4-100%
- PWM frequency 400Hz
- Output current tolerance ±5%
- Standby power < 1W
- Turn on time ≤0.5 s
- Turn off time at full load 20ms
- Hold on time at power failure 10ms
- Set up time (acc to the DALI Standard) < 600ms
- Ambient temperature range -25ºC to +50 ºC

5. EXTERIOR LIGHTING

Exterior luminaires shall be installed in locations as shown on the Lighting Layout Drawings. Final set out of luminaires shall be as per the coordinated landscape plans.

Exterior luminaires shall be installed such that they maintain the IP rating to which they were designed.

During installation of exterior uplights, the fittings shall be sealed after due warming up time to avoid retention of moisture, in accordance with manufacturer's installation instructions. All gaskets and seal points shall be inspected to ensure that they have not been compromised by environmental factors. Manufacturer supplied block out sleeves shall be installed prior to concreting. Final finished level of the fitting shall be flush with the surrounding pavement.

All external lighting shall be supplied with anti-leaching glands fitted. Orange circular cable shall be used when terminating into IP rated glands.

All lighting poles are to meet all relevant local and international standards including AS 4312, AS 1874 and ISO 9223. All lighting poles and pole finishes, including those used within marine environments, shall be provided with adequate protection to conditions and shall maintain a minimum 10 year warranty unless otherwise stated.

The contractor shall coordinate all poles and pole mounted light fittings to ensure all fixings are concealed and integrated. During installation and site coordination of lighting poles, pole mounted luminaires and pole accessories, the contractor shall ensure that the materials are not compromised and that the corrosive protection and structural integrity of the lighting poles is maintained.

Unless otherwise stated in the luminaire schedule, the contractor shall nominate appropriate lighting pole coatings and footings to meet local environmental and regulatory requirements. The proposed solution shall be provided to the client and the design team for approval prior to order.

6. SHOP DRAWINGS

Shop Drawings are required for each custom made luminaire or luminaire mounting accessories. These must be submitted to the Lighting Designer for approval. Re-submissions shall occur until such time the Shop Drawings are approved.

Shop Drawings shall be submitted within three (3) weeks after award of the Contract. Shop Drawings may be submitted progressively, but must be in such an order as to suit ordering and fabrication lead times, and the construction programme as stipulated by the Superintendant.

At least one (1) working week must be allocated for review and approval of the Shop Drawings from the time of receipt by the Lighting Designer.

Failure to submit Shop Drawings in a timely manner to facilitate ordering, fabrication or installation shall not constitute grounds for an Extension of Time to the Contract.

The Contractor shall carry out site measurement and prepare and submit detailed Working and Shop Drawings for review and approval prior to ordering, manufacture or installation, and be responsible for the detailed design of all systems. Site measurements will take precedence over the dimensions shown on the Lighting Layout Drawings.

All Shop Drawings submitted will be taken to have been fully coordinated with all other relevant Trade Sub-Contractors for locations, structural and electrical load ratings, etc.

Such Shop Drawings will be examined by the Lighting Designer to verify only that they represent the Lighting Designer's design intent. The endorsement of such drawings by the Superintendent does not relieve the Contractor of his responsibility for detailed checking.

7. SAMPLE LUMINAIRES

Prior to commencement on site and the ordering of materials, the Contractor shall confirm with the Lighting Designer which luminaire types require the submission of samples for approval. Luminaire types requiring sample approval are to be submitted as working samples along with their respective data sheets.

In addition to Luminaire types, samples of the following are to be provided for approval:

- Working prototype sample of custom luminaires

All samples shall be provided with the correct colour finish, beam distribution and lamp as specified, and shall be operational to allow the fitting to be switched on and the optical performance inspected prior to approval.

Each sample shall be provided with a unique identifier, which shall correspond to the luminaire reference number as specified in the Luminaire Schedule, and shall be recorded on a sample register.

The samples register shall contain a complete list of all samples as required and updated with submission date, approval date and authorised sign-off personnel.

Each sample shall be accompanied by a technical data sheet from the supplier / manufacturer.

Approved samples will be retained by the Superintendent / Project Manager for the duration of the contract

8. LIGHTING CONTROL SYSTEMS

8.1 GENERAL

The Contractor shall supply and install a lighting control system for energy management of the lighting installation unless noted otherwise.

Refer to the Lighting Control Functionality Brief for further information and more detailed lighting control requirements for the project, including the delineation of spaces, scene selection, lighting control panels etc.

A Lighting Control System able to control the luminaires as specified and provides individual control and dimming as nominated in the Lighting Layouts and the Lighting Control Functionality Brief should be used. The Control System should be from a reputable manufacturer, user friendly and have local support.

The lighting control system shall also meet the following general criteria:

- Lighting control equipment shall be located in a concealed, protected and accessible locations
- Input units such as switch units, PIR movement detectors and lux level sensors shall be of a programmable type and able to control any number of output units such as relay units
- The Lighting control system will have the ability to be programmed at any connection point

8.2 SYSTEM DESCRIPTION

The control of the lighting shall be via a lighting control system. The Contractor shall refer to the Control Schematic (by System provider) for system details. The system includes, but is not limited to DALI controllers (Enumerated and/or Broadcast. If DALI is used it is to be considered as enumerated type unless otherwise stated), 1-10V Controller, Leading Edge Dimmers, Trailing Edge Dimmers, Astronomical Time Clock, User Interfaces (Lighting Control Panels and Touch Screens) and Motion Detectors.

Control Equipment shall be as specified in a Schematic Drawing provided by the Lighting Control System Provider.

8.3 INSTALLATION

- The Contractor shall deliver and install all lighting control equipment including wiring and miscellaneous equipment to achieve a complete lighting control system installation as specified
- A representative from the supplier of the Lighting Control System, shall assist the Contractor in the design of the complete system using the Electrolight functionality as a basis
- A representative from the Lighting Control integration consultancy shall also assist the Contractor with installation and commissioning

8.4 SENSORS

- Motion Sensors shall be of the passive infra-red or other suitable type and shall be enclosed in a high impact PVC enclosure
- Each motion detector shall be installed in a position designed to ensure that the motion caused by people within the respective area is clearly detected. The motion detector setout is to be undertaken by the Electrical Engineer.
- The detectors shall be fully programmable over the network with time out periods adjustable from 30 seconds to 10 hours, with ranges up to 24m
- Motion detectors shall be located to suit room furniture layout and primary occupant position
- Colour and finish will complement the surroundings and blend harmoniously with backgrounds. The Architect and/or interior designer to approve finish colour.

9. OPERATING AND MAINTENANCE MANUAL

9.1 GENERAL

The Contractor shall compile and submit a comprehensive Operating and Maintenance Manual and Instructions.

The Contractor shall submit three (3) complete sets of the Operating and Maintenance Manual and Instructions, which includes the set required for Demonstration and Training.

A draft of the proposed Manual and Instructions shall be provided for the approval of the Superintendent no later than four (4) weeks prior to Practical Completion.

9.2 OPERATING AND MAINTENANCE MANUAL

The Operating and Maintenance Manual should contain the following information presented in a professional manner in an A4 size folder bound for durability and organised for clarity and ease of reference:

- Indexed Scope and Contents
- General Description of all Lighting Equipment and the Lighting Control System
- Luminaire Schedule
- Luminaire Maintenance and Repair Instructions (See 9.3)
- Lighting Control System Operating Instructions (See 9.4)
- Comprehensive Maintenance and Lamp Replacement Schedule
- Equipment Suppliers' Data Schedules.
- "As-Built" Drawings and CAD disc(s) (See 9.5)
- Equipment Manufacturer's Literature
- Testing and Commissioning Data
- Certificates
- Other Information

One (1) set of the Operating and Maintenance Manual shall contain all the original test reports, compliance certificates and manufacturers' catalogues. This set will be clearly labelled as "OPERATING AND MAINTENANCE MANUAL – ORIGINAL". The word "ORIGINAL" is to be omitted from all other copies.

Equipment reference numbers, and other identifying references, shall be consistent to the Lighting Layout Drawings and Luminaire Schedule throughout the Operating and Maintenance Manual.

Sufficient illustrations, diagrams drawings, pamphlets and photographs shall be included for the efficient operation, maintenance and repair of the entire lighting installation.

The Contractor shall provide detailed handbooks, catalogues, and data schedules from manufacturers and suppliers for all lighting equipment installed under this Contract.

The Contractor shall provide testing and commissioning data results as required to be carried out by the Superintendant and all relevant Australian Standards.

The Contractor shall include all compliance and warranty certificates in the Maintenance Manual.

Etched or engraved labels for all controls, switches and equipment shall be provided to ensure their identification independently and in relation to the diagrams and instructions.

9.3 LUMINAIRE MAINTENANCE AND REPAIR INSTRUCTIONS

The Contractor shall prepare a series of maintenance and repair instructions for each luminaire in the lighting installation. Each instruction shall be complete and shall not refer to other instructions. Each instruction shall clearly identify the relevant luminaire, with a reference number that is consistent with the Lighting Layout Drawings and Luminaire Schedule.

Each maintenance and repair instruction shall clearly identify the specification of the replacement lamp, with special consideration to colour temperature and wattage.

Clear and precise aiming instruction shall be provided for all adjustable luminaires, including aiming diagrams or illustrations where necessary, for the precise re-aiming of luminaires after a lamp replacement, maintenance or repair has occurred.

9.4 LIGHTING CONTROL SYSTEM OPERATING INSTRUCTIONS

The Contractor shall provide a fully detailed technical and functional description of the Lighting Control System, including the operation of each item / component under normal, test and fault conditions. The Contractor shall liaise with the Lighting Automation Consultant to provide a fully coordinated documentation for the lighting control system.

Description shall include, but not be restricted to:

- Locally switching ON / OFF
- Manual Adjustment Control of Lighting Levels
- Sensor Functions
- Time Clock Functions
- Editing of Settings

These instructions shall allow the Client a comprehensive knowledge and ability to operate the entire lighting system confidently, competently and in a timely fashion.

9.5 “AS-BUILT” DRAWINGS

The Contractor shall provide “As-Built” Drawings in print and CAD disc(s) in each Operating and Maintenance Manual.

All drawings shall be prepared with a computer based drafting system and supplied in .DWG or .DXF format. All computer drawings shall be compiled and saved on CD-ROM or DVD.

“As-Built” Drawings shall include corresponding drawings to the Lighting Layout Drawings, as listed in Section 3.4 of this Specification. In addition, all approved Shop Drawings of custom luminaires and luminaire mounting accessories shall be included.

“As-Built” Drawings of plans shall be at least the same scale as the Lighting Layout Drawings. “As-Built” derived from Shop Drawings, shall be at the same scale as that provided during submission of the Shop Drawings.

10. TESTING AND COMMISSIONING

10.1 SCOPE

The Contractor shall test all systems and equipment which form part of the lighting installation subject to this Specification.

Notwithstanding any prior agreement to proposed testing dates, formal testing shall not commence until the Contractor has carried out all preliminary tests, checks and control settings, etc; and all test results and operations are in compliance with the intent of this Specification. Only then, shall the Superintendent be notified that the systems are completely ready for formal testing.

Where testing interfaces between systems, where the systems are provided by different Trade Sub-Contractors all relevant Trade Sub-Contractors' Foreman shall attend when directed by the Superintendent.

The Contractor shall supply free of charge all skilled operators required to operate each respective system, and all instruments and equipment for testing.

The Contractor shall test and demonstrate operational readiness of the following systems:

- All general Lighting
- All lighting dimming systems

After formal testing, the Contractor shall fully schedule the results in spreadsheet format and shall supply three (3) copies of the scheduled results to the Superintendent within two (2) weeks of the completion of testing.

10.2 LIGHTING

After formal testing, the Contractor shall check and clean all luminaires. All accessories including louvers, diffusers, snoot and glare rings, shall be checked that are correctly installed.

The Lighting Designer shall be given the opportunity to guide the pointing and aiming of any part of the works that are adjustable (not fixed) with practical support from the Contractor.

10.3 INSPECTION PRIOR TO CLOSING OF CEILING

48 hour notice must be given to enable verification by the Superintendant before closing up of ceiling. If verification is not provided by the Superintendant and the ceiling is closed, the ceiling shall be re-opened, closed and painted as directed by the Superintendent and will be at the Contractor's cost.

10.4 COMPREHENSIVE DEFECTS LIST

The Lighting designer shall be given the opportunity to inspect the works and provide a comprehensive defect lists at Practical Completion.

The Contractor must provide the defects lists that have been used to identify and rectify defects including a separate sheet for the final list of all outstanding defects. A comment that all defects have been rectified is not acceptable.

Each comprehensive defects list shall contain the following information:

- Unique room label or number to identify the room, preferable to use those shown on the architectural drawings
- Defect description
- Date defect noted
- Date defect rectified
- Contractor's representative's signature

The final comprehensive defect list shall be provided to the Lighting Designer to assess readiness of the installation for inspection, and shall include each and every room for the Project.
Should a room not have any defects, then that room is still to be entered into the defects list as an item with the description being "NO DEFECT".

11. MEANS OF ASSESSING “EQUAL AND APPROVED”

11.1 GENERAL

The Contractor or Supplier who may wish to nominate an alternative luminaire for consideration needs to ensure that any luminaire submitted as an alternative to a specified luminaire meets the same standards as the specified luminaire, achieves the same results and has the same standard of review by members of the design team. The burden of proof with regard to a submitted product's ability to meet performance criteria is placed solely on the submitting entity. Any alternative reviews will be charged on a time basis to the contractor.

11.2 PHOTOMETRIC EQUALITY

The Lighting Designer shall request the submission of full photometric characteristics for all alternative luminaires being offered, including the necessary polar curves (in IES format), or equivalent, as well as detailed lighting calculations for the affected space. These calculations are to be provided along with the alternative luminaires. Such data and calculation shall be reviewed to ensure that the alternative luminaire still meets or exceeds the scheme parameters and criteria. Any calculations submitted must be made using the same parameters, such as room reflectances and maintenance factors, as the original calculations. Submission of such calculations must be considered as a legal undertaking by the submitting party, and should be covered by suitable professional indemnity. Time spent reviewing alternative luminaires and associated calculations etc. will be charged at an hourly rate unless otherwise agreed.

11.3 BUILDING REGULATIONS – LIGHTING ENERGY CONSUMPTION

The energy consumption of the submitted luminaire shall be checked against that of the specified luminaire. If the energy consumption is higher a re-calculation of the overall energy consumption of the luminaires in the building shall be required to be performed by the submitting entity to confirm that the installation still meets the requirements of Section J6 of the National Construction Code (NCC).

11.4 CONSTRUCTION AND ROBUSTNESS

The designer must be satisfied that the luminaire being offered as an alternative is of equal quality, durability and robustness as the original luminaire specified. This shall require submission of sample luminaires for both specified and alternative luminaires, and any components forming the total luminaire and its support, by the submitting entity.

11.5 AESTHETIC ACCEPTANCE

Alternative luminaires shall be considered both individually and in relation to other luminaires on the project to ensure aesthetic acceptability. This exercise shall be carried out in conjunction with the Architects, Designers, Client and other interested parties who were involved in the selection of the original luminaires. In the case of exterior lighting this assessment shall be carried out in conjunction with any fixing system, the bracket, and where applicable the lighting pole. Any alternative reviews will be charged on a time basis to the contractor.

11.6 ELECTRICAL AND THERMAL EQUALITY

If the project circumstances have dictated special characteristics for the luminaire that are not covered by normal product or installation standards or directives then the assessment process shall assess whether the proposed luminaire meets these special characteristics. Compatibility of components and systems shall be checked to ensure safety and performance of the original design is maintained.

11.7 EQUALITY OF OTHER TECHNICAL PROPERTIES

Luminaires shall only be specified that meet and comply with the Australian Standards and EMC regulations. Any alternative luminaire shall be submitted with full specification and technical detail sheets to show that they meet the same or equivalent Standards.

11.8 MAINTENANCE

The ease and simplicity of maintenance shall be considered as part of any assessment of any alternative luminaire submitted. Any alternative luminaire shall meet any specific maintenance factor for the installation.

11.9 ADDITIONAL CRITERIA FOR LED

Luminaires shall achieve equivalent values for the following criteria. Where stated next to criteria these values are minimums:

- Lumen output
- Light distribution
- Colour Temperature
- McAdams Steps: Max 3 Steps
- Colour Rendering (CRI): Min 90 CRI
- Glare
- Ingress Protection (IPXX)
- Warranties: Min 5 year replacement warranty

11.10 BENEFIT

Whatever the benefits, be they financial, ease of installation or time saving on the contract, they shall be declared by the submitting entity with their submission and request for change of the specified luminaire.

NEWCASTLE PLAYSPACE
LIGHTING CONTROL FUNCTIONALITY BRIEF

PROJECT 3034

DOCUMENT 3034-902P

DRAFTED: HB | REVIEWED: JP

REVISION 03 100% DOCUMENTATION ISSUE

16 AUGUST 2024

Electrolight
Melbourne | Sydney | San Francisco
australia@electrolight.com
www.electrolight.com

Melbourne Studio
L2, 373 Little Bourke Street
Melbourne VIC 3000
+61 3 9670 2694

CONTENTS

1. INTRODUCTION 3
2. CONTROL SYSTEM GENERAL FUNCTIONALITY 4
3. SCENES 5
4. GENERAL LIGHTING ITEMS 7

1. INTRODUCTION

The following Lighting Control Functionality Brief applies to the Newcastle Playspace project and is intended to be read in conjunction with all Electrolight Drawings, Documents, Specifications and Schedules, as well as any relevant Electrical Engineering documentation.

The works to be executed consist of but are not necessarily limited to the manufacture, supply, installation, testing and commissioning of the following:

- External Playspace- General landscape works
- External Playspace- D&C Play structures (Industrial Play, Awabakal & Water Play)

Select light fittings and lamps specified within the design are dimmable to provide maximum control over lighting levels for each space. This is necessary to create an appropriate ambience at any given time throughout the day as well as any given activity or occasion within the space.

This Lighting Control Functionality Brief outlines the delineation of spaces within the project and provides a rationale behind the intent of the lighting design and proposed lighting control method for all areas within Electrolight's scope.

Refer to the Electrolight Lighting Specification for further general information regarding the control system scope, components and installation. For the extent of distribution board zones refer to the Electrical Engineer's documentation.

The proposed Lighting Control Functionality Brief should be reviewed by the client, who should make necessary adjustments based on any additional functionality requirements.

2. CONTROL SYSTEM GENERAL FUNCTIONALITY

The Lighting Control System shall include and facilitate the following:

General

- Ultimate flexibility in switching arrangements and grouping
- Re-programming of the system should be simple and without need to provide alterations to the electrical system or hardware
- Automatic time scheduling utilising an astronomical timeclock to allow for different light scenes to be triggered throughout the day (refer to the following “Scenes” and section)

Typical Landscape Lighting:

- Relay on/off lighting control

DMX

- Full-range individual DMX dimming for all colour-change luminaires where specified (refer to the Electrolight Luminaire Schedule and Drawings)

Miscellaneous:

- The Lighting Control System shall be connected to and interface with the Building Management System
- A master override control panel provided at an accessible BOH location nominated by Council (Kiosk building TBC). A Colour Touchscreen shall be provided.
- Provide scene inputs to allow the AV system to trigger lighting scenes via a high level interface

3. SCENES

For all areas, a selection of lighting “scenes” will be programmed at the time of commissioning. The control system programmer shall pre-program all luminaires of the same type within the same space into groups. Multiple groups within the same space, zone or room will be programmed in conjunction to create a specific lighting “scene”. Further adjustment of each luminaire, group and scene may be undertaken at the time of commissioning.

The following Lighting Scenes shall be provided as a minimum in any one space/zone/room. Final quantity of lighting scenes to be approved by the client prior to commissioning:

EXTERNAL PLAYSPACE AND PATHWAYS			
SCENE #	SCENE NAME	DESCRIPTION	OPERATION
1	Day	Day operational mode with general luminaires off and levels set on site during commissioning process.	The Day scene will activate at sunrise. Included luminaires will adjust slowly to their new levels over a period of 2 mins.
2	Evening	Evening operational mode with all general luminaires on and levels set on site during commissioning process.	The Evening scene will be activated approximately 30 mins before sunset. Included luminaires will adjust slowly to their new levels over a period of 2 mins.
3	After Hours	After Hours mode with select luminaires on and levels set on site during commissioning process.	The After Hours scene will be activated at time nomianted by Council. Included luminaires will adjust slowly to their new levels over a period of 2 mins.
4	Event	Event mode with select luminaires on and levels set on site during commissioning process.	The Event scene will be manually activated. Included luminaires will adjust slowly to their new levels over a period of 2 mins.

4. COMMISSIONING

The lighting design scheme shall be commissioned to ensure a fully automatic and functional result. The Contractor shall allow for a total of 4 hours during the day and 8 hours during the night (after hours) for the attendance of a suitably qualified electrician and control system programmer to adjust and fine tune the whole lighting scheme under the direction of the Lighting Designer (Electrolight).

The electrician shall have access and be able to adjust all adjustable luminaires, while the programmer shall be able to reprogram touch screens and switches, add or change control groups and lighting scenes, as well as set lighting levels.

More time may be required pending all items not performing adequately. To ensure the process runs smoothly and on time the lighting commissioning should be preceded by the following:

- A "pre-commissioning" stage where the programmer prepares the agreed upon lighting scenes and sets all Lighting Control Panels.
- An inspection of the performance of all lighting by Electrolight and the programmer, to ensure that all luminaires are functional and dimming as required. This inspection may occur at the start of the commissioning session.

Appendix F

Civil and Hydraulic Plans

Northrop

FORESHORE PARK PLAYSPACE

FORESHORE PARK, NEWCASTLE, N.S.W, 2300 - DETAILED DESIGN
CIVIL ENGINEERING PACKAGE



LOCALITY PLAN

IMAGE SOURCE : NEARMAPS

DRAWING SCHEDULE

SHEET No.	SHEET TITLE
DD-C01.01	COVER SHEET, DRAWING LIST AND LOCALITY PLAN
DD-C01.11	CIVIL SPECIFICATIONS - SHEET 1
DD-C01.12	CIVIL SPECIFICATIONS - SHEET 2
DD-C01.51	GENERAL ARRANGEMENT PLAN
DD-C02.01	EROSION & SEDIMENT CONTROL PLAN
DD-C02.10	EROSION AND SEDIMENT CONTROL DETAILS
DD-C03.01	DEMOLITION PLAN SHEET 1
DD-C03.02	DEMOLITION PLAN SHEET 2
DD-C04.01	CIVIL WORKS PLAN - SHEET 1
DD-C04.02	CIVIL WORKS PLAN - SHEET 2
DD-C04.51	JOINTING PLAN - SHEET 1
DD-C04.52	JOINTING PLAN - SHEET 2
DD-C04.61	COMBINED SERVICES PLAN - SHEET 1
DD-C04.62	COMBINED SERVICES PLAN - SHEET 2
DD-C09.01	CIVIL DETAILS - SHEET 1
DD-C09.02	CIVIL DETAILS - SHEET 2

DRAWN: R KENNEDY DESIGNED: G WOOD JOB MANAGER: C PIPER VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR 50% TENDER	RK		GW	25.11.22
2	ISSUED FOR 75% TENDER	RK		GW	19.12.22
3	ISSUED FOR TENDER	RK		GW	20.12.23
4	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
5	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
6	ISSUED FOR 100% TENDER	DM		GW	06.09.24

CLIENT
City of Newcastle
DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
TCL LANDSCAPE ARCHITECTURE
THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.
NOT TO SCALE

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT
NEWCASTLE FORESHORE PARK
LIVVI'S PLACE PLAYSPACE
NEWCASTLE, N.S.W, 2300

DRAWING TITLE
CIVIL ENGINEERING PACKAGE
COVER SHEET, DRAWING LIST AND LOCALITY PLAN

JOB NUMBER NL213165
DRAWING NUMBER DD-C01.01
REVISION 6
DRAWING SHEET SIZE = A1

Date : 03.10.2024 4:05 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\O - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C01.01 - COVER SHEET.dwg

NOTE: ALL CIVIL ENGINEERING CONSTRUCTION WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CITY OF NEWCASTLE DEVELOPMENT GUIDELINES, READ IN CONJUNCTION WITH THE NOTES PROVIDED BELOW.
IF CONFLICT ARISE, CITY OF NEWCASTLE GUIDELINES AND SPECIFICATIONS TAKE PRECEDENCE. WHERE CITY OF NEWCASTLE GUIDELINES AND SPECIFICATIONS ARE SILENT, THE SPECIFICATION NOTES BELOW TAKE PRECEDENCE.

ACCESS AND SAFETY

1. THE CONTRACTOR SHALL COMPLY WITH ALL STATUTORY AND INDUSTRIAL REQUIREMENTS FOR PROVISION OF A SAFE WORKING ENVIRONMENT INCLUDING (BUT NOT LIMITED TO) TRAFFIC CONTROL.
2. THE CONTRACTOR SHALL ENSURE SAFE ACCESS TO ALL ADJACENT AND NEIGHBOURING BUSINESSES AND RESIDENCES AT ALL TIMES DURING AND AFTER WORK ACTIVITIES.
3. WHERE NECESSARY THE CONTRACTOR SHALL PROVIDE SAFE PASSAGE OF VEHICLES AND / OR PEDESTRIANS THROUGH OR BY THE SITE AT ALL TIMES.
4. THE CONTRACTOR SHALL ENSURE PUBLIC ACCESS EXTERNAL TO THE SITE IS IN ACCORDANCE WITH COUNCILS REQUIREMENTS AT ALL TIMES.

EXISTING SERVICES

1. ALL UTILITY SERVICES INDICATED ON THE DRAWINGS ORIGINATE FROM SUPPLIED DATA OR DIAL BEFORE YOU DIG SEARCHES, AND THEREFORE THEIR ACCURACY AND COMPLETENESS IS NOT GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE AND CONFIRM THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY. NOTE SERVICE AUTHORITY REQUIREMENTS FOR LOCATING OF SERVICES PRIOR TO COMMENCEMENT OF WORKS.
2. THE CONTRACTOR IS TO PROTECT AND MAINTAIN ALL EXISTING SERVICES THAT ARE TO BE RETAINED IN THE VICINITY OF WORKS. ANY AND ALL DAMAGES TO EXISTING SERVICES AS A RESULT OF PROPOSED WORKS (INCLUDING ANY ECONOMIC LOSS SUFFERED AS A RESULT OF DAMAGES) SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND SUPERINTENDENT TO RECTIFY AND MADE GOOD AT NO COST TO THE PRINCIPAL OR NORTHROP CONSULTING ENGINEERS.
3. CARE TO BE TAKEN WHEN EXCAVATING NEAR EXISTING SERVICES. NO MECHANICAL EXCAVATIONS AREA TO BE UNDERTAKEN OVER COMMUNICATION, GAS OR ELECTRICAL SERVICES. HAND EXCAVATION ONLY IN THESE AREAS.
4. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR THE ADJUSTMENT OF EXISTING SERVICE AND INFRASTRUCTURE AS REQUIRED TO FACILITATE PROPOSED WORKS AND CONSTRUCTION REQUIREMENTS.
5. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR THE CAPPING OFF, EXCAVATION AND REMOVAL (IF REQUIRED) OF EXISTING SERVICES IN AREAS AFFECTED BY WORKS UNLESS DIRECTED OTHERWISE ON THE DRAWINGS OR BY THE SUPERINTENDENT.
6. THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES, SERVICES TO ALL ADJACENT BUILDINGS NOT AFFECTED BY THE WORKS ARE PROTECTED AND NOT DISRUPTED.
7. PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL GAIN APPROVAL OF THE PROGRAM FOR THE RELOCATION AND/OR CONSTRUCTION OF TEMPORARY SERVICES AND FOR ANY ASSOCIATED INTERRUPTION OF SUPPLY FROM THE APPROPRIATE SERVICE AUTHORITY.
8. THE CONTRACTOR SHALL CONSTRUCT TEMPORARY SERVICES TO MAINTAIN EXISTING SUPPLY TO BUILDINGS REMAINING IN OPERATION DURING WORKS TO THE SATISFACTION AND APPROVAL OF THE SUPERINTENDENT. ONCE DIVERSION IS COMPLETE AND COMMISSIONED THE CONTRACTOR SHALL REMOVE ALL SUCH TEMPORARY SERVICES AND MAKE GOOD TO THE SATISFACTION OF THE SUPERINTENDENT.

HOLD POINTS

1. THE CONTRACTOR SHALL PROVIDE MINIMUM 72 HOURS NOTICE TO CERTIFYING AUTHORITY FOR ALL CIVIL ENGINEERING INSPECTIONS AT ALL HOLD POINTS. THE STAGES FOR HOLD POINTS ARE:
   - PRIOR TO BACK FILLING STORMWATER PIPES / TRENCHES.
   - AT FINISHED SUBGRADE UNDER PAVEMENTS
   - PRIOR TO BACKFILLING RETAINING WALLS
   - PRIOR TO EXTERNAL CONCRETE POUR (INCLUDING STORMWATER PITS WHERE CAST INSITU)
   - FINAL INSPECTION PRIOR TO PRACTICAL COMPLETION.
2. CONSTRUCTION SHALL NOT PROCEED UNTIL APPROVAL IS GIVEN BY CERTIFYING AUTHORITY FOR EACH HOLD POINT.

SOIL AND WATER MANAGEMENT

1. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH RELEVANT ORDINANCES AND REGULATIONS; NOTE IN PARTICULAR THE REQUIREMENTS OF LANDCOMS MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION' (THE BLUE BOOK).
2. THE CONTRACTOR MUST NOTIFY COUNCIL WITHIN 5 WORKING DAYS OF THE INITIAL EROSION CONTROL MEASURES BEING INSTALLED AND CHECK / MAINTAIN THE INSTALLED CONTROL MEASURES DAILY.
3. INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
4. ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
5. INSTALL SEDIMENT FENCING AROUND INDIVIDUAL BUILDING ZONES / AREAS AS REQUIRED AND AS DIRECTED BY THE SUPERINTENDENT.
6. ALL TRENCHES AND SWALE EXCAVATION SHALL BE SIDE-CAST TO THE HIGH SIDE AND CLOSED AT THE END OF EACH DAYS WORK.
7. THE CONTRACTOR SHALL ENSURE THAT ALL VEGETATION (TREE, SHRUB & GROUND COVER) WHICH IS TO BE RETAINED SHALL BE PROTECTED THROUGH THE DURATION OF CONSTRUCTION. REFER ARCHITECTS PLANS FOR TREES TO BE KEPT.
8. ALL VEGETATION TO BE REMOVED SHALL BE MULCHED ONSITE AND SPREAD/STOCKPILED AS DIRECTED BY THE SUPERINTENDENT.
9. STRIP TOPSOIL IN AREAS DESIGNATED FOR STRIPPING AND STOCKPILE FOR RE-USE AS REQUIRED. ANY SURPLUS MATERIAL SHALL BE REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES.
10. CONSTRUCT AND MAINTAIN ALL MATERIAL STOCKPILES IN ACCORDANCE WITH DETAIL SD4-1 OF THE 'BLUE BOOK' (INCLUDING CUT-OFF SWALES TO THE HIGH SIDE AND SEDIMENT FENCES TO THE LOW SIDE). NOTABLY, ENSURE STOCKPILES DO NOT EXCEED 2.0M HIGH. IF MATERIALS ARE LIKELY TO BE STOCKPILED FOR MORE THAN 10 DAYS, THE CONTRACTOR SHALL PROVIDE AN APPROPRIATE PROTECTIVE COVER (SYNTHETIC OR ORGANIC).
11. PROVIDE WATER TRUCKS OR SPRINKLER DEVICES DURING CONSTRUCTION AS REQUIRED TO SUPPRESS DUST. WHERE COUNCIL CONSIDERS THAT THE DUST IS NOT ADEQUATELY CONTROLLED, THE CONTRACTOR MUST INVESTIGATE OTHER DUST MITIGATION MEASURES SUCH AS DUST SUPPRESSANTS. THE CONTRACTOR MUST ENSURE THE CHEMICAL BASED DUST SUPPRESSANT DOES NOT CREATE A TRAFFIC OR ENVIRONMENTAL HAZARD.
12. SHOULD ANY SEDIMENT LADEN WATER LEAVE THE SITE, THE INCIDENT MUST BE REPORTED TO COUNCIL WITHIN 2 HOURS OF THE SITE MANAGER BECOMING AWARE OF THE INCIDENT.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING A DETAILED WRITTEN RECORD OF ALL EROSION & SEDIMENT CONTROLS ON-SITE DURING THE CONSTRUCTION PERIOD. THIS RECORD SHALL BE UPDATED ON A WEEKLY BASIS & SHALL CONTAIN DETAILS ON THE CONDITION OF CONTROLS AND ANY / ALL MAINTENANCE, CLEANING & BREACHES. THIS RECORD SHALL BE KEPT ON-SITE AT ALL TIMES AND SHALL BE MADE AVAILABLE FOR INSPECTION BY THE PRINCIPAL CERTIFYING AUTHORITY AND THE SUPERINTENDENT DURING NORMAL WORKING HOURS.
14. MEASURES USED TO CONTROL WIND EROSION MUST BE APPROPRIATE FOR THE LOCATION AND PREVENT SOIL EROSION AT ALL TIMES, INCLUDING WORK HOURS, WEEKENDS, PUBLIC HOLIDAYS AND DURING ANY OTHER SHUTDOWN PERIODS.
15. ONCE CUT / FILL OPERATIONS HAVE BEEN FINALISED ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE RE-VEGETATED AS SOON AS IS PRACTICAL.
16. PRIORITY MUST BE GIVEN TO THE PREVENTION, OR AT LEAST MINIMISATION, OF SOIL EROSION, RATHER THAN THE TRAPPING OF DISPLACED SEDIMENT. SUCH A CLAUSE SHALL NOT REDUCE THE RESPONSIBILITY OF A CONTRACTOR TO APPLY AND MAINTAIN, AT ALL TIMES, ALL NECESSARY SEDIMENT CONTROL MEASURES.

TREE PROTECTION

1. REFER TO LANDSCAPE / ARCHITECTS PLAN FOR TREES TO BE RETAINED AND PROTECTED.
2. ANY EXISTING TREES WHICH FORM PART OF THE FINAL LANDSCAPING PLAN SHALL BE PROTECTED FROM CONSTRUCTION ACTIVITIES BY;
   - INSTALLING APPROPRIATE PROTECTION BARRIER FENCING OR SIMILAR MATERIALS INSTALLED IN ACCORDANCE WITH ARBORIST SPECIFICATIONS.
   - CARE IS TAKEN NOT TO CUT ROOTS UNNECESSARILY. COUNCILS AND / OR INDEPENDENT ARBORISTS TO BE CONSULTED WHERE TREE ROOTS ARE TO BE REMOVED AND / OR CUT.

GENERAL

1. ALL WORKS TO BE IN ACCORDANCE WITH RELEVANT LOCAL COUNCIL SPECIFICATIONS, REGULATORY AUTHORITIES SPECIFICATIONS, ENGINEERING DRAWINGS AND NOTES, AUSTRALIAN STANDARDS, LANDCOM AND EPA SPECIFICATIONS AND THE LATEST VERSION OF NATSPEC SPECIFICATIONS. CONFLICTS BETWEEN THE ABOVE DOCUMENT SHALL BE REFERRED TO THE SUPERINTENDENT FOR DIRECTION.
2. ALL CIVIL ENGINEERING DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS DRAWINGS AND SPECIFICATION DOCUMENTATION, NAMELY ARCHITECTURAL, STRUCTURAL, HYDRAULIC AND LANDSCAPE.
3. THE CONTRACTOR IS TO DESIGN, OBTAIN APPROVALS AND CARRY OUT REQUIRED TEMPORARY TRAFFIC CONTROL PROCEDURES BEFORE AND DURING CONSTRUCTION IN ACCORDANCE WITH ALL REGULATORY AUTHORITIES, INCLUSIVE OF LOCAL COUNCILS AND STATE AUTHORITIES AS REQUIRED.
4. THE CONTRACTOR IS TO OBTAIN ALL AUTHORITY APPROVALS AS REQUIRED PRIOR TO COMMENCEMENT OF WORKS.
5. RESTORE ALL PAVED, COVERED, GRASSED AND LANDSCAPED AREAS TO THEIR ORIGINAL CONDITION OR AS DIRECTED BY THE SITE SUPERINTENDENT ON COMPLETION OF ALL AND ANY WORKS. WHERE PLANTING OF NEW GRASS IS NECESSARY REFER TO LANDSCAPE ARCHITECT AND / OR ARCHITECT DOCUMENTATION.
6. THE CONTRACTOR SHALL ARRANGE ALL SURVEY SETOUT TO BE CARRIED OUT BY A REGISTERED SURVEYOR PRIOR TO COMMENCEMENT OF WORKS.
7. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND EXISTING LEVELS ONSITE PRIOR TO LODGMENT OF TENDER AND ONSITE WORKS. THE PRICE AS TENDERED SHALL BE INCLUSIVE OF ALL WORKS SHOWN ON THE TENDER PROJECT DRAWINGS. ADDITIONAL PAYMENTS FOR WORKS SHOWN ON THE TENDER PROJECT DRAWINGS WILL NOT BE APPROVED.
8. DO NOT OBTAIN DIMENSIONS BY SCALING DRAWINGS.
9. IN CASE OF DOUBT OR DISCREPANCY REFER TO SUPERINTENDENT FOR CLARIFICATION OR CONFIRMATION PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
10. WHERE NEW WORKS ABUT EXISTING SURFACES AND INFRASTRUCTURE, THE CONTRACTOR SHALL ENSURE THAT A SMOOTH EVEN PROFILE, FREE FROM ABRUPT CHANGES IS OBTAINED. MAKE SMOOTH TRANSITION TO EXISTING FEATURES AND MAKE GOOD WHERE JOINED.
11. ALL CIVIL ENGINEERING DESIGN HAS BEEN DOCUMENTED UNDER THE ASSUMPTION THAT ALL NECESSARY SITE CONTAMINATION REMEDIATION WORKS HAVE BEEN SATISFACTORILY COMPLETED (IF APPLICABLE) AND THAT THE SITE IS NOT AFFECTED BY ANY SOIL STRATA OR GROUNDWATER TABLE CONTAMINATION.
12. ORIGIN OF LEVELS SHOWN ON THE FOLLOWING DRAWINGS ARE ASSUMED TO BE TO AUSTRALIAN HEIGHT DATUM (AHD) AS PROVIDED BY SURVEY DATA. THE CONTRACTOR IS TO CONFIRM ALL LEVELS AND HEIGHT DATA PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
13. ALL WORK SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE DETAILS SHOWN ON THE DRAWINGS AND THE DIRECTIONS OF THE SUPERINTENDENT.
14. THE CONTRACTOR IS TO PROVIDE AND INSTALL 10mm MINIMUM WIDE COMPRESSIBLE FILLER JOINTS BETWEEN BUILDINGS AND CONCRETE PAVEMENTS.
15. THE CONTRACTOR IS TO PROVIDE TEMPORARY DIVERSION DRAINS AND MOUNDS AS REQUIRED TO ENSURE THAT AT ALL TIMES EXPOSED SURFACES ARE FREE DRAINING AND WHERE NECESSARY EXCAVATE SUMPS AND PROVIDE PUMPING EQUIPMENT TO DRAIN EXPOSED AREAS.
16. ANY AND ALL DAMAGE TO EXISTING INFRASTRUCTURE AND/OR PAVEMENTS SHALL BE REPORTED TO THE SUPERINTENDENT AND SHALL BE REPAIRED AND MADE GOOD BY THE CONTRACTOR TO MATCH NEATLY AND FLUSH TO EXISTING AT NO EXTRA COST TO THE PRINCIPAL OR NORTHROP CONSULTING ENGINEERS.
17. THE CONTRACTOR IS TO REFER TO HYDRAULIC ENGINEERS DRAWINGS FOR STORMWATER DRAINAGE DETAILS IN ADDITION TO THOSE SHOWN ON THE CIVIL ENGINEERING DRAWINGS. ANY CONFLICTS IDENTIFIED ARE TO BE REFERRED TO THE SITE FORMAN OR SUPERINTENDENT PRIOR TO PROCEEDING WITH WORKS.
18. THE CONTRACTOR IS TO ENSURE ALL FINISHED SURFACE LEVELS DRAIN TOWARDS THE PROPOSED STORMWATER SYSTEM AND NO AREAS POND / HOLD WATER.
19. THE CONTRACTOR SHALL ENSURE COUNCIL ASSETS AND UTILITIES ARE PROTECTED AT ALL TIMES. ANY AND ALL DAMAGE TO COUNCIL ASSETS AND / OR UTILITIES SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF COUNCIL AND THE UTILITIES AUTHORITY AND AT NO COST TO THE PRINCIPAL OR NORTHROP CONSULTING ENGINEERS.

EARTHWORKS

PRIOR TO THE COMMENCEMENT OF EARTHWORKS THE CONTRACTOR IS TO REVIEW THE HAZARDOUS MATERIALS ASSESSMENT / ENVIRONMENTAL REPORT IN ORDER TO ASCERTAIN ANY ONSITE CONTAMINATION AND MANAGE ACCORDINGLY. ALL SURPLUS EXCAVATED MATERIAL SHALL REQUIRE A WASTE CLASSIFICATION ASSESSMENT PRIOR TO ITS REMOVAL FROM SITE.

1. THE CONTRACTOR SHALL REVIEW THE SITE SPECIFIC GEOTECHNICAL REPORT PREPARED BY DOWN TO EARTH GEOTECHNICAL & ENVIRONMENTAL (REF DE-743_1). SITE PREPARATION TO BE UNDERTAKEN IN ACCORDANCE WITH SECTION 4.4, GENERALLY INCLUDING REMOVAL OF ALL TOPSOIL, ORGANIC MATTER, RUBBLE, UNCONTROLLED FILL, UNSUITABLE MATERIAL AND THE LIKE AND UNDERTAKE ALL REQUIRED SUBGRADE / BASE LAYER TESTING (PROOF ROLLING ETC) UNDER THE GUIDANCE OF A SUITABLE QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO BACK FILLING WITH CONTROLLED SPECIFIED MATERIAL.
2. THE CONTRACTOR SHALL ALLOW TO EXCAVATE IN ALL MATERIALS UNLESS NOTED OTHERWISE
3. THE CONTRACTOR SHALL STRIP AND STOCKPILE SUFFICIENT TOPSOIL AS REQUIRED FOR LATER REUSE AND SITE REHABILITATION. EXCESS TOPSOIL MAY BE SPREAD ON SITE ONLY IF AUTHORISED AND INSTRUCTED BY THE SUPERINTENDENT. ALL MATERIAL STOCKPILES AND UNVEGETATED AREAS SHALL HAVE SEDIMENT AND EROSION CONTROL MEASURES INSTALLED IN ACCORDANCE WITH THE 'BLUE BOOK' (MANAGING URBAN STORMWATER SOILS AND CONSTRUCTION, PRODUCED BY LANDCOM). ANY SURPLUS EXCAVATED MATERIAL (INCLUDING TOPSOIL) SHALL BE REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES. LIMIT STOCKPILE TO A MAXIMUM HEIGHT OF 2.0m UNLESS APPROVED OTHERWISE BY THE SUPERINTENDENT.
5. THE CONTRACTOR IS TO ALLOW FOR A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER TO PROVIDE ADVICE AND CERTIFICATION OF ANY WORKS ASSOCIATED WITH TREATING OR MANAGING UNSUITABLE GROUND CONDITIONS THROUGHOUT THE CONTRACT (E.G. STABILITY OF EXCAVATIONS, POOR SUBGRADE, ETC).
6. THE CONTRACTOR SHALL PROOF ROLL ALL EXPOSED NATURAL SUBGRADE FOR BUILDING PLATFORMS, PAVED AREAS, AREAS TO BE FILLED, OR CUT BATTERS IN THE PRESENCE OF A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER WHO WILL CERTIFY THE WORKS AND CONFIRM FILLING METHODOLOGY. ALL SOFT, WET OR UNSUITABLE MATERIAL ENCOUNTERED SHALL BE ADVISED TO THE PRINCIPAL'S AGENT FOR INSTRUCTION REMOVE & REPLACE OR REMEDIATE ALL AREAS AS DIRECTED BY THE PRINCIPAL'S AGENT.
7. THE CONTRACTOR AND GEOTECHNICAL ENGINEER ARE TO ENSURE CONTINUITY IN COMPACTION BETWEEN CUT / FILL AREAS LOCATED IN BUILDING PLATFORMS AND ROAD SUBGRADES
8. THE CONTRACTOR IS TO OBTAIN AND PROVIDE CERTIFICATES VERIFYING THE QUALITY OF IMPORTED MATERIAL FOR THE SUPERINTENDENTS APPROVAL.
9. TESTING OF SITE MATERIAL, SUBGRADES AND PAVEMENT LAYERS SHALL BE CARRIED OUT BY AN APPROVED N.A.T.A. REGISTERED LABORATORY AND IN ACCORDANCE WITH THE LATEST VERSION OF AS3798. WHERE THE FILL IS TO PROVIDE SUPPORT TO BUILDING FLOOR SLAB, LEVEL 1 TESTING PROCEDURES (IN ACCORDANCE WITH AS3798) SHALL BE FOLLOWED, OTHERWISE LEVEL 2 TESTING SHALL BE UNDERTAKEN. THE TESTING AUTHORITY SHALL BE ENGAGED BY THE BUILDER.
10. ALL FILL MATERIAL SHALL BE PLACED IN MAXIMUM 200mm THICK LAYERS (LOOSE) AND COMPACTED AT OPTIMUM MOISTURE CONTENT (+ OR - 2%) USING SUITABLE COMPACTION EQUIPMENT TO ACHIEVE A DRY DENSITY DETERMINED IN ACCORDANCE WITH AS1289.2.1.1, AS1289.5.7.1 AND AS1289.5.8.8 OF NOT LESS THAN THE FOLLOWING STANDARD MINIMUM DRY DENSITY:

LOCATION	COMPACTION REQUIREMENT
- SERVICE TRENCHES (NOT UNDER PAVEMENTS)	95% SMDD
- SERVICE TRENCHES (UNDER PAVEMENTS)	100% SMDD
- TOP 600mm TO SUBGRADE LEVEL UNDER PAVED AREAS	100% SMDD
- LANDSCAPED & GENERAL AREAS	95% SMDD
- PAVEMENT SUB-BASE LAYERS	100% SMDD (U.N.O.)
- PAVEMENT BASE LAYERS	100% SMDD (U.N.O.)

11. FREQUENCY OF TESTING SHALL BE IN ACCORDANCE WITH TABLE 8.1 OF AS3798 FOR TYPE 1 EARTHWORKS
12. DENSITY TESTING SHALL BE UNDERTAKEN WITHIN TRENCHES AT A RATE OF ONE (1) TEST PER TWO (2) LAYERS PER FORTY (40) LINEAL METRES OF TRENCH.
13. WHERE TEST RESULTS ARE BELOW THE SPECIFIED COMPACTION, RECOMPACT AND RETEST UNTIL SPECIFIED COMPACTION STANDARDS ARE ACHIEVED, OTHERWISE SUBGRADE REPLACEMENT IS REQUIRED IF COMPACTION STANDARDS ARE NOT ACHIEVED.

EARTHWORKS (cont)

14. IF SUBGRADE OR FILL IS TOO WET TOO ACHIEVE COMPACTION, UNDERTAKE ONE OR MORE OF THE FOLLOWING:
    - SCARIFY AND WORK TO ACCELERATE DRYING.
    - STABILIZE BY MIXING WITH LIME.
    - REPLACE WITH SUITABLE MATERIAL. RE-COMPACT WHEN MOISTURE CONTENT APPROACHES OPTIMUM.
15. THE CONTRACTOR CAN REUSE CUT MATERIAL AS DIRECTED BY THE SITE SPECIFIC GEOTECHNICAL AUTHORITY OR PRINCIPALS AGENT. WHERE THERE IS INSUFFICIENT CUT MATERIAL SUITABLE FOR FILLING OR SUBGRADE REPLACEMENT, THE CONTRACTOR IS TO ALLOW TO IMPORT FILL. IMPORTED FILL SHALL COMPLY WITH THE FOLLOWING:
    - APPROVED AND CERTIFIED BY THE SITE GEOTECHNICAL ENGINEER.
    - MAXIMUM PARTICLE SIZE OF 50mm
    - PASSING 37.5mm SIEVE (NOT LESS THAN 80%)
    - PASSING 75 MICRON SIEVE (NOT GREATER THAN 15%)
    - PLASTICITY INDEX BETWEEN 2-15%
    - MINIMUM CBR VALUE OF 8%
16. THE CONTRACTOR IS TO ALLOW FOR THE REPLACEMENT OF UNSUITABLE AND/OR SENSITIVE GROUND (I.E. SILTS, ORGANIC MATTER ETC) WITH SELECTED MATERIAL FROM EXCAVATIONS IF AVAILABLE OR SELECT IMPORTED FILL
17. THE CONTRACTOR IS TO PROGRAM EXCAVATIONS TO ENSURE THAT BULK EARTHWORKS AND EXPOSED SURFACES ARE ADEQUATELY DRAINED DURING CONSTRUCTION. ALL EXPOSED SURFACES SHALL BE GRADED AND SEALED OFF TO REMOVE DEPRESSIONS, ROLLERS MARKS AND SIMILAR WHICH WOULD ALLOW WATER TO POND AND PENETRATE THE UNDERLYING MATERIAL. ANY DAMAGE RESULTING FROM THE CONTRACTOR NOT OBSERVING THESE REQUIREMENTS SHALL BE RECTIFIED AT NO COST TO THE PRINCIPAL OR NORTHROP CONSULTING ENGINEERS.
18. THE CONTRACTOR IS TO PROVIDE AND INSTALL TEMPORARY DRAINAGE OR SUMP PUMPING AS REQUIRED UNTIL SUFFICIENT SITE STORMWATER DRAINAGE HAS BEEN INSTALLED. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL PROVISIONS ARE ADHERED TO FOR TEMPORARY DRAINAGE MEASURES (REFER TO THE ENGINEERING SEDIMENT AND EROSION CONTROL DRAWINGS
19. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE AND MAINTAIN THE INTEGRITY OF ALL SERVICES, CONDUITS AND PIPES DURING CONSTRUCTION, SPECIFICALLY DURING THE BACKFILLING AND COMPACTION PROCEDURE. ANY AND ALL DAMAGE TO NEW OR EXISTING SERVICES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST.
20. ALLOWABLE EXCAVATION TOLERANCE IS -25MM (BELOW DOCUMENTED LEVELS) AND +0MM (ABOVE DOCUMENTED LEVELS) NOTE THAT BULK EARTHWORKS LEVELS MAY NOT ALLOW FOR A SAND LEVELLING LAYER. ANY SAND THAT IS REQUIRED DUE TO OVER-EXCAVATION SHALL BE PROVIDED, AT NO EXTRA COST TO THE PRINCIPAL OR NORTHROP CONSULTING ENGINEERS
21. THE CONTRACTOR IS TO INSTALL CUT-OFF DRAINAGE SWALES (AT MIN. 1% LONGITUDINAL GRADE AND MIN. 500MM WIDE) TO THE HIGH SIDE OF ALL BUILDING PLATFORMS TO PROTECT THE PLATFORMS DURING CONSTRUCTION. ALL TEMPORARY DRAINAGE SWALES ARE TO BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF "THE BLUE BOOK"
22. ALL EARTH BATTERS SHALL BE CUT/FILLED TO A MAXIMUM 1 (VERTICAL) IN 4 (HORIZONTAL) SLOPE UNLESS NOTED OTHERWISE ON THE DRAWINGS.
23. ANY CONTAMINATED MATERIAL FOUND ON SITE DURING CONSTRUCTION AND EARTHWORKS ACTIVITIES SHALL BE ADVISED TO THE PRINCIPAL'S AGENT FOR DIRECTION.

DEEP EXCAVATIONS

24. PRIOR TO THE COMMENCEMENT OF EXCAVATION WORKS GREATER THAN 1.5M IN DEPTH, THE CONTRACTOR SHALL OBTAIN THE SERVICES OF A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER TO DETERMINE THE STABILITY OF A NATURAL MATERIAL AND BENCHING REQUIREMENTS.
25. THE CONTRACTOR MUST PROVIDE THE SUPERINTENDENT AND OR THE DESIGN ENGINEER WITH A COPY OF THE GEOTECHNICAL ENGINEERS REPORT.
26. THE CONTRACTOR IS TO PROVIDE SAFETY BARRIERS / FENCING IN ACCORDANCE WITH OH&S AND REGULATORY AUTHORITY REQUIREMENTS.

DRAWN: R KENNEDY DESIGNED: G WOOD JOB MANAGER: C PIPER VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
2	ISSUED FOR 75% TENDER	RK		GW	19.12.22
3	ISSUED FOR TENDER	RK		GW	20.12.23
4	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
5	ISSUED FOR 75% DD	RK		GW	28.03.24
6	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
7	ISSUED FOR 100% TENDER	DM		GW	06.09.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK LIVVI'S PLACE PLAYSPACE

NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

CIVIL SPECIFICATIONS - SHEET 1

JOB NUMBER: NL213165

DRAWING NUMBER: DD-C01.11

REVISION: 7

DRAWING SHEET SIZE = A1

Date: 03.10.2024 4:06 PM Plotted By: DIMITRI MAVROUDIS Found: O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\O - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C01.01 - COVER SHEET.dwg

NOTE: ALL CIVIL ENGINEERING CONSTRUCTION WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CITY OF NEWCASTLE DEVELOPMENT GUIDELINES, READ IN CONJUNCTION WITH THE NOTES PROVIDED BELOW.
IF CONFLICT ARISE, CITY OF NEWCASTLE GUIDELINES AND SPECIFICATIONS TAKE PRECEDENCE. WHERE CITY OF NEWCASTLE GUIDELINES AND SPECIFICATIONS ARE SILENT, THE SPECIFICATION NOTES BELOW TAKE PRECEDENCE.

STORMWATER DRAINAGE

1. ALL 225mm AND ABOVE PIPES TO BE DUAL WALLED POLYPROPYLENE/POLYETHYLENE PIPE SN8 MIN. ONLY PIPE UNDER 225 TO BE uPVC. ALL PIPES TO BE LAID, BACKFILLED AND COMPACTED IN ACCORDANCE WITH MANUFACTURER SPECIFICATIONS AND AUSTRALIAN STANDARDS. WHERE PIPE COVER IS LESS THAN SPECIFIED IN RELEVANT AUSTRALIAN STANDARDS, THEY ARE TO BE CLSM ENCASED (NOT CONCRETE ENCASED).
2. uPVC STORMWATER LINES PASSING UNDER FLOOR SLABS TO BE CONCRETE ENCASED.
3. ALL PIPE ARE TO BE LAID AT 1.0% MIN GRADE U.N.O.ALL
4. ALL STORMWATER INLET PITS SHOWN ON THE CIVIL ENGINEERING DRAWINGS SHALL BE CAST IN-SITU REINFORCED CONCRETE PITS (U.N.O.). THE USE OF PRE-CAST CONCRETE STORMWATER DRAINAGE PITS ARE TO BE CONFIRMED AND APPROVED BY THE SUPERINTENDENT AND NORTHROP CONSULTING ENGINEERS PRIOR TO THEIR PURCHASE AND INSTALMENT ON SITE (U.N.O.)
5. PIT COVERS
   - USE HOT DIPPED GALVANISED COVERS AND GRATES COMPLYING WITH RELEVANT COUNCIL AND AUSTRALIAN STANDARDS U.N.O.
   - ALL COVERS AND GRATES TO BE POSITION IN A FRAME AND MANUFACTURED AS A UNIT TO THE MINIMUM LOAD CLASS SPECIFIED.
   - ALL COVERS AND GRATES TO BE FITTING WITH POSITIVE COVER LIFTING KEYS
   - OBTAIN SUPERINTENDENTS APPROVAL FOR THE USE OF CAST IRON SOLID COVERS AND GRATES (U.N.O.). CAST IRON SOLID COVERS (IF APPROVED) TO CONSIST OF CROSS-WEBBED, CELLULAR CONSTRUCTION WITH THE RIBS UPPERMOST TO ALLOW INFILLING WITH CONCRETE. INSTALL POSITIVE COVER LIFTING KEYS AND PLASTIC PLUGS.
   - UNLESS DETAILED OR SPECIFIED OTHERWISE, COVERS AND GRATES TO BE CLASS 'D' IN VEHICULAR PAVEMENTS AND CLASS 'B' ELSEWHERE.
   - ALL GRATED TRENCH DRAINS SHOULD BE 'CLASS D' CAST IRON WITHIN VEHICULAR PAVEMENTS AND CLASS 'B' HEEL SAFE WITHIN PEDESTRIAN PAVEMENTS.
7. THE CONTRACTOR IS TO ENSURE A SMOOTH TRANSITION BETWEEN ADJACENT PAVEMENT SURFACES AND STORMWATER PIT COVERS/GRATES
8. ALL PIPE BENDS, JUNCTIONS, ETC ARE TO BE PROVIDED USING PURPOSE MADE FITTINGS OR STORMWATER PITS.
9. ALL CONNECTIONS TO EXISTING DRAINAGE STRUCTURES SHALL BE MADE IN A TRADESMAN-LIKE MANNER AND CEMENT RENDERED TO ENSURE A SMOOTH, WATER TIGHT FINISH.
10. STORMWATER PIPEWORK TO FINISH FLUSH WITH INTERNAL PIT WALLS AND MUST NOT PROTRUDE. CONNECTION TO BE NEATLY RENDER AND MADE NEAT.
11. THE CONTRACTOR SHALL SUPPLY AND INSTALL ALL FITTINGS AND SPECIALS INCLUDING VARIOUS PIPE ADAPTORS TO ENSURE PROPER CONNECTION BETWEEN DISSIMILAR PIPEWORK.
12. U.N.O. MATERIAL USED FOR BEDDING OF PIPES SHALL BE APPROVED NON-COHESIVE GRANULAR MATERIAL HAVING HIGH PERMEABILITY AND HIGH STABILITY WHEN SATURATED AND FREE OF ORGANIC AND CLAY MATERIAL.
13. WHERE TRENCHES ARE IN ROCK, THE PIPE SHALL BE BEDDED ON A MIN 50mm CONCRETE BED (OR 75mm THICK BED OF 12mm BLUE METAL) UNDER THE BARREL OF THE PIPE. THE PIPE COLLAR AT NO POINT SHALL BEAR ON THE ROCK.
14. MATERIAL USED FOR ALL PIPE BEDDING AND BACK FILL SHALL BE APPROVED NON-COHESIVE GRANULAR MATERIAL HAVING A HIGH PERMEABILITY AND HIGH STABILITY WHEN SATURATED, BE FREE FROM ORGANIC AND CLAY MATERIAL AND COMPLY WITH THE CURRENT VERSION OF AS3725. PIPE BEDDING SHALL BE TYPE HS2 U.N.O. UNDER ROADS AND H2 UNDER GENERAL AREAS U.N.O. AND BE IN ACCORDANCE WITH THE CURRENT VERSION OF AS3725.
15. THE CONTRACTOR SHALL ENSURE AND PROTECT THE INTEGRITY OF ALL STORMWATER PIPES DURING CONSTRUCTION. ANY AND ALL DAMAGE TO THESE PIPES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR UNDER THE DIRECTION OF THE SUPERINTENDENT AND AT NO EXTRA COST.
16. NOTE THAT THE PIT COVER LEVEL NOMINATED IN GUTTERS ARE TO THE INVERT OF THE GUTTER WHICH ARE 40mm LOWER THAN THE PAVEMENT LEVEL AT LIP OF GUTTER. REFER KERB DETAILS FOR CONFIRMATION.

STORMWATER DRAINAGE (cont)

SUBSOIL DRAINAGE

17. ALL SUBSOIL DRAINAGE LINES ARE TO BE Ø100mm WITH NON-WOVEN GEOTEXTILE FILTER SOCK SURROUND SHALL BE CONNECTED TO A STORMWATER DRAINAGE PIT (AT MIN 1% LONGITUDINAL GRADE) AND PROVIDED IN THE FOLLOWING LOCATIONS;
   - THE HIGH SIDE OF PROPOSED TRAFFICKED PAVEMENT AREAS.
   - ALL PLANTER AND TREE BEDS PROPOSED ADJACENT TO PAVEMENT AREAS.
   - BEHIND RETAINING WALLS (IN ACCORDANCE WITH RETAINING WALL DETAILS).
   - ALL OTHER AREAS SHOWN ON DRAWINGS.
   - CONTRACTOR IS TO MAKE ALLOWANCE IN BOTH TENDER AND CONSTRUCTION COSTING TO ALLOW FOR SUBSURFACE DRAINAGE BEHIND ALL RETAINING WALLS / ABOVE LOCATIONS AND TO MAKE CONNECTION TO STORMWATER SYSTEM.
18. WHERE SUBSOIL DRAINAGE PASSES BENEATH BUILDINGS / PAVED AREAS AND / OR PAVEMENTS. CONTRACTOR TO ENSURE Ø100mm CLASS 'SN10' uPVC DRAINAGE LINE IS USED AND THAT PROPRIETARY FITTINGS ARE USED TO RECONNECT SUBSOIL DRAINAGE LINE.
19. THE CONTRACTOR SHALL INSTALL INSPECTION OPENINGS / CLEAROUTS TO ALL SUBSOIL DRAINAGE LINES AND DOWNPIPE LINES AS SPECIFIED ON DRAWINGS AND IN ACCORDANCE WITH COUNCIL SPECIFICATIONS AT MAXIMUM 30m CENTRE AND AT ALL UPSTREAM ENDPOINTS.
20. PROVIDE 3.0m LENGTH OF Ø100 SUBSOIL DRAINAGE LINE WRAPPED IN NON-WOVEN GEOTEXTILE FILTER FABRIC TO THE UPSTREAM SIDE OF STORMWATER PITS, LAID IN STORMWATER PIPE TRENCHES AND CONNECTED TO DRAINAGE PIT.
21. IN AREAS WHERE DUMPED / HAND PLACED ROCK IS USED AS A MEANS OF SCOUR PROTECTION, CONTRACTOR IS TO EXCAVATE A MINIMUM OF 100mm FROM PROPOSED SURFACE, LEVEL AND COMPACT SUBGRADE AS SPECIFIED. ROCK TO THEN BE PLACED ON GEOTEXTILE FILTER FABRIC.

PAVEMENTS

1. ALL PAVEMENT MATERIALS SHALL COMPLY WITH CURRENT RMS AND/OR COUNCIL SPECIFICATIONS. PROVIDE CERTIFICATES VERIFYING THE QUALITY AND SPECIFICATION COMPLIANCE OF ALL IMPORTED MATERIAL. CERTIFICATES ARE TO BE VERIFIED AGAINST STOCKPILED MATERIAL AND NOT BE MORE THAN 1 MONTH OLD.
2. ALL PAVEMENTS HAVE BEEN DESIGNED FOR A SUBGRADE CBR AS NOMINATED ON THE PAVEMENT DETAILS

   COMPACTION STANDARDS

BASE	98% MODIFIED MAXIMUM DRY DENSITY
SUBBASE	98% MODIFIED MAXIMUM DRY DENSITY
SUBGRADE	100% STANDARD MAXIMUM DRY DENSITY

3. THE CONTRACTOR SHALL CONFIRM THE DESIGN CBR WITH A MINIMUM OF 3 TESTS TAKEN AT SUBGRADE LEVEL. WHERE DISCREPANCY IS FOUND, CONTACT THE DESIGN ENGINEER.
4. ALLOW FOR AT LEAST TWO SUCCESSFUL COMPACTION TESTS IN EACH LAYER. ALLOW FOR ONE (1) ADDITIONAL TEST PER 200sq.m OF PAVEMENT. ALL COMPACTION TESTING TO BE BY A N.A.T.A. REGISTERED LABORATORY IN ACCORDANCE WITH THE LATEST VERSION OF AS3798 FOR PAVEMENTS (MINIMUM 2 TESTS PER LAYER).
5. MATCH NEW PAVEMENTS NEATLY AND FLUSH WITH EXISTING
6. AFTER BASE IS APPROVED, SWEEP CLEAN AND PRIME AT NOMINAL RATE OF 1.0L PER 1.0 sq.m.
7. PAVEMENT HOLD POINTS
   - SUB-GRADE PROOF ROLL PRIOR TO SET-UP AND FORM FOR CONCRETE POUR.
   - INSPECTION OF FORMWORK / STEEL PRIOR TO CONCRETE POUR.
   - SUBMISSION OF SUB-GRADE AND BASE DENSITY TESTS.

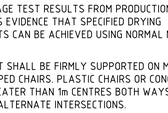
CONCRETE PAVEMENTS

1. THIS SECTION REFERS TO CIVIL CONCRETE WORKS AND DOES NOT INCLUDE STRUCTURAL ELEMENTS SUCH AS BUILDINGS, BELOW GROUND STRUCTURES OR RETAINING WALLS.
2. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS3600 CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.
3. NO CONCRETE IS TO BE POURED ON DAYS FORECAST TO BE GREATER THAN 30 DEGREES CENTIGRADE
4. CONCRETE POURS IN CONDITIONS OF HIGH TEMPERATURE, HIGH WIND OR MODERATE COMBINATIONS OF EACH WILL LEAD TO EXCESSIVE CRACKING. THE CONTRACTOR SHALL TAKE FULL RESPONSIBILITY OF SUCH CONCRETE FINISHES AND SHALL UNDERTAKE REMEDIATION WORK AS DIRECTED BY THE SUPERINTENDENT AND AT NO EXTRA COST
5. CONCRETE QUALITY AND REINFORCING COVER

   ALL REQUIREMENTS OF THE CURRENT ACSE CONCRETE SPECIFICATION DOCUMENT 1 SHALL APPLY TO THE FORMWORK, REINFORCEMENT AND CONCRETE UNLESS NOTED OTHERWISE.

ELEMENT	SLAB ON GROUND	ALL OTHER CONCRETE ELEMENTS
CONCRETE STRENGTH f'c (MPa)	40	40
SPECIFIED SLUMP	80	80
NOMINAL AGGREGATE SIZE	20	20
MAX. 56 DAY DRYING SHRINKAGE	650 microns	650 microns
COVER (mm)	TOP 50 BTM 40	TOP 50 BTM 40

6. CONCRETE PROPERTIES SHALL BE VARIED FROM NORMAL CLASS AS FOLLOWS:
   - MINIMUM CEMENT CONTENT 250 kg/m^3
   - MAXIMUM 56 DAY SHRINKAGE STRAIN = AS NOMINATED ABOVE
   - PRIOR TO COMMENCEMENT CONCRETE SUPPLIER TO PROVIDE DRYING SHRINKAGE TEST RESULTS FROM PRODUCTION ASSESSMENT AS EVIDENCE THAT SPECIFIED DRYING SHRINKAGE LIMITS CAN BE ACHIEVED USING NORMAL MIX DESIGN.
7. ALL REINFORCEMENT SHALL BE FIRMLY SUPPORTED ON MILD STEEL PLASTIC TIPPED CHAIRS. PLASTIC CHAIRS OR CONCRETE CHAIRS AT NOT GREATER THAN 1m CENTRES BOTH WAYS. BARS SHALL BE TIED AT ALTERNATE INTERSECTIONS.
8. CEMENT TYPE SHALL BE (ACSE SPECIFICATION) TYPE SL.
9. PROJECT CONTROL TESTING SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 1379. TEST CYLINDERS ARE TO BE KEPT ON SITE.
10. ALL COMPRESSIVE STRENGTH TEST REPORTS SHALL BE SUBMITTED TO THE CIVIL ENGINEER FOR REVIEW.
11. ALL CONCRETE IS TO BE CONTINUOUSLY CURED FOR A MINIMUM PERIOD OF 10 DAYS AFTER PLACING . CURING TO COMMENCE IMMEDIATELY AFTER FINISHING. SPRAY ON CURING COMPOUNDS TO COMPLY WITH AS3799.
12. PLACE CONCRETE CONTINUOUSLY BETWEEN CONSTRUCTION JOINTS SHOWN ON PLAN. DO NOT BREAK OR INTERRUPT SUCCESSIVE POURS SUCH THAT COLD JOINTS OCCUR. ANY REVISIONS OR ADDITIONS TO CONSTRUCTION JOINTS SHOWN ON PLAN REQUIRE APPROVAL FROM NORTHROP CONSULTING ENGINEERS.
13. FALLS IN SLAB AS SHOWN ON PLAN MAINTAIN MINIMUM SLAB THICKNESS AS SHOWN.
14. NO ADMIXTURES SHALL BE USED IN CONCRETE UNLESS APPROVED IN WRITING BY THE DESIGN ENGINEER.
15. THE FINISHED CONCRETE SHALL BE A DENSE HOMOGENOUS MASS, COMPLETELY FILLING THE FORMWORK, THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF STONE POCKETS.
16. FABRIC SHALL BE LAPPED IN ACCORDANCE WITH THE FOLLOWING DETAIL:



FOLLOWING THE FABRIC SYMBOL SL IS THE REFERENCE NUMBER FOR FABRIC TO AS1304.

17. POLYETHYLENE SHEET SHALL BE PLACED BELOW ALL CONCRETE PAVEMENTS.
18. ALL PENETRATIONS TO HAVE 2/N12 TRIMMER BARS TOP AND BOTTOM TO EACH FACE U.N.O. EXTEND TRIMMERS 700 BEYOND PENETRATION. MAINTAIN 40mm COVER TOP AND BOTTOM.
19. FORMWORK CLASS SHALL BE IN ACCORDANCE WITH AS3600.
20. SURFACE FINISHES:

ELEMENT	FORMWORK CLASS
STORMWATER PIT	OFF FORM
PAVEMENTS	MACHINE FLOAT / BROOM FINISH
KERBS	STEEL FLOAT / TROWEL

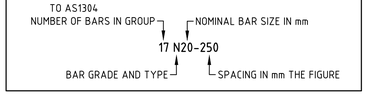
CONCRETE PAVEMENTS

21. REINFORCEMENT SYMBOLS:

    N DENOTES GRADE 500 N BARS TO AS1302 GRADE N

    R DENOTES 230 R HOT ROLLED PLAIN BARS TO AS1302

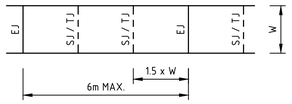
    SL DENOTES HARD-DRAWN WIRE REINFORCING FABRIC TO AS1304



PAVEMENT JOINTS

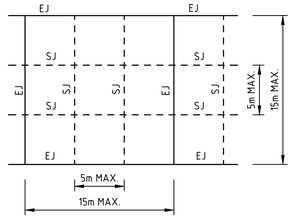
1. PROVIDE 10mm ABLEFLEX BETWEEN NEW CONCRETE WORKS AND EXISTING STRUCTURES.
2. LOCAL AUTHORITY REQUIREMENTS SHALL TAKE PRECEDENCE WITHIN THE PUBLIC ROAD RESERVE.
3. DOWELS TO BE PLACED ON PROPRIETARY CRADLES TO ENSURE CORRECT SPACING AND ALIGNMENT.
4. PEDESTRIAN PAVEMENTS

   ALL PEDESTRIAN PAVEMENTS ARE TO BE JOINTED AS FOLLOWS U.N.O. ON THE DESIGN DRAWINGS.
5. EXPANSION JOINTS ARE TO BE LOCATED WHERE POSSIBLE AT TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX. 6.0m CENTRES.
6. WEAKENED PLANE JOINTS (SAWN OR TOOL JOINTS) ARE TO BE LOCATED AT A MAX. SPACING OF 1.5m x WIDTH OF THE PAVEMENT.
7. WHERE POSSIBLE JOINTS SHOULD BE LOCATED TO MATCH KERBING AND OR ADJACENT PAVEMENT JOINTS.
8. TYPICAL PEDESTRIAN PAVEMENT JOINT DETAIL



9. VEHICULAR PAVEMENTS

   ALL VEHICULAR PAVEMENTS TO BE JOINTED AS FOLLOWS U.N.O. ON THE DESIGN DRAWINGS.
10. TIED KEYED CONSTRUCTION JOINTS SHOULD GENERALLY BE LOCATED LONGITUDINALLY AT A MAX. OF 5.0m CENTRES.
11. SAWN JOINTS SHOULD GENERALLY BE LOCATED LATERALLY AT A MAX. OF 5.0m CENTRES WITH DOWELED EXPANSION JOINTS AT MAX. 15.0m CENTRES.
12. TYPICAL VEHICULAR PAVEMENT JOINT DETAIL.



13. KERB EXPANSION JOINTS SHALL BE FORMED FROM 10mm ABLEFLEX FOR FULL DEPTH OF SECTION.
14. KERB EXPANSION JOINTS TO BE LOCATED AT DRAINAGE PITS, TANGENT POINTS OF CURVES / CORNERS AND AT 12m MAX CENTRES.
15. KERB TOOLED JOINTS TO BE MIN 3mm WIDE AND LOCATED AT MAX 3m CENTRES.
16. INTEGRAL KERB JOINTS SHALL MATCH THE LOCATION OF PAVEMENT JOINTS.

STRUCTURAL NOTES

GENERAL NOTES

1. CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR REVIEW AND ACCEPTANCE BY NORTHROP PRIOR TO FABRICATION.
2. REFER TO PERFORMANCE SPECIFICATIONS FOR ALL FURNITURE.

STEEL WORK

1. FABRICATE AND ERECT STRUCTURAL STEELWORK IN ACCORDANCE WITH AS4100-2020 AND AS5131 (CC2 REQUIREMENTS).
2. THE SHOP DETAILER IS TO DEVELOP DRAWINGS AS A BASIS FOR DIMENSIONAL COORDINATION WITH OTHER CONSULTANT'S DRAWINGS AND IS TO PREPARE DETAILED SHOP DRAWINGS. FABRICATOR SHALL PREPARE SHOP DRAWINGS AND SUBMIT THEM TO THE CONTRACTOR FOR THEIR APPROVAL. CONTRACTOR MUST PROVIDE ELECTRONIC COPIES OF THE APPROVED DRAWINGS TO THE STRUCTURAL DESIGN ENGINEER FOR REVIEW PRIOR TO FABRICATION.
3. THE FABRICATION AND ERECTION OF THE STRUCTURAL STEEL WORK SHALL BE SUPERVISED BY A QUALIFIED PERSON EXPERIENCED IN SUCH SUPERVISION, IN ORDER TO ENSURE THAT ALL REQUIREMENTS OF THE DESIGN ARE MET.
4. MINIMUM YIELD STRESSES OF STEEL SECTIONS MUST BE CLEARLY IDENTIFIED ON THE DESIGN DRAWINGS.
5. COLD FORMED SECTIONS TO CONFORM WITH:
6. AS/NZS 1594, AS/NZS 1595, AS/NZS 4600 AND AS 1397, AS1397, AS/NZS 1594 AND AS/NZS 1595.
7. ALL WELDS SHALL BE SP CATEGORY.
8. NO PAINT ON MATING SURFACES WITH TF OR TB BOLTING UNLESS APPROVED BY STRUCTURAL DESIGN ENGINEER.
9. TF OR TB BOLTS TO BE INSTALLED WITH ONE HARDENED WASHER UNDER THE TURNED PART.
10. USE LOAD INDICATING WASHERS FOR ALL TB AND TF CONNECTIONS.
11. HIGH STRENGTH BOLTS (8.8) ARE NOT TO BE WELDED.
12. ALL BOLTS, SCREWS, HOLD DOWN BOLTS, MUST BE DESIGNED TO WITHSTAND COASTAL NEWCASTLE ENVIRONMENTS PER CORROSION RATES SPECIFIED IN AS4312. NO CONNECTION SHALL HAVE LESS THAN 2 BOLTS.
13. SURFACE TREATMENTS OF STEEL WORK TO ACHIEVE A MINIMUM TIME TO FIRST MAINTENANCE OF 15-25 YEARS FOR THE SUITABLE SITE SPECIFIC ATMOSPHERIC CORROSIVITY CATEGORY IN ACCORDANCE WITH AS2312.1-2014.

IMPORTED STRUCTURAL STEEL MATERIAL

ALL STRUCTURAL STEELWORK USED ON THIS PROJECT SHALL BE COMPLIANT WITH AS4100, AND IN PARTICULAR:

1. CERTIFIED MILL TEST REPORTS, OR TEST CERTIFICATES SHALL BE PROVIDED AS EVIDENCE OF COMPLIANCE WITH THE STANDARDS REFERRED TO IN AS4100. THESE CERTIFICATES SHALL BE SUBMITTED TO THE STRUCTURAL DESIGN ENGINEER FOR APPROVAL PRIOR TO COMMENCEMENT OF FABRICATION.
2. PROVIDE TEST CERTIFICATED FOR COMPLIANCE FOR ALL FASTENERS. THESE CERTIFICATES SHALL BE SUBMITTED TO THE STRUCTURAL DESIGN ENGINEER FOR APPROVAL PRIOR TO FABRICATION.
3. FOR COLD FORMED SECTIONS A "CERTIFICATE OF CONFORMITY TO AS1163" SHALL BE SUBMITTED TO THE STRUCTURAL DESIGN ENGINEER FOR APPROVAL PRIOR TO FABRICATION.
4. CERTIFICATES SHALL ONLY BE ACCEPTED FROM TESTING COMPANIES ACCREDITED BY A TESTING AUTHORITY RECOGNISED IN AUSTRALIA, EG NATA OR JAS-ANZ CERTIFIED.
5. UNIDENTIFIED STEEL I.E. ANY STEEL THAT IS NOT ACCOMPANIED WITH EVIDENCE STATING COMPLIANCE WITH THE REQUIREMENT OF AS4100 MUST BE REJECTED. IF MATERIALS SUPPLIED AND INSTALLED ARE SUBSEQUENTLY PROVEN TO BE NON-COMPLIANT WITH THE SPECIFIED AUSTRALIAN STANDARDS IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY AND COST TO UNDERTAKE NATA OR EQUIVALENT CERTIFIED TESTING TO PROVE CONFORMANCE TO THE AUSTRALIAN STANDARDS AND DESIGN SPECIFICATIONS. SIMILARLY, ANY RECTIFICATION WORKS THAT MAY SUBSEQUENTLY BE REQUIRED TO SATISFY AUSTRALIAN CODE REQUIREMENT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

CONCRETE SEALING

1. THE CURING PROCESS FOR NEW CONCRETE IS TO INCORPORATE THE FOLLOWING ASPECTS, GENERALLY AS ORDERED;
   - SPRAY CURING COMPOUND
   - SAWCUT JOINTS AS LOCATED AND SPECIFIED AS SOON AS CURING PERMITS.
   - COVER NEW PAVING WITH HESSIAN AND BLACK PLASTIC SHEETS TAPED AT JOINTS ON COMPLETION OF SAWCUTTING. NOTE COVERING IS TO EXTENT MIN 5m BEYOND PAVEMENT BEING CURED. OVER ADJOINING (EXISTING) PAVEMENT AREAS, MAINTAIN CURING AS SPECIFIED.

STRUCTURAL NOTES (cont)

STAINLESS STEEL (GRADE 316-L)

THE CONTRACTOR IS RESPONSIBLE FOR THE INCLUSION OF SUCH STEELWORK ELEMENTS TO THE EXTENT REQUIRED TO DELIVER THE DESIGN AND CONSTRUCTION PACKAGE OF WORKS. THE FABRICATION AND ERECTION OF THE STRUCTURAL STEEL WORK SHALL BE SUPERVISED BY A QUALIFIED PERSON EXPERIENCED IN SUCH SUPERVISION, TO ENSURE THAT ALL REQUIREMENTS OF THE DESIGN ARE MET. FABRICATE AND ERECT STAINLESS STEELWORK IN ACCORDANCE WITH AS4673. ALL WELDS ARE TO BE IN ACCORDANCE WITH AS1554.6. U.N.O. ALL WELDS ARE TO BE MINIMUM CATEGORY OF 1B AND MINIMUM SURFACE FINISH IS AS PER AS1554.6.

MINIMUM 0.2 PERCENT PROOF STRESS:

- SQUARE HOLLOW SECTIONS = 205MPA
- RECTANGULAR HOLLOW SECTIONS = 205MPA
- CIRCULAR HOLLOW SECTION = 205MPA

ALL BURIED STEELWORK TO BE ENCASED IN CONCRETE WITH A MINIMUM COVER OF 50MM TO STEELWORK.

ALL BOLTS AND HOLD DOWN BOLTS SHALL BE GRADE 316L STAINLESS STEEL WITH A MINIMUM PROPERTY CLASS OF 70 TO BS EN ISO 3506 (I.E. ALL BOLTS TO BE A4-70 OR A4-80). THE CONTRACTOR SHALL SUPPLY WRITTEN CERTIFICATION TO THE STRUCTURAL DESIGN ENGINEER CONFIRMING BOLTS PROPOSED TO BE USED ARE AS PER THIS SPECIFICATION PRIOR TO ERECTION. GRADE 316 STAINLESS STEEL BOLTS AND HOLD DOWN BOLTS ARE NOT TO BE WELDED.

ALL BUTT WELDS SHALL BE COMPLETE PENETRATION BUTT WELDS CATEGORY 1A TO AS1554.6-2012. U.N.O. THE EXTENT OF NON-DESTRUCTIVE WELD EXAMINATION FOR BOTH BUTT WELDS AND FILLET WELDS SHALL BE AS NOTED IN AS1554.6:2012 TABLE 7.4 FOR THE RELEVANT WELD CATEGORY. A MINIMUM OF 10% OF FILLET WELDS AND 100% OF BUTT WELDS SHALL BE LIQUID PENETRANT TESTED.

GROUT ALL STEEL BASES BY DRY PACKING USING GROUT WHICH IS NON-SHRINK AND HAS A MINIMUM COMPRESSIVE STRENGTH AT 7 DAYS OF 40 MPA

STAINLESS STEEL WITH POLISHED FINISH:

- ALL STAINLESS STEEL SHALL BE GRADE 316L WITH A 320-GRIT MINIMUM MILL FINISH. TARGET FINISH IS AN RA = 0.5UM.
- MAXIMUM LOCAL DEFECT SHALL BE RA = 1.0UM
- ALL STAINLESS STEEL SHALL BE PROTECTED DURING SHIPPING USING APPROPRIATE PLASTIC WRAPPING.
- IF FULLY FABRICATED COMPONENTS ARE TO BE SHIPPED, APPROPRIATE PROTECTION SHALL BE USED. THIS PROTECTION SHALL BE SUBMITTED TO CITY OF NEWCASTLE AND THE STRUCTURAL DESIGN ENGINEER FOR APPROVAL PRIOR TO SHIPPING.
- ALL STAINLESS STEEL SHALL BE PICKLED AND PASSIVATED AFTER FABRICATION.

CONCRETE-ELAPSED DELIVERY TIMES

1. ELAPSED TIME BETWEEN THE WETTING OF THE MIX AND THE DISCHARGE OF THE MIX AT THE SITE MUST NOT EXCEED THE CRITERIA IN THE ELAPSED DELIVERY TIMETABLE BELOW

CONCRETE TEMPERATURE AT TIME OF DISCHARGE (°C)	MAXIMUM ELAPSED TIME (HOURS)
<24	2
24 TO 27	1
27 TO 30	1
30 TO 32	0
32 TO 35	0

IF THE ELAPSED TIME IS LONGER THAN THE CORRESPONDING TIME IN THE TABLE ABOVE, OR THE TEMPERATURE IS GREATER THAN 35°C, EITHER NORTHROP CONSULTING ENGINEERS OR THE CONCRETE MIX DESIGN ENGINEER ARE TO BE CONTACTED TO CONFIRM WHETHER PLACEMENT IS TO PROCEED OR IF THE POUR IS TO BE STOPPED. IF THE POUR IS STOPPED, PRIOR TO ANY FURTHER CONCRETE PLACEMENT NORTHROP CONSULTING ENGINEERS ARE TO BE CONTACTED TO INSPECT THE WORKS AND DETERMINE WHAT, IF ANY, RECTIFICATION WORKS ARE REQUIRED.

DRAWN: R KENNEDY DESIGNED: G WOOD JOB MANAGER: C PIPER VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
3	ISSUED FOR TENDER	RK		GW	20.12.23
4	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
5	ISSUED FOR 75% DD	RK		GW	28.03.24
6	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
7	ISSUED FOR 100% TENDER	DM		GW	06.09.24
8	ISSUED FOR 100% TENDER	DM		GW	03.10.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK LIVVI'S PLACE PLAYSPACE
NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
CIVIL SPECIFICATIONS - SHEET 2

JOB NUMBER: NL213165
DRAWING NUMBER: DD-C01.12
REVISION: 8
DRAWING SHEET SIZE = A1

Date: 03.10.2024 4:05 PM Plotted By: DIMITRI MAVROUDIS Found: O:\5 Pre-July 24 Projects\Newcastle\1YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\D - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C01.01 - COVER SHEET.dwg



DRAWN: R KENNEDY DESIGNED: G WOOD JOB MANAGER: C PIPER VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR 50% TENDER	RK		GW	25.11.22
2	ISSUED FOR 75% TENDER	RK		GW	19.12.22
3	ISSUED FOR TENDER	RK		GW	20.12.23
4	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
5	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
6	ISSUED FOR 100% TENDER	DM		GW	06.09.24

CLIENT
City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

SCALE 1:400 @ A1

0 4 8 12 16 20m

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT
NEWCASTLE FORESHORE PARK
LIVVI'S PLACE PLAYSPACE

NEWCASTLE, N.S.W, 2300

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

GENERAL ARRANGEMENT PLAN

JOB NUMBER
NL213165

DRAWING NUMBER
DD-C01.51

REVISION
6

DRAWING SHEET SIZE = A1

Date : 03.10.2024 4:09 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\CI - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C01.51 - GENERAL ARRANGEMENT.dwg



LEGEND

- MAXIMUM EXTENT OF DISTURBANCE
- SEDIMENT FENCE
- MESH AND GRAVEL INLET FILTER
- SANDBAG SEDIMENT FILTER
- GEOTEXTILE INLET FILTER
- STABILISED SITE ACCESS
- STOCKPILES

NOTES

1. ALL EROSION AND SEDIMENTATION CONTROL MEASURES MUST BE APPROPRIATE FOR THE SEDIMENT TYPE(S) OF THE SOILS ON-SITE, IN ACCORDANCE WITH THE 'BLUE BOOK' (MANAGING URBAN STORMWATER – SOILS AND CONSTRUCTION. LANDCOM, 2004), OR OTHER CURRENT RECOGNISED INDUSTRY STANDARDS FOR EROSION AND SEDIMENT CONTROL FOR AUSTRALIAN CONDITIONS. THIS INCLUDES SEDIMENT TRAPS AND LINING OF CHANNELS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING A DETAILED WRITTEN RECORD OF ALL EROSION AND SEDIMENT CONTROLS ON-SITE DURING THE CONSTRUCTION PERIOD. THIS RECORD SHALL BE UPDATED ON A DAILY BASIS AND SHALL CONTAIN DETAILS ON THE CONDITION OF CONTROLS AND ANY/ALL MAINTENANCE, CLEANING AND BREACHES. THIS RECORD SHALL BE KEPT ON-SITE AT ALL TIMES AND SHALL BE MADE AVAILABLE FOR INSPECTION BY THE PRINCIPAL CERTIFYING AUTHORITY AND THE SUPERINTENDENT DURING NORMAL WORKING HOURS.
3. INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
4. ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
5. INSTALL SEDIMENT FENCING, OR OTHER SEDIMENT CONTROL DEVICES, AROUND INDIVIDUAL BUILDING ZONES/AREAS AS REQUIRED AND AS DIRECTED BY THE SUPERINTENDENT OR APPROPRIATE COUNCIL OFFICER.
6. ALL TRENCHES INCLUDING ALL SERVICE TRENCHES AND SWALE EXCAVATION SHALL BE SIDE-CAST TO THE HIGH SIDE AND CLOSED AT THE END OF EACH DAYS WORK.
7. THE CONTRACTOR SHALL ENSURE THAT ALL VEGETATION (TREE, SHRUB AND GROUND COVER) WHICH IS TO BE RETAINED SHALL BE PROTECTED DURING THE DURATION OF CONSTRUCTION.
8. ALL VEGETATION TO BE REMOVED SHALL BE MULCHED ON-SITE AND SPREAD/STOCKPILED AS DIRECTED BY THE SUPERINTENDENT.
9. STRIP TOPSOIL IN AREAS DESIGNATED FOR STRIPPING AND STOCKPILE FOR RE-USE AS REQUIRED. ANY SURPLUS MATERIAL SHALL BE SPREAD ON-SITE AS DIRECTED BY THE SUPERINTENDENT OR REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES.
10. CONSTRUCT AND MAINTAIN ALL MATERIAL STOCKPILES IN ACCORDANCE WITH DETAIL SD4-1 OF THE 'BLUE BOOK' (INCLUDING CUT-OFF SWALES TO THE HIGH SIDE AND SEDIMENT FENCES TO THE LOW SIDE).
11. ENSURE STOCKPILES DO NOT EXCEED 2.0m HIGH. PROVIDE WIND AND RAIN EROSION PROTECTION AS REQUIRED IN ACCORDANCE WITH THE 'BLUE BOOK'.
12. PROVIDE WATER TRUCKS OR SPRINKLER DEVICES DURING CONSTRUCTION AS REQUIRED TO SUPPRESS DUST.
13. ONCE CUT/FILL OPERATIONS HAVE BEEN FINALIZED ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE RE-VEGETATED AS SOON AS IS PRACTICAL.

NOT FOR CONSTRUCTION

DRAWN: R KENNEDY DESIGNED: G WOOD JOB MANAGER: C PIPER VERIFIER:

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR TENDER	RK		GW	20.12.23
2	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
3	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
4	ISSUED FOR 100% TENDER	DM		GW	06.09.24
5	ISSUED FOR 100% TENDER	DM		GW	03.10.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

SCALE 1:400 @ A1

0 4 8 12 16 20m

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK LIVVI'S PLACE PLAYSPACE

NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

EROSION & SEDIMENT CONTROL PLAN

JOB NUMBER: NL213165

DRAWING NUMBER: DD-C02.01

REVISION: 4

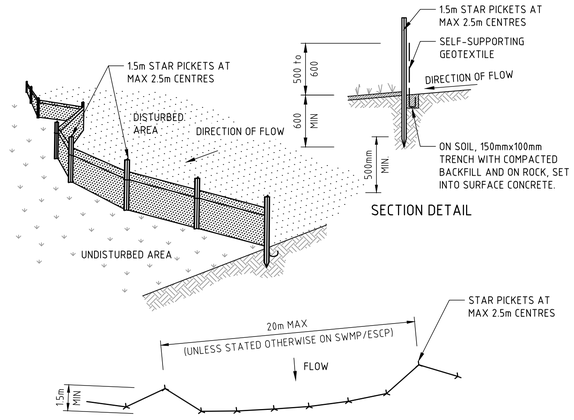
DRAWING SHEET SIZE = A1

Date : 03.10.2024 4:05 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\O - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C02.01 - ESC.dwg

CONSTRUCTION NOTES

1. PLACE STOCKPILES MORE THAN 2m (PREFERABLY 5m) FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS (STANDARD DRAWING 5-5) ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES (STANDARD DRAWING 6-8) 1 TO 2m DOWNSLOPE.

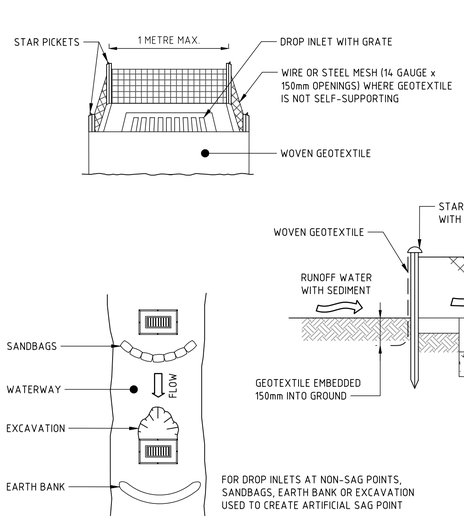
STOCKPILES (SD 4-1)



CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.5 METRE LONG STAR PICKETS INTO GROUND AT 2.5 METRE INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

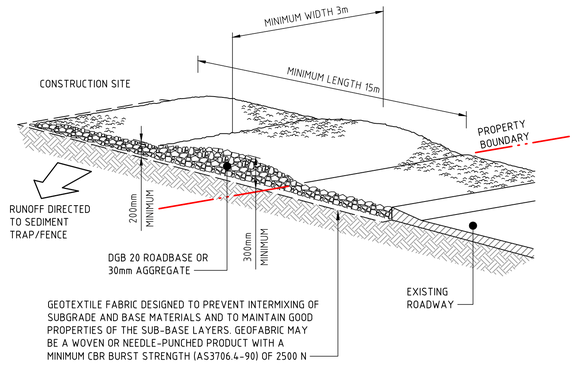
SEDIMENT FENCE (SD 6-8)



CONSTRUCTION NOTES

1. FABRICATE A SEDIMENT BARRIER MADE FROM GEOTEXTILE OR STRAW BALES.
2. FOLLOW STANDARD DRAWING 6-7 AND STANDARD DRAWING 6-8 FOR INSTALLATION PROCEDURES FOR THE STRAW BALES OR GEOFABRIC. REDUCE THE PICKET SPACING TO 1 METRE CENTRES.
3. IN WATERWAYS, ARTIFICIAL SAG POINTS CAN BE CREATED WITH SANDBAGS OR EARTH BANKS AS SHOWN IN THE DRAWING.
4. DO NOT COVER THE INLET WITH GEOTEXTILE UNLESS THE DESIGN IS ADEQUATE TO ALLOW FOR ALL WATERS TO BYPASS IT.

GEOTEXTILE INLET FILTER (SD 6-12)



CONSTRUCTION NOTES

1. STRIP THE TOPSOIL, LEVEL THE SITE AND COMPACT THE SUBGRADE.
2. COVER THE AREA WITH NEEDLE-PUNCHED GEOTEXTILE.
3. CONSTRUCT A 200mm THICK PAD OVER THE GEOTEXTILE USING ROAD BASE OR 30mm AGGREGATE.
4. ENSURE THE STRUCTURE IS AT LEAST 15 METRES LONG OR TO BUILDING ALIGNMENT AND AT LEAST 3 METRES WIDE.
5. WHERE A SEDIMENT FENCE JOINS ONTO THE STABILISED ACCESS, CONSTRUCT A HUMP IN THE STABILISED ACCESS TO DIVERT WATER TO THE SEDIMENT FENCE.

STABILISED SITE ACCESS (SD 6-14)

DRAWN: R KENNEDY DESIGNED: G WOOD JOB MANAGER: C PIPER VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR TENDER	RK		GW	20.12.23
2	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
3	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
4	ISSUED FOR 100% TENDER	DM		GW	06.09.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

SCALE 1:200 @ A1 (0 2 4 6 8 10m)

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK LIVVI'S PLACE PLAYSPACE

NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

EROSION AND SEDIMENT CONTROL DETAILS

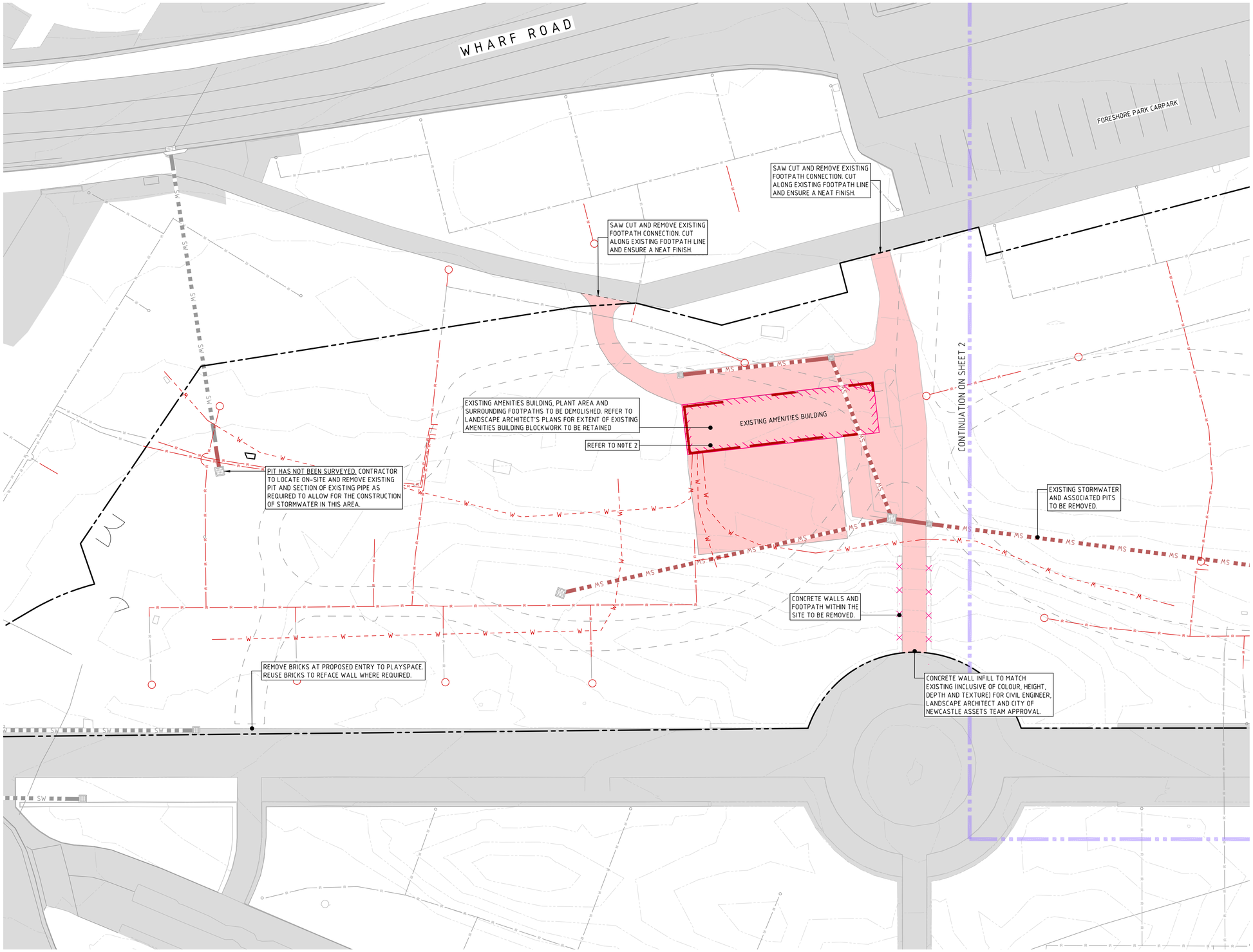
JOB NUMBER: NL213165

DRAWING NUMBER: DD-C02.10

REVISION: 4

DRAWING SHEET SIZE = A1

Date : 03.10.2024 4:05 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\O - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C02.01 - ESC.dwg



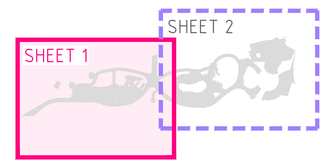
LEGEND

- SITE BOUNDARY / EXTENT OF WORKS
- EXISTING HARDSTAND
- EXISTING HARDSTAND TO BE REMOVED
- EXISTING HARDSTAND REMOVED AS PART OF KIOSK WORKS
- EXISTING STRUCTURE TO BE DEMOLISHED
- BRICK WALL TO BE RETAINED
- EXISTING FEATURE TO BE REMOVED
- SW — EXISTING STORMWATER PIPE
- SW — STORMWATER TO BE REMOVED
- EXISTING STORMWATER PIT
- PROPOSED STORMWATER PIT
- IR — EXISTING IRRIGATION
- IR — EXISTING IRRIGATION TO BE REMOVED
- W — EXISTING WATER TO BE REMOVED

NOTES

1. LOCATION OF EXISTING STORMWATER IS BASED ON SURVEY, QGIS DATA AND COUNCIL CORRESPONDENCE. TO BE CONFIRMED ON-SITE.
2. CONTRACTOR TO STORE BRICK (OF SUITABLE STRUCTURAL AND AESTHETIC QUALITY ONSITE. BRICK WALL TO BE RETAINED (SUBJECT TO STRUCTURAL INTEGRITY AND AESTHETIC QUALITY) TO 450mm (MINIMUM HEIGHT + ADDITIONAL TO MEET FULL BRICK HEIGHT). STRUCTURAL ENGINEER, LANDSCAPE ARCHITECT AND CITY OF NEWCASTLE ASSETS TEAM TO APPROVE EXISTING BRICK QUALITY FOR USE. PLEASE REFER TO MUSICAL ALCOVE SEATING EXTENTS FOR EXTENT OF BRICK WALL RETENTION (SHOWN HERE INDICATIVELY)
3. ALL EXISTING BRICKWORK TO BE RETAINED IS TO BE INSPECTED AND VERIFIED AS BEING STRUCTURALLY ADEQUATE AND FIT FOR PURPOSE BY A CHARTERED STRUCTURAL ENGINEER. PROPOSED SEATING LOCATIONS ARE ALSO TO BE VERIFIED AS SUITABLE.
4. REFER TO RELEVANT ENGINEERING PLANS FOR EXTENT OF EXISTING SERVICE TO BE REMOVED AND SPECIFIC REQUIREMENTS FOR DECOMMISSIONING AND DISCONNECTION. REMOVAL OF ANY EXISTING ELECTRICAL OR HYDRAULIC SERVICES ARE TO BE COMPLETED UNDER STRICT SUPERVISION BY LICENSED ELECTRICIAN OR PLUMBER AS REQUIRED.
5. EXISTING SERVICES SHOWN AS BEING DEMOLISHED ARE INDICATIVE ONLY AND TO BE CONFIRMED BY BUILDER ON SITE. ANY EXISTING SERVICES THAT ARE FOUND TO SUPPLY INFRASTRUCTURE ARE TO BE RETAINED OR RELOCATED IN CONSULTATION WITH THE RELEVANT DESIGN ENGINEER.

KEYPLAN



NOT FOR CONSTRUCTION

DRAWN: R KENNEDY DESIGNED: G WOOD JOB MANAGER: C PIPER VERIFIER:

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR TENDER	RK		GW	20.12.23
2	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
3	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
4	ISSUED FOR 100% TENDER	DM		GW	06.09.24
5	ISSUED FOR 100% TENDER	DM		GW	03.10.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

SCALE 1:200 @ A1 — 0 2 4 6 8 10m

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK
LIVVI'S PLACE PLAYSPACE

NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

DEMOLITION PLAN
SHEET 1

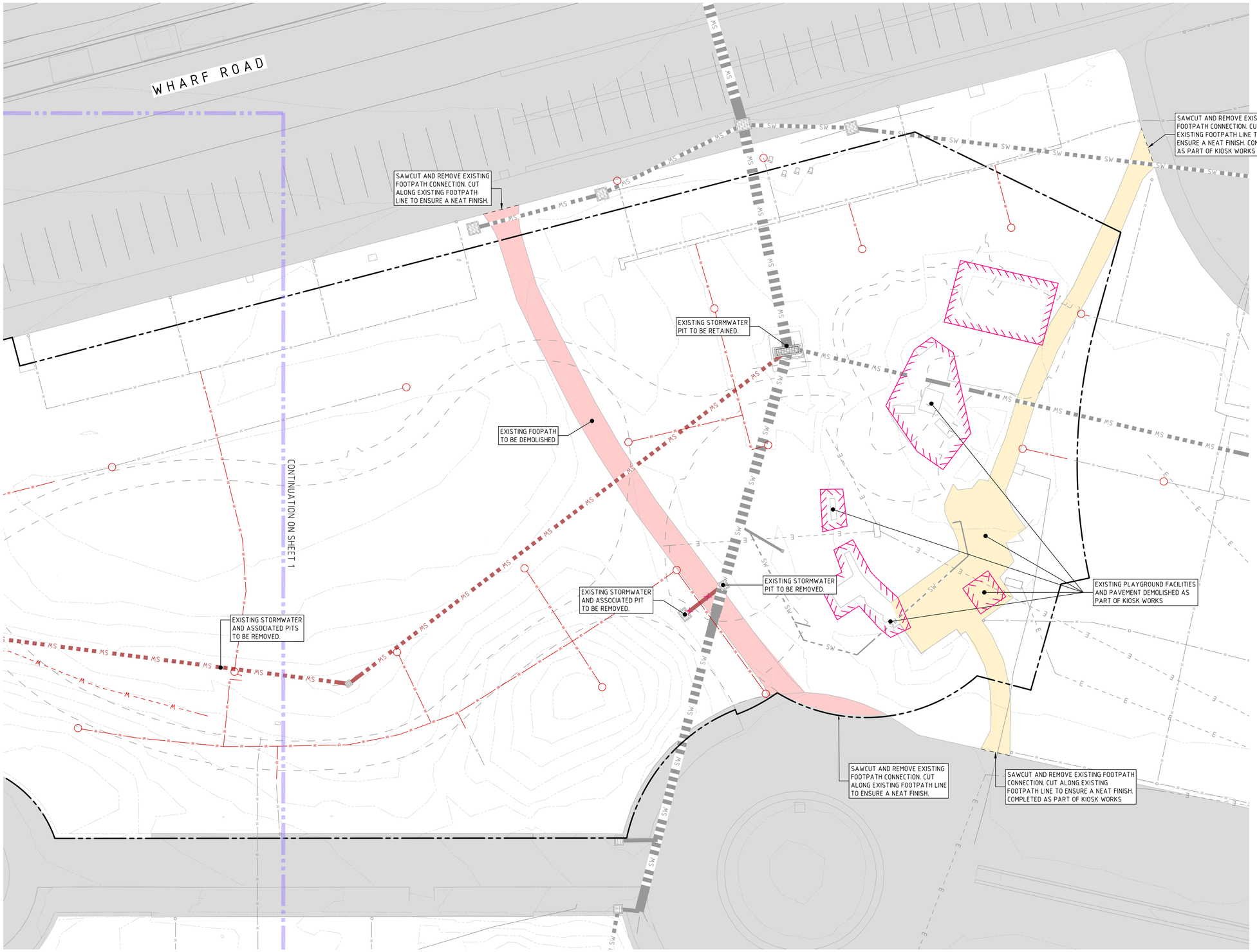
JOB NUMBER: NL213165

DRAWING NUMBER: DD-C03.01

REVISION: 5

DRAWING SHEET SIZE = A1

Date : 03.10.2024 4:05 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\O - Drawings\CIVIL\03-CAD\05- TENDER\NL213165-DD-C03.01 - DEMOLITION.dwg



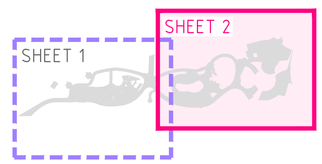
LEGEND

- SITE BOUNDARY / EXTENT OF WORKS
- EXISTING HARDSTAND
- EXISTING HARDSTAND TO BE REMOVED
- EXISTING HARDSTAND REMOVED AS PART OF KIOSK WORKS
- EXISTING STRUCTURE TO BE DEMOLISHED
- BRICK WALL TO BE RETAINED
- EXISTING FEATURE TO BE REMOVED
- SW EXISTING STORMWATER PIPE
- SW STORMWATER TO BE REMOVED
- EXISTING STORMWATER PIT
- PROPOSED STORMWATER PIT
- IR EXISTING IRRIGATION
- IR EXISTING IRRIGATION TO BE REMOVED
- W EXISTING WATER TO BE REMOVED

NOTES

1. LOCATION OF EXISTING STORMWATER IS BASED ON SURVEY, QGIS DATA AND COUNCIL CORRESPONDENCE. TO BE CONFIRMED ON-SITE.
2. CONTRACTOR TO STORE BRICK (OF SUITABLE STRUCTURAL AND AESTHETIC QUALITY ONSITE. BRICK WALL TO BE RETAINED (SUBJECT TO STRUCTURAL INTEGRITY AND AESTHETIC QUALITY) TO 450mm (MINIMUM HEIGHT + ADDITIONAL TO MEET FULL BRICK HEIGHT). STRUCTURAL ENGINEER, LANDSCAPE ARCHITECT AND CITY OF NEWCASTLE ASSETS TEAM TO APPROVE EXISTING BRICK QUALITY FOR USE. PLEASE REFER TO MUSICAL ALCOVE SEATING EXTENTS FOR EXTENT OF BRICK WALL RETENTION (SHOWN HERE INDICATIVELY)
3. ALL EXISTING BRICKWORK TO BE RETAINED IS TO BE INSPECTED AND VERIFIED AS BEING STRUCTURALLY ADEQUATE AND FIT FOR PURPOSE BY A CHARTERED STRUCTURAL ENGINEER. PROPOSED SEATING LOCATIONS ARE ALSO TO BE VERIFIED AS SUITABLE.
4. REFER TO RELEVANT ENGINEERING PLANS FOR EXTENT OF EXISTING SERVICE TO BE REMOVED AND SPECIFIC REQUIREMENTS FOR DECOMMISSIONING AND DISCONNECTION. REMOVAL OF ANY EXISTING ELECTRICAL OR HYDRAULIC SERVICES ARE TO BE COMPLETED UNDER STRICT SUPERVISION BY LICENSED ELECTRICIAN OR PLUMBER AS REQUIRED.
5. EXISTING SERVICES SHOWN AS BEING DEMOLISHED ARE INDICATIVE ONLY AND TO BE CONFIRMED BY BUILDER ON SITE. ANY EXISTING SERVICES THAT ARE FOUND TO SUPPLY INFRASTRUCTURE ARE TO BE RETAINED OR RELOCATED IN CONSULTATION WITH THE RELEVANT DESIGN ENGINEER.

KEYPLAN



DRAWN: R KENNEDY
DESIGNED: G WOOD
JOB MANAGER: C PIPER
VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR TENDER	RK		GW	20.12.23
2	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
3	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
4	ISSUED FOR 100% TENDER	DM		GW	06.09.24
5	ISSUED FOR 100% TENDER	DM		GW	03.10.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

SCALE 1:200 @ A1 — 0 2 4 6 8 10m

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK LIVVI'S PLACE PLAYSPACE

NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

DEMOLITION PLAN SHEET 2

JOB NUMBER: NL213165

DRAWING NUMBER: DD-C03.02

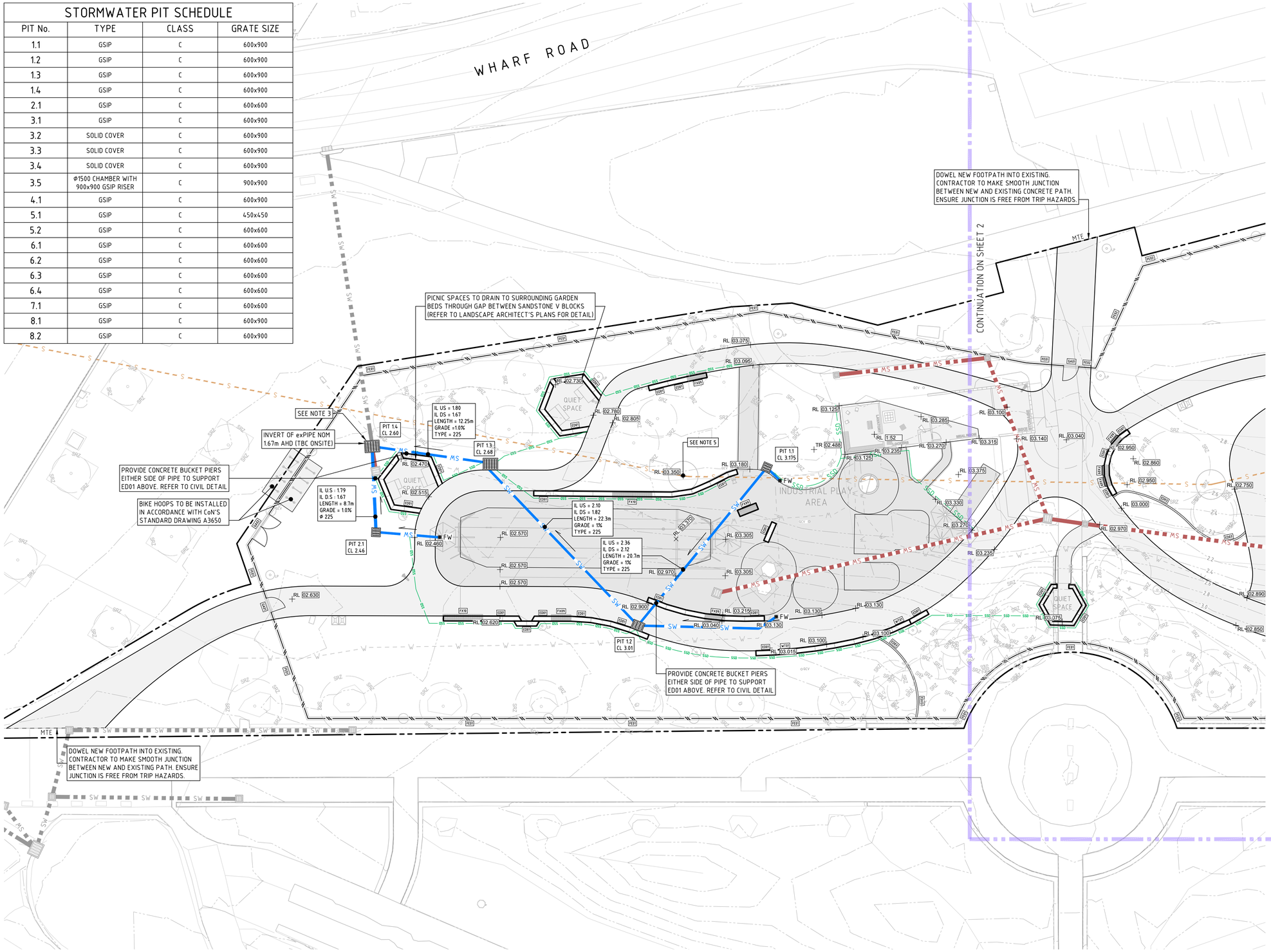
REVISION: 5

DRAWING SHEET SIZE = A1

Date: 03.10.2024 4:09 PM Plotted By: DIMITRI MAVROUDIS Found: O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\O - Drawings\CIVIL\03-CAD\05- TENDER\NL213165-DD-C03.01 - DEMOLITION.dwg

STORMWATER PIT SCHEDULE

PIT No.	TYPE	CLASS	GRATE SIZE
1.1	GSIP	C	600x900
1.2	GSIP	C	600x900
1.3	GSIP	C	600x900
1.4	GSIP	C	600x900
2.1	GSIP	C	600x600
3.1	GSIP	C	600x900
3.2	SOLID COVER	C	600x900
3.3	SOLID COVER	C	600x900
3.4	SOLID COVER	C	600x900
3.5	Φ1500 CHAMBER WITH 900x900 GSIP RISER	C	900x900
4.1	GSIP	C	600x900
5.1	GSIP	C	450x450
5.2	GSIP	C	600x600
6.1	GSIP	C	600x600
6.2	GSIP	C	600x600
6.3	GSIP	C	600x600
6.4	GSIP	C	600x600
7.1	GSIP	C	600x600
8.1	GSIP	C	600x900
8.2	GSIP	C	600x900



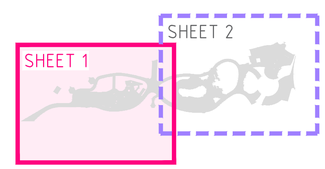
LEGEND

- SITE EXTENTS
- EXISTING CONTOURS (0.2m INTERVAL)
- RL2.57 — SPOT HEIGHT
- SW — EXISTING STORMWATER PIPE
- SW — STORMWATER TO BE REMOVED
- SW — PROPOSED STORMWATER PIPE
- EXISTING STORMWATER PIT
- PROPOSED STORMWATER PIT
- PIT 5.2 CL -- — PIT NUMBER AND COVER LEVEL
- FW — FLOOR WASTE
- SSD — SUBSOIL DRAINAGE
- LANDSCAPE SURFACE FINISHES — REFER TO PAVEMENT AND JOINTING PLAN
- MTE — MATCH TO EXISTING
- EXTENT OF STRUCTURE
- PROPOSED FENCELINE — REFER TO LANDSCAPE ARCHITECT'S DRAWINGS
- ED01 — RETAINING WALL AND TYPE — SEE KEY BELOW AND DETAILS ON DRAWINGS C09
- ED01 — SANDSTONE SEAT EDGE
- ED03 — GARDEN EDGE (FLUSH) – REFER TO CoN DRAWING A3202 – CONCRETE EDGING
- ED06 — GARDEN EDGE (RAISED)
- FX09 — TIMBER SEAT TOP
- WT01 — TWO-TIER RETAINING WALL
- WT02 — KIOSK SEAT EDGE

NOTES

1. REFER TO LANDSCAPE ARCHITECT'S PLANS FOR ALL LEVELS AND DETAILS. ENSURE ALL SURFACES DRAIN TOWARDS A STORMWATER INLET PIT AT MINIMUM 1% AND THERE ARE NO TRAPPED LOW POINTS.
2. LOCATION AND INVERTS OF EXISTING STORMWATER ARE BASED ON SURVEY, SITE INSPECTION AND COUNCIL CORRESPONDENCE. TO BE CONFIRMED ONSITE. SUPERINTENDENT TO BE NOTIFIED OF ANY DISCREPANCIES.
3. CONTRACTOR TO CONSTRUCT STORMWATER PIT OVER EXISTING STORMWATER PIPE, AVOIDING STRUCTURAL ROOT ZONES. LOCATION OF EXISTING STORMWATER PIPE TO BE CONFIRMED ONSITE. CONTRACTOR TO GRADE LANDSCAPING TOWARDS PROPOSED PIT AND ENSURE NO TRAPPED LOW POINTS. REDUNDANT STORMWATER PIPE AND ASSOCIATED PIT TO BE REMOVED.
4. CONTRACTOR TO PROVIDE A Φ225 STORMWATER CONNECTION TO PROPOSED PUMP HOUSE. REFER TO AQUATIC ONE DRAWINGS FOR DETAILS OF PUMP HOUSE AND CONNECTION.
5. CONTRACTOR TO RAISE SEWER MAINTENANCE HOLE COVER TO 3.35m AHD.TO BE APPROVED BY HUNTER WATER CORPORATION. RELEVANT APPROVALS ARE TO BE SOUGHT PRIOR TO COMMENCEMENT OF WORKS AND PROVIDE ALLOWANCE TO REBUILD CHAMBER AND SHAFT OF MAINTENANCE HOLE.
6. CONTRACTOR TO ALLOW FOR MASS CONCRETE BUCKET PIERS EITHER SIDE OF ANY STORMWATER PIPES BELOW FOUNDATIONS.

KEYPLAN



NOT FOR CONSTRUCTION

VERIFIER:
JOB MANAGER: C PIPER
DESIGNED: G WOOD
DRAWN: R KENNEDY

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
2	ISSUED FOR 75% TENDER	RK		GW	19.12.22
3	ISSUED FOR TENDER	RK		GW	20.12.23
4	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
5	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
6	ISSUED FOR 100% TENDER	DM		GW	06.09.24
7	ISSUED FOR 100% TENDER	DM		GW	03.10.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

SCALE 1:200 @ A1 — 0 2 4 6 8 10m

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK LIVVI'S PLACE PLAYSPACE
NEWCASTLE, N.S.W, 2300

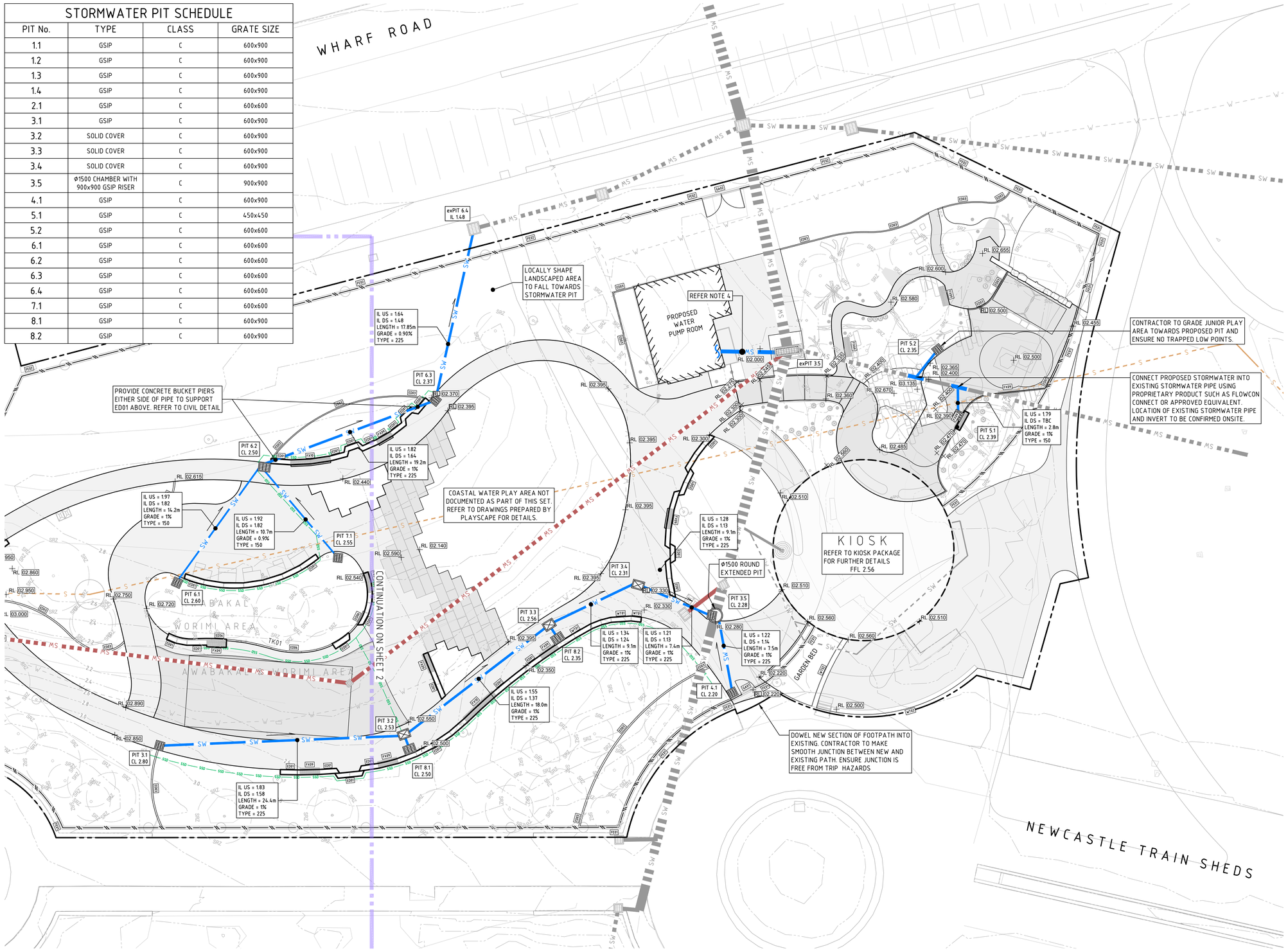
DRAWING TITLE: CIVIL ENGINEERING PACKAGE
CIVIL WORKS PLAN - SHEET 1

JOB NUMBER: NL213165
DRAWING NUMBER: DD-C04.01
REVISION: 7
DRAWING SHEET SIZE = A1

Date : 03.10.2024 4:09 PM Plotted By : DIMITRI MAVROUDIS Found : O:\6 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\O - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C04.01 - CIVIL WORKS.dwg

STORMWATER PIT SCHEDULE

PIT No.	TYPE	CLASS	GRATE SIZE
1.1	GSIP	C	600x900
1.2	GSIP	C	600x900
1.3	GSIP	C	600x900
1.4	GSIP	C	600x900
2.1	GSIP	C	600x600
3.1	GSIP	C	600x900
3.2	SOLID COVER	C	600x900
3.3	SOLID COVER	C	600x900
3.4	SOLID COVER	C	600x900
3.5	Φ1500 CHAMBER WITH 900x900 GSIP RISER	C	900x900
4.1	GSIP	C	600x900
5.1	GSIP	C	450x450
5.2	GSIP	C	600x600
6.1	GSIP	C	600x600
6.2	GSIP	C	600x600
6.3	GSIP	C	600x600
6.4	GSIP	C	600x600
7.1	GSIP	C	600x600
8.1	GSIP	C	600x900
8.2	GSIP	C	600x900



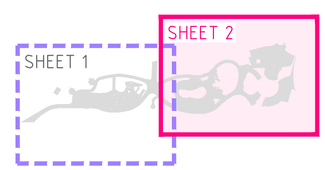
LEGEND

- SITE EXTENTS
- EXISTING CONTOURS (0.2m INTERVAL)
- RL2.57 — SPOT HEIGHT
- SW — EXISTING STORMWATER PIPE
- SW — STORMWATER TO BE REMOVED
- SW — PROPOSED STORMWATER PIPE
- EXISTING STORMWATER PIT
- PROPOSED STORMWATER PIT
- PIT 5.2 CL -- — PIT NUMBER AND COVER LEVEL
- FW — FLOOR WASTE
- SSD — SUBSOIL DRAINAGE
- LANDSCAPE SURFACE FINISHES — REFER TO PAVEMENT AND JOINTING PLAN
- MTE — MATCH TO EXISTING
- EXTENT OF STRUCTURE
- PROPOSED FENCELINE — REFER TO LANDSCAPE ARCHITECT'S DRAWINGS
- RETAINING WALL AND TYPE — SEE KEY BELOW AND DETAILS ON DRAWINGS C09
- ED01 — SANDSTONE SEAT EDGE
- ED03 — GARDEN EDGE (FLUSH) – REFER TO CoN DRAWING A3202 – CONCRETE EDGING
- ED06 — GARDEN EDGE (RAISED)
- FX09 — TIMBER SEAT TOP
- WT01 — TWO-TIER RETAINING WALL
- WT02 — KIOSK SEAT EDGE

NOTES

1. REFER TO LANDSCAPE ARCHITECT'S PLANS FOR ALL LEVELS AND DETAILS. ENSURE ALL SURFACES DRAIN TOWARDS A STORMWATER INLET PIT AT MINIMUM 1% AND THERE ARE NO TRAPPED LOW POINTS.
2. LOCATION AND INVERTS OF EXISTING STORMWATER ARE BASED ON SURVEY, SITE INSPECTION AND COUNCIL CORRESPONDENCE. TO BE CONFIRMED ONSITE. SUPERINTENDENT TO BE NOTIFIED OF ANY DISCREPANCIES.
3. CONTRACTOR TO CONSTRUCT STORMWATER PIT OVER EXISTING STORMWATER PIPE, AVOIDING STRUCTURAL ROOT ZONES. LOCATION OF EXISTING STORMWATER PIPE TO BE CONFIRMED ONSITE. CONTRACTOR TO GRADE LANDSCAPING TOWARDS PROPOSED PIT AND ENSURE NO TRAPPED LOW POINTS. REDUNDANT STORMWATER PIPE AND ASSOCIATED PIT TO BE REMOVED.
4. CONTRACTOR TO PROVIDE A Φ225 STORMWATER CONNECTION TO PROPOSED PUMP HOUSE. REFER TO AQUATIC ONE DRAWINGS FOR DETAILS OF PUMP HOUSE AND CONNECTION.
5. CONTRACTOR TO RAISE SEWER MAINTENANCE HOLE COVER TO 3.35m AHD.TO BE APPROVED BY HUNTER WATER CORPORATION. RELEVANT APPROVALS ARE TO BE SOUGHT PRIOR TO COMMENCEMENT OF WORKS AND PROVIDE ALLOWANCE TO REBUILD CHAMBER AND SHAFT OF MAINTENANCE HOLE.
6. CONTRACTOR TO ALLOW FOR MASS CONCRETE BUCKET PIERS EITHER SIDE OF ANY STORMWATER PIPES BELOW FOUNDATIONS.

KEYPLAN



NOT FOR CONSTRUCTION

VERIFIER:
JOB MANAGER: C PIPER
DESIGNED: G WOOD
DRAWN: R KENNEDY

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
2	ISSUED FOR 75% TENDER	RK		GW	19.12.22
3	ISSUED FOR TENDER	RK		GW	20.12.23
4	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
5	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
6	ISSUED FOR 100% TENDER	DM		GW	06.09.24
7	ISSUED FOR 100% TENDER	DM		GW	03.10.24

CLIENT: City of Newcastle
DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

SCALE 1:200 @ A1 (0 2 4 6 8 10m)

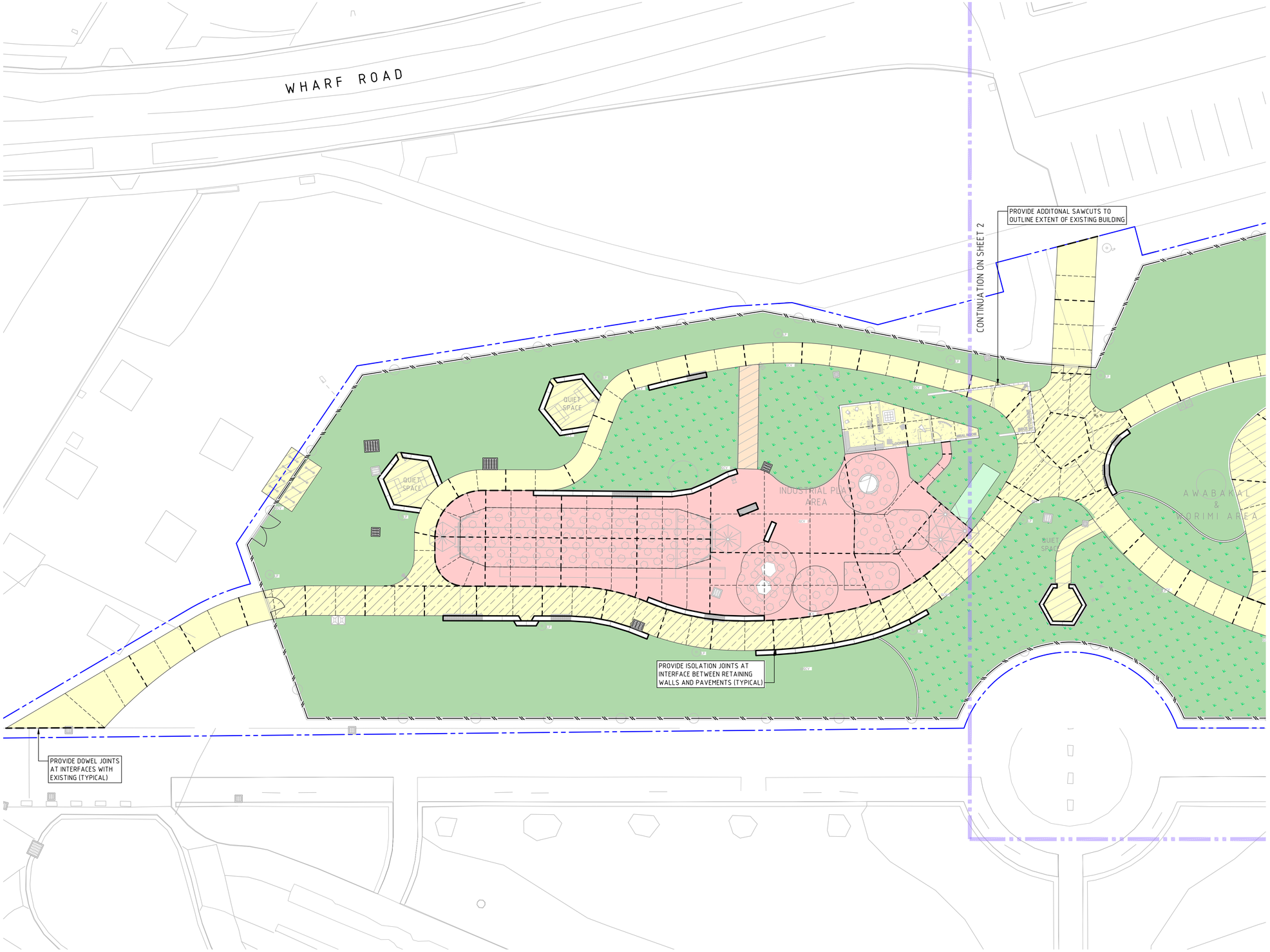
NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK
LIVVI'S PLACE PLAYSPACE
NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
CIVIL WORKS PLAN - SHEET 2

JOB NUMBER: NL213165
DRAWING NUMBER: DD-C04.02
REVISION: 7
DRAWING SHEET SIZE = A1

Date : 03.10.2024 4:05 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\O - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C04.01 - CIVIL WORKS.dwg



LEGEND

- SITE BOUNDARY
- STORMWATER PIT - PROPOSED
- STORMWATER PIT - EXISTING
- SAWN JOINT
- EXPANSION JOINT
- DOWELLED JOINT
- PROPOSED FENCELINE. REFER TO LANDSCAPE ARCHITECT'S DRAWINGS FOR DETAILS

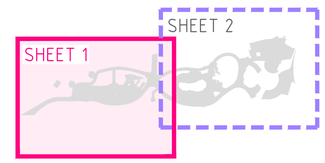
REFER TO DRAWING C09.02 FOR PAVEMENT DETAILS U.N.O

- PV01 - CONCRETE TYPE 1
- PV02 - CONCRETE TYPE 2
- PV04 - TESSELATED EDGE
- PV06 - GRANITIC GRAVEL (LOW IMPACT)
- PV07 - TREETOP WALK REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR DETAIL
- PV09 - MUSICAL ALCOVE WITH BRICK INSERTS. REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR DETAIL
- PV10 - PERMEABLE PAVING. REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR DETAIL
- PV11 - CONCRETE PAVING
- PV12 - TRAFFICABLE PAVEMENT
- SF01 - RUBBERISED SOFTFALL TO BE RESOLVED AT D&C
- SF02 - RUBBERISED SOFTFALL FALLZONES
- SL01 - TURF. REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR DETAIL
- GB01 - GARDEN BED. REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR DETAIL
- GB02 - ORGANIC MULCH. REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR DETAIL
- PV08 - JUNIOR PLAY ENTRANCE - MICROMESH. REFER TO LANDSCAPE DRAWINGS FOR DETAILS.

NOTES

1. REFER TO LANDSCAPE ARCHITECT'S PLANS FOR ALL SETOUT DETAILS AND LEVELS

KEYPLAN



VERIFIER:
JOB MANAGER: C PIPER
DESIGNED: G WOOD
DRAWN: R KENNEDY

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR TENDER	RK		GW	20.12.23
2	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
3	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
4	ISSUED FOR 100% TENDER	DM		GW	06.09.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

SCALE 1:200 @ A1 (0 2 4 6 8 10m)

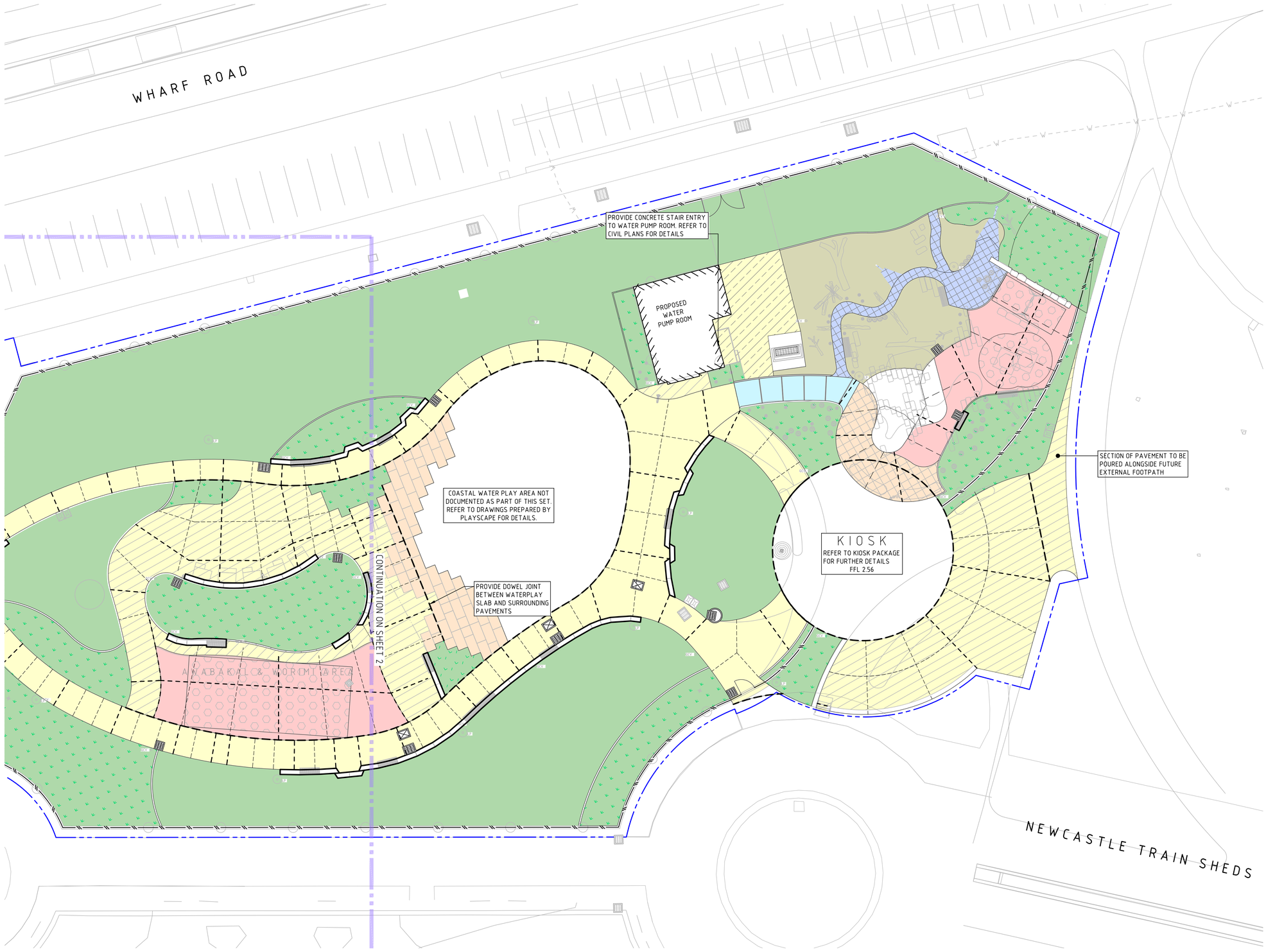
NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK
LIVVI'S PLACE PLAYSPACE
NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
JOINTING PLAN - SHEET 1

JOB NUMBER: NL213165
DRAWING NUMBER: DD-C04.51
REVISION: 4
DRAWING SHEET SIZE = A1

Date : 03.10.2024 4:05 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\D - Drawings\CIVIL\03-CAD\05- TENDER\NL213165-DD-C04.51 - JOINTING.dwg



LEGEND

- SITE BOUNDARY
- STORMWATER PIT - PROPOSED
- STORMWATER PIT - EXISTING
- SAWN JOINT
- EXPANSION JOINT
- DOWELLED JOINT
- PROPOSED FENCELINE. REFER TO LANDSCAPE ARCHITECT'S DRAWINGS FOR DETAILS

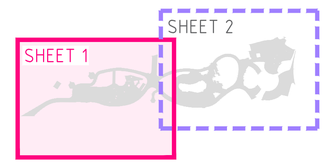
REFER TO DRAWING C09.02 FOR PAVEMENT DETAILS U.N.O

- PV01 - CONCRETE TYPE 1
- PV02 - CONCRETE TYPE 2
- PV04 - TESSELATED EDGE
- PV06 - GRANITIC GRAVEL (LOW IMPACT)
- PV07 - TREETOP WALK REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR DETAIL
- PV09 - MUSICAL ALCOVE WITH BRICK INSERTS. REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR DETAIL
- PV10 - PERMEABLE PAVING. REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR DETAIL
- PV11 - CONCRETE PAVING
- PV12 - TRAFFICABLE PAVEMENT
- SF01 - RUBBERISED SOFTFALL TO BE RESOLVED AT D&C
- SF02 - RUBBERISED SOFTFALL FALLZONES
- SL01 - TURF. REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR DETAIL
- GB01 - GARDEN BED. REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR DETAIL
- GB02 - ORGANIC MULCH. REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR DETAIL
- PV08 - JUNIOR PLAY ENTRANCE - MICROMESH. REFER TO LANDSCAPE DRAWINGS FOR DETAILS.

NOTES

1. REFER TO LANDSCAPE ARCHITECT'S PLANS FOR ALL SETOUT DETAILS AND LEVELS

KEYPLAN



NOT FOR CONSTRUCTION

VERIFIER:
JOB MANAGER: C PIPER
DESIGNED: G WOOD
DRAWN: R KENNEDY

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR TENDER	RK		GW	20.12.23
2	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
3	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
4	ISSUED FOR 100% TENDER	DM		GW	06.09.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

SCALE 1:200 @ A1

0 2 4 6 8 10m

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK
LIVVI'S PLACE PLAYSPACE

NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

JOINTING PLAN - SHEET 2

JOB NUMBER: NL213165

DRAWING NUMBER: DD-C04.52

REVISION: 4

DRAWING SHEET SIZE = A1

Date: 03.10.2024 4:05 PM Plotted By: DIMITRI MAVROUDIS Found: O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\O - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C04.51 - JOINTING.dwg

NON DESTRUCTIVE DIGGING PROPOSED WITHIN THE TPZ. TO BE CONFIRMED BY ARBORIST

CONTRACTOR TO ALLOW TO MOVE EXISTING ELECTRICAL BOX OUT OF FOOTPATH.

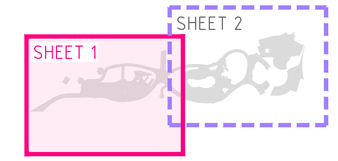
LEGEND

- EXISTING STORMWATER
- PROPOSED STORMWATER
- STORMWATER TO BE REMOVED
- EXISTING WATER
- PROPOSED WATER
- EXISTING SEWER
- PROPOSED SEWER
- EXISTING ELECTRICAL
- EXISTING IRRIGATION TO BE REMOVED
- EXISTING IRRIGATION TO BE RETAINED
- PROPOSED IRRIGATION
- PROPOSED ELECTRICAL
- PROPOSED PUMPOUT LINE
- PUMPHOUSE SERVICE TRENCH

NOTES

1. REFER TO RELEVANT SERVICE PLAN FOR HYDRAULIC, IRRIGATION, WATER PLAY AND ELECTRICAL SERVICES. SERVICES ARE SHOWN AS A GUIDE ONLY ON THIS PLAN.
2. CONTRACTOR TO ENSURE NO CLASHES BETWEEN PROPOSED AND EXISTING SERVICES ON SITE. CONTRACTOR TO NOTIFY SUPERINTENDENT OF ANY MAJOR SERVICE CLASHES TO BE RESOLVED.

KEYPLAN



NOT FOR CONSTRUCTION

DRAWN: R KENNEDY DESIGNED: G WOOD JOB MANAGER: C PIPER VERIFIER: C PIPER

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR 75% TENDER	RK		GW	19.12.22
2	ISSUED FOR TENDER	RK		GW	20.12.23
3	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
4	ISSUED FOR 75% DETAILED DESIGN	DM	CP	GW	08.04.24
5	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
6	ISSUED FOR 100% TENDER	DM		GW	03.10.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

SCALE 1:200 @ A1 (0 2 4 6 8 10m)

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK
LIVVI'S PLACE PLAYSPACE

NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

COMBINED SERVICES PLAN - SHEET 1

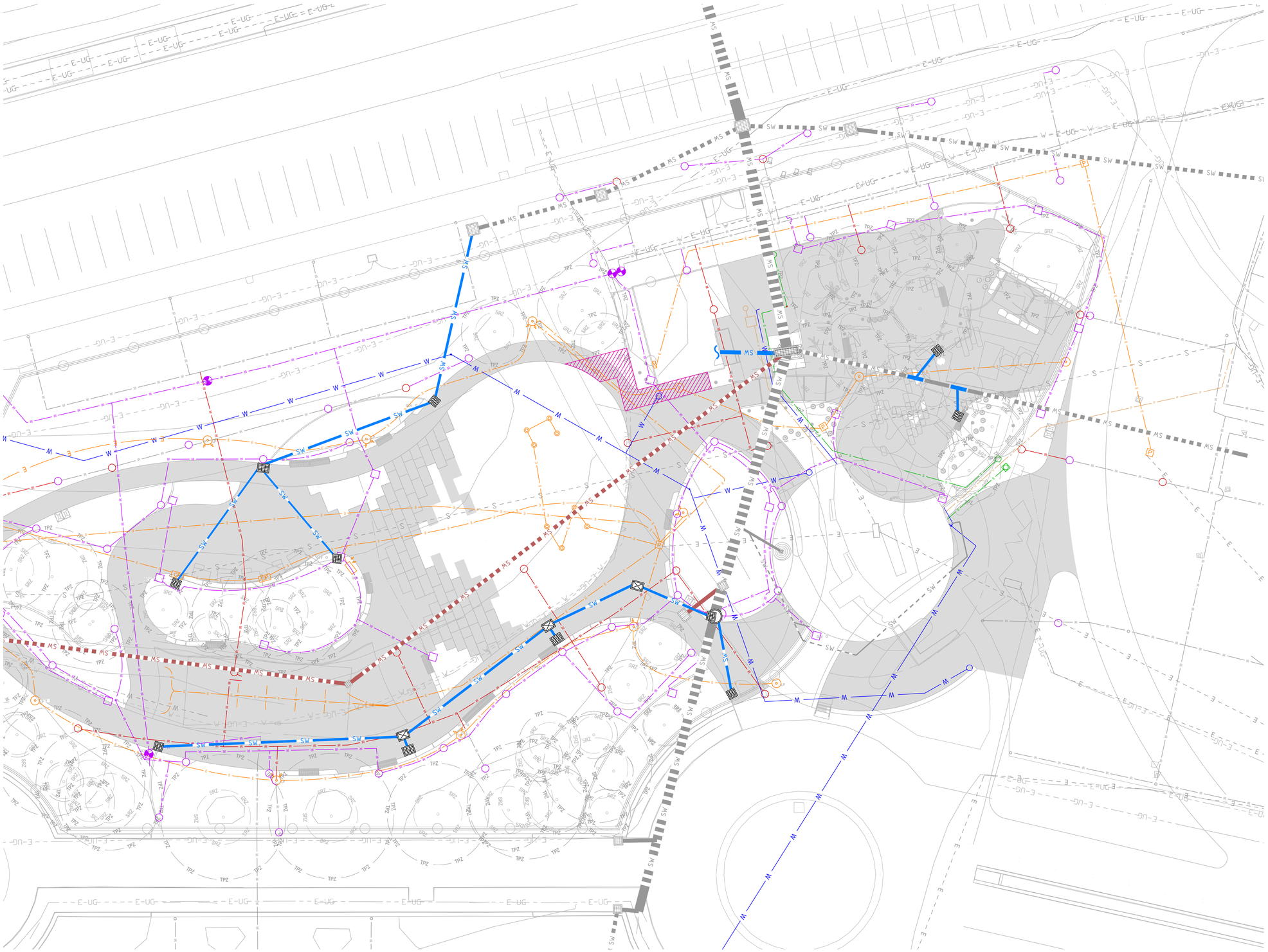
JOB NUMBER: NL213165

DRAWING NUMBER: DD-C04.61

REVISION: 6

DRAWING SHEET SIZE = A1

Date : 03.10.2024 4:05 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\3 - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C05.01 - COMBINED SERVICES.dwg



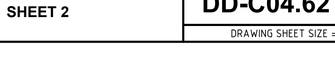
LEGEND

- SW — EXISTING STORMWATER
- SW — PROPOSED STORMWATER
- SW — STORMWATER TO BE REMOVED
- W — EXISTING WATER
- W — PROPOSED WATER
- S — EXISTING SEWER
- S — PROPOSED SEWER
- E — EXISTING ELECTRICAL
- IR — EXISTING IRRIGATION TO BE REMOVED
- IR — EXISTING IRRIGATION TO BE RETAINED
- IR — PROPOSED IRRIGATION
- E — PROPOSED ELECTRICAL
- P — PROPOSED PUMPOUT LINE
- PUMPHOUSE SERVICE TRENCH

NOTES

1. REFER TO RELEVANT SERVICE PLAN FOR HYDRAULIC, IRRIGATION, WATER PLAY AND ELECTRICAL SERVICES. SERVICES ARE SHOWN AS A GUIDE ONLY ON THIS PLAN.
2. CONTRACTOR TO ENSURE NO CLASHES BETWEEN PROPOSED AND EXISTING SERVICES ON SITE. CONTRACTOR TO NOTIFY SUPERINTENDENT OF ANY MAJOR SERVICE CLASHES TO BE RESOLVED.

KEYPLAN



DRAWN: R KENNEDY
DESIGNED: G WOOD
JOB MANAGER: C PIPER
VERIFIER: C. PIPER

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR 75% TENDER	RK		GW	19.12.22
2	ISSUED FOR TENDER	RK		GW	20.12.23
3	ISSUED FOR 75% DETAILED DESIGN	DM		GW	22.03.24
4	ISSUED FOR 75% DETAILED DESIGN	DM	CP	GW	08.04.24
5	ISSUED FOR 100% DETAILED DESIGN	DM		GW	16.08.24
6	ISSUED FOR 100% TENDER	DM		GW	03.10.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

SCALE 1:200 @ A1 — 0 2 4 6 8 10m

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK
LIVVI'S PLACE PLAYSPACE

NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

COMBINED SERVICES PLAN - SHEET 2

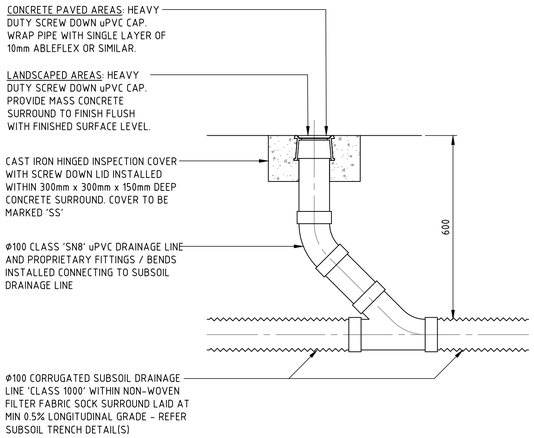
JOB NUMBER: NL213165

DRAWING NUMBER: DD-C04.62

REVISION: 6

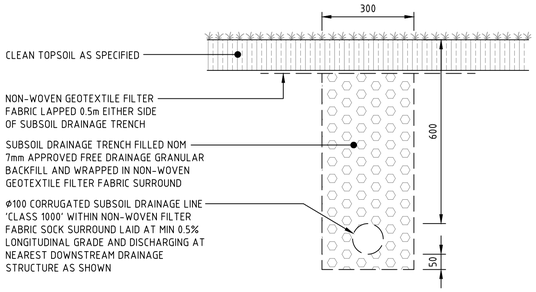
DRAWING SHEET SIZE = A1

Date: 03.10.2024 4:08 PM Plotted By: DIMITRI MAVROUDIS Found: O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\CI - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C05.01 - COMBINED SERVICES.dwg



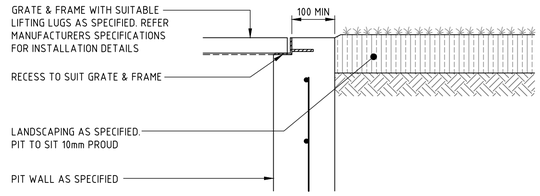
SUBSOIL DRAINAGE CLEAROUT 'CO'

CLEAROUT TO BE INSTALLED AT INTERMEDIATE POINTS ALONG SUBSOIL DRAINAGE LINES @ MAX 30m CENTRES AND DISCHARGING TO DRAINAGE STRUCTURES @ MAX 60m CENTRES.

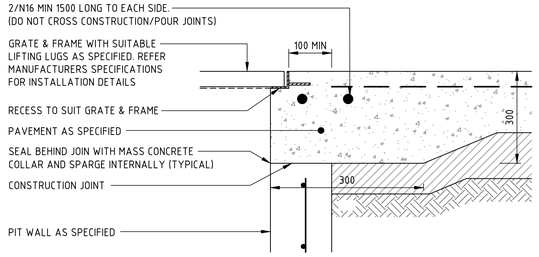


SUBSOIL DRAINAGE TRENCH - LANDSCAPING 'SSD'

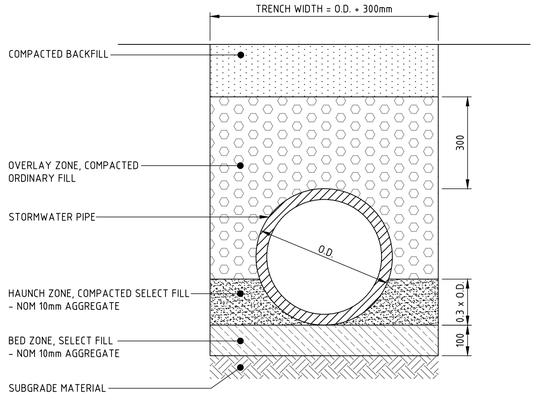
CLEAROUT TO BE INSTALLED @ MAX 30m CENTRES AND DISCHARGING TO DRAINAGE STRUCTURES @ MAX 60m CENTRES.



PIT INTERFACE - DETAIL 'D'

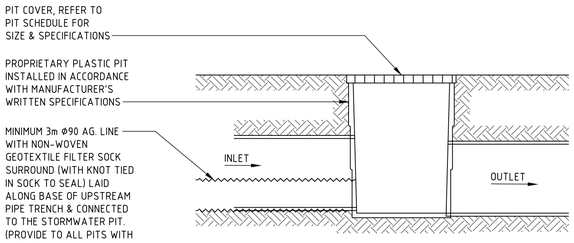


PIT INTERFACE - DETAIL 'B'

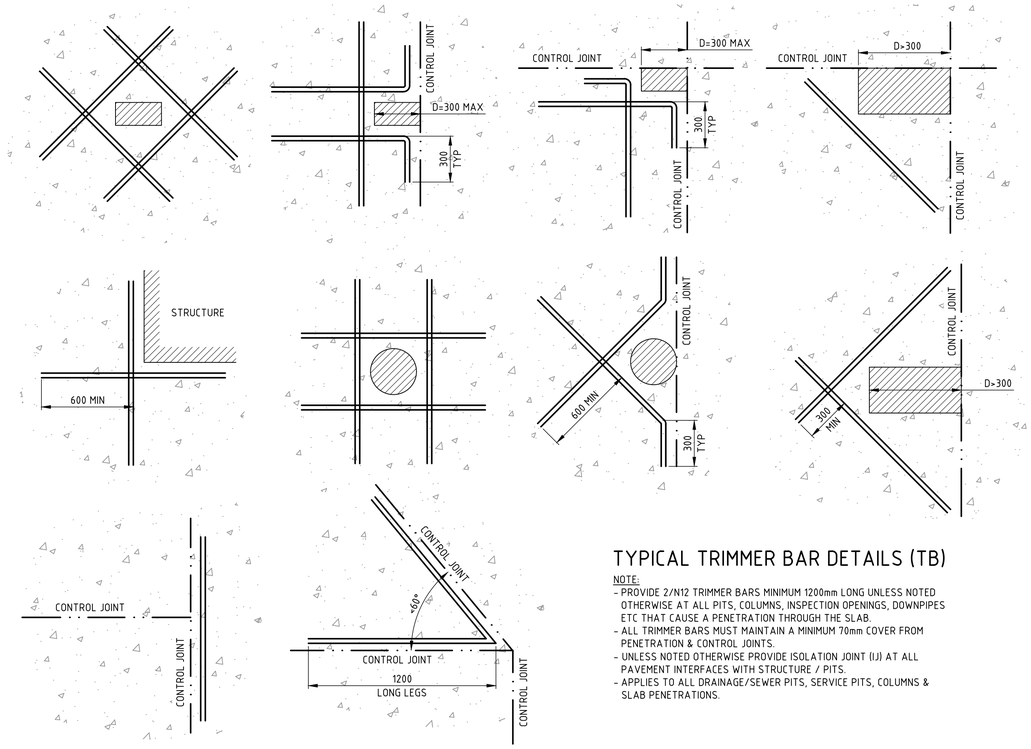


TYPICAL PIPE TRENCH - GENERAL AREAS

1. WHERE PROPRIETARY PRODUCT SUCH AS STORMPRO IS USED, PIPEWORK TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS
2. TRENCH WIDTH MAY NEED TO BE INCREASED SUBJECT TO ACHIEVING COMPACTION. ENSURE MINIMUM 300mm CLEARANCE BETWEEN, WHEN USING MULTIPLE PIPES TO ACHIEVE ADEQUATE COMPACTION.
3. THE CONTRACTOR SHALL ENSURE THAT SHORING OF TRENCHES IS INSTALLED AS REQUIRED BY STATUTORY REQUIREMENTS.
4. ENSURE BACKFILLING COMPACTION MEETS THE FOLLOWING STANDARDS;
   - 4.1. TRENCHES UNDER PAVED AREAS / BUILDING - 100% SMDD
   - 4.2. TRENCHES NOT UNDER PAVEMENTS - 95% SMDD

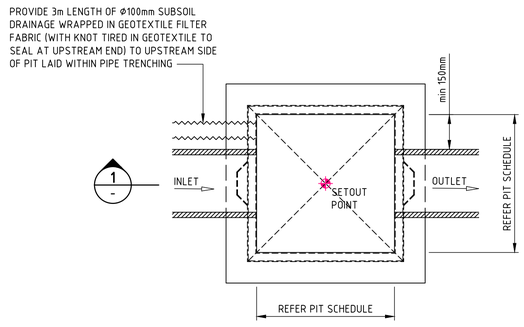


LIGHT DUTY STORMWATER PIT
(FOR PIPES Φ300 OR LESS & DEPTHS 0.45m OR LESS)



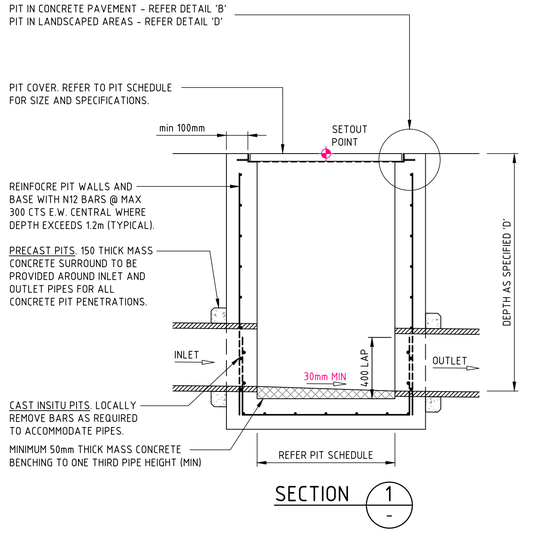
TYPICAL TRIMMER BAR DETAILS (TB)

NOTE:
- PROVIDE 2/N12 TRIMMER BARS MINIMUM 1200mm LONG UNLESS NOTED OTHERWISE AT ALL PITS, COLUMNS, INSPECTION OPENINGS, DOWNPIPES ETC THAT CAUSE A PENETRATION THROUGH THE SLAB.
- ALL TRIMMER BARS MUST MAINTAIN A MINIMUM 70mm COVER FROM PENETRATION & CONTROL JOINTS.
- UNLESS NOTED OTHERWISE PROVIDE ISOLATION JOINT (IJ) AT ALL PAVEMENT INTERFACES WITH STRUCTURE / PITS.
- APPLIES TO ALL DRAINAGE/SEWER PITS, SERVICE PITS, COLUMNS & SLAB PENETRATIONS.



PLAN
SURFACE INLET 'SIP' / JUNCTION PIT 'JP'

- PIT STRUCTURE TO BE 150mm THICK MINIMUM (UNLESS SHOWN OTHERWISE)
- REFER TO PIT INTERFACE DETAIL 'F' FOR CORNER REINFORCEMENT IF MESH IS USED IN LIEU OF N12-300 EACH WAY
- PROVIDE STEP IRONS IN ACCORDANCE WITH AS1657 WHEN PIT DEPTHS ARE GREATER THEN 1200mm
- SPARGE INTERNAL PIT FACE AT ALL PIPE CONNECTIONS AND PENETRATIONS.
- SHAPE BASE OF PIT TO DIRECT FLOWS TOWARDS OUTLET. PROVIDE A MINIMUM 30mm SMOOTH DROP FROM INLET TO OUTLET
- PROVIDE ADEQUATE LEVEL OF COMPACTION AROUND PIT. REFER TO SPECIFICATION FOR REQUIREMENTS.



SECTION 1 -

NOT FOR CONSTRUCTION

DRAWN: R KENNEDY DESIGNED: G WOOD JOB MANAGER: C PIPER VERIFIER:

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR 50% TENDER	RK		GW	25.11.22
2	ISSUED FOR 75% TENDER	RK		GW	19.12.22
3	ISSUED FOR TENDER	RK		GW	20.12.23
4	ISSUED FOR 75% DD	RK		GW	28.03.24
5	ISSUED FOR 100% TENDER	DM		GW	06.09.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

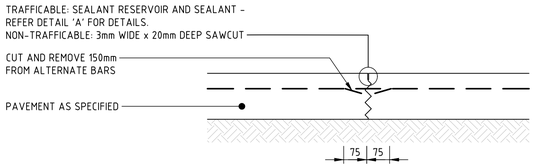
NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK
LIVVI'S PLACE PLAYSPACE
NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
CIVIL DETAILS SHEET 1

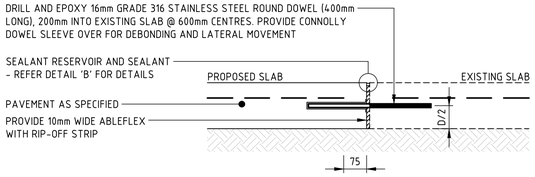
JOB NUMBER: NL213165
DRAWING NUMBER: DD-C09.01
REVISION: 5
DRAWING SHEET SIZE = A1

Date : 03.10.2024 4:06 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\O - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C09.01 - CIVIL DETAILS.dwg



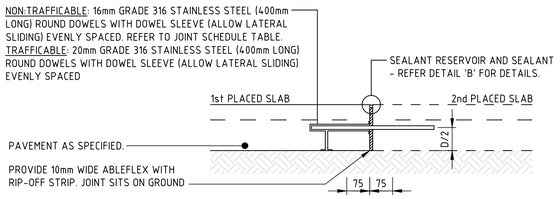
SAWN JOINT 'SJ'

- JOINT TO BE SAWN AS SOON AS CONCRETE HAS HARDENED SUFFICIENTLY THAT IT WILL NOT BE DAMAGED BY SAWING (MAX 24HRS)
- REFER PLANS AND SPECIFICATION NOTES FOR JOINT SPACINGS (2m UNO)



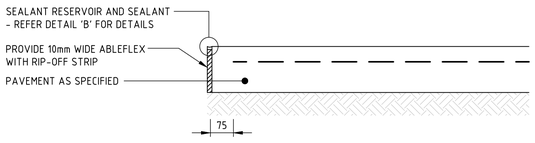
FOOTPATH DOWELED JOINT TO EXISTING 'DJ'

- TO ALSO BE USED AS A 'STOPWORK JOINT'
- JOINT TO BE INSTALLED TO MANUFACTURERS SPECIFICATIONS



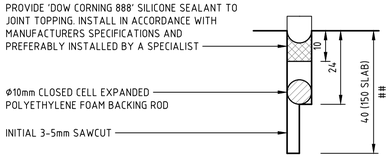
EXPANSION JOINT 'EJ'

- NOTE: PROVIDE ABILITY FOR LATERAL MOVEMENT IN SLAB EQUAL TO CONNOLLY UNIVERSAL DOWEL SLEEVES OR DANLEY DOWEL MASTER.



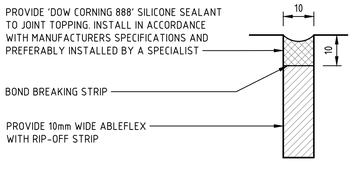
ISOLATION JOINT 'IJ'

- PROVIDE JOINT BETWEEN ALL NEW CONCRETE AND EXISTING STRUCTURES
- JOINT TO BE USED AGAINST ALL WALLS, FOOTINGS, COLUMNS, BACK OF KERB, SERVICE PITS, DRAINAGE PITS AND ALL SLAB PENETRATIONS

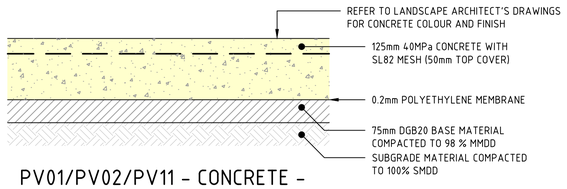


DETAIL 'A'

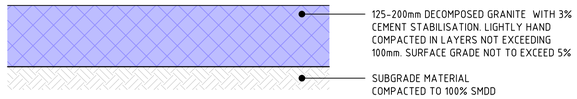
DEPTH OF CUT TO BE NO GREATER THAN PAVEMENT REINFORCEMENT (COVER -10mm)



DETAIL 'B'

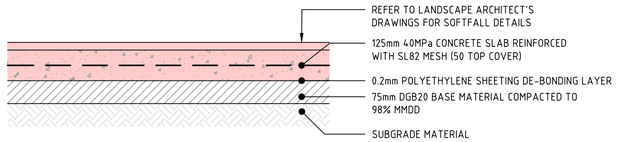


PV01/PV02/PV11 - CONCRETE - NON-TRAFFICABLE

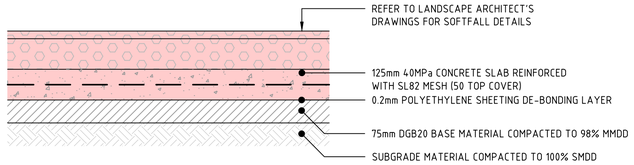


PV06 - GRANITIC GRAVEL PAVING

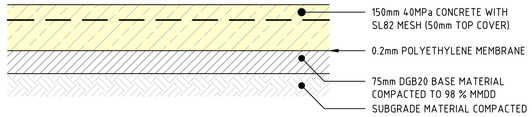
NOTE: ALL WORKS WITHIN TPZ TO BE SUPERVISED BY ARBORIST ENGAGED BY CONTRACTOR AND COUNCIL TO ENSURE NO ADVERSE IMPACT TO TREES



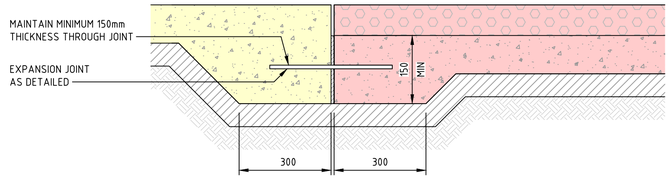
SF01 - SOFTFALL PAVEMENT



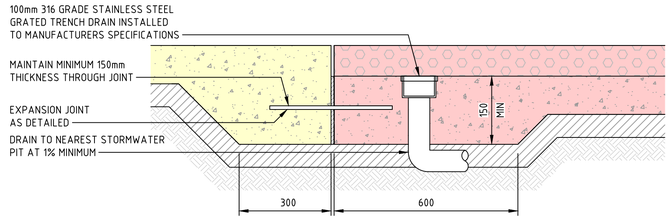
SF02 - SOFTFALL PAVEMENT - FALLZONES



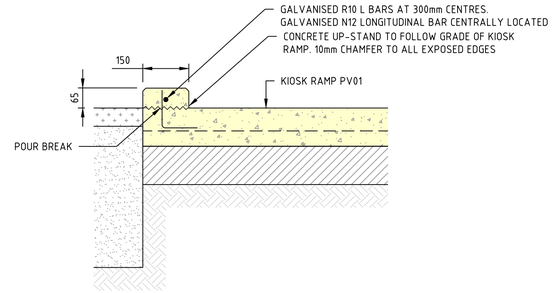
PV12 - CONCRETE - TRAFFICABLE



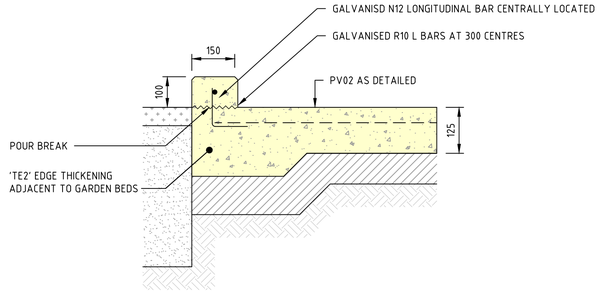
CONCRETE TO SOFTFALL INTERFACE



CONCRETE TO SOFTFALL INTERFACE WITH TRAPPED LOW POINT



KIOSK RAMP CONCRETE UPSTAND



KIOSK RAMP CONCRETE UPSTAND

PAVEMENT NOTES

1. CONFIRM MINIMUM 100KPa UNDER ALL PAVEMENTS PRIOR TO COMMENCEMENT
2. ALL WORKS WITHIN TPZ TO BE SUPERVISED BY ARBORIST ENGAGED BY CONTRACTOR AND COUNCIL TO ENSURE NO ADVERSE IMPACT TO TREES
3. PROVIDE AT LEAST 48 HOURS NOTICE TO THE ENGINEER FOR INSPECTION OF REINFORCEMENT, PRIOR TO POUR.
4. MAINTAIN COVER TO ALL REINFORCEMENT IN ACCORDANCE WITH THE 'REINFORCEMENT DETAILS'
5. USE ONLY STAINLESS STEEL DOWEL BARS (MIN. GRADE 316)
6. SEAL ALL JOINTS (U.N.O) USING 'SIKAFLEX-PRO' WITH COLOUR TO MATCH SURROUNDING PAVEMENT OR APPROVED EQUIVALENT
7. FOUNDATION CP01/CP02/CP03/FX06 - ALLOW FOR 300mm DGB20 COMPACTED TO 98% SMDD, SUCH THAT 400mm OF RESIDUAL FILL MATERIAL IS REMOVED
8. CP03/FX06 - ALLOW FOR 150mm DGB20 COMPACTED TO 98% SMDD
9. FX06 - ALLOW FOR N20 GALVANISED DOWELS 600mm LONG, MIN 300mm EMBEDMENT. ALLOW FOR 2 PER BOULDER, PER LAYER
10. FOR SUBGRADE PREP UNDER ALL FEATURES AND PAVEMENT ALLOW FOR COMPACTION OF EXISTING SUBGRADE TO 100% SMDD
11. REINFORCED NON-TRAFFICABLE CONCRETE PAVEMENTS MAY BE REPLACED WITH FIBRE REINFORCED PAVEMENT EPC 42mm FIBRES @ 3.5kg/m^3 (IN ACCORDANCE WITH CoN STANDARD DRAWING A1401)

INTERFACE DETAIL TABLE

PAVEMENT TYPE 1	PAVEMENT TYPE 2	INTERFACE TREATMENT
PV10 PERMEABLE PAVING	PV01 CONCRETE	THICKENED EDGE TE2
PV10 PERMEABLE PAVING	SF01 SOFTFALL	FLUSH KERB
FX11 JUNIOR PLAY WALKWAY	PV01/PV11 CONCRETE	THICKENED EDGE TE2
PV06 GRANITIC GRAVEL	SF01/SF02 SOFTFALL	ED03 (GARDEN EDGE)
SF01 SOFTFALL	PV01/PV02/PV11	SEE DETAIL ON THIS PAGE
SF02 SOFT FALL	PV01/PV02/PV11	SEE DETAIL ON THIS PAGE

VERIFIER:
JOB MANAGER: C PIPER
DESIGNED: G WOOD
DRAWN: R KENNEDY

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR 75% TENDER	RK		GW	19.12.23
2	ISSUED FOR COORDINATION	RK		GW	24.07.23
3	ISSUED FOR TENDER	RK		GW	20.12.23
4	ISSUED FOR 75% DD	RK		GW	28.03.24
5	ISSUED FOR 100% TENDER	DM		GW	06.09.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

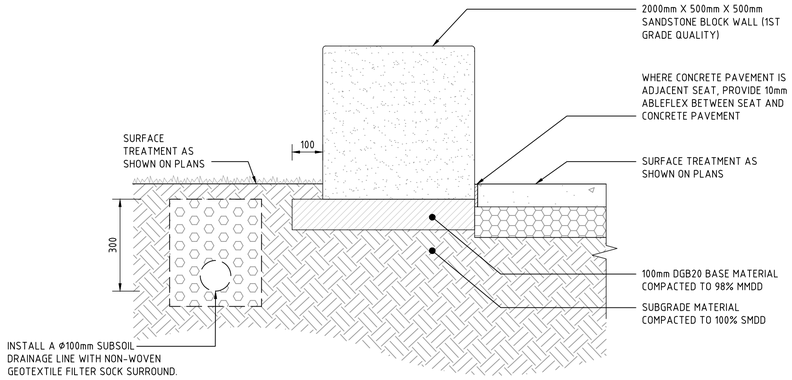
NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK LIVVI'S PLACE PLAYSPACE
NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
CIVIL DETAILS SHEET 2

JOB NUMBER: NL213165
DRAWING NUMBER: DD-C09.02
REVISION: 5
DRAWING SHEET SIZE = A1

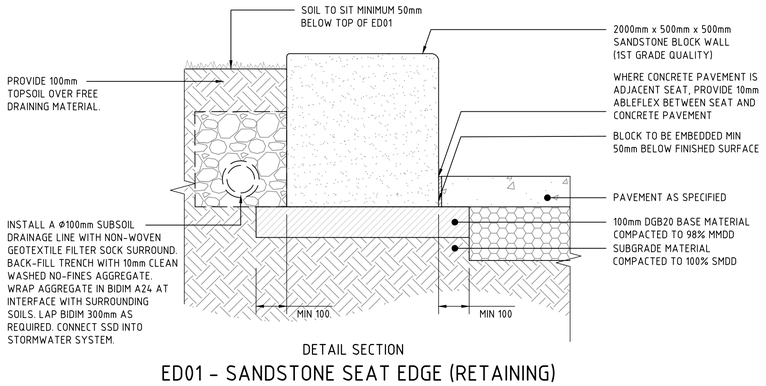
Date : 03.10.2024 4:06 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\D - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C09.01 - CIVIL DETAILS.dwg



DETAIL SECTION

ED01 - SANDSTONE SEAT EDGE

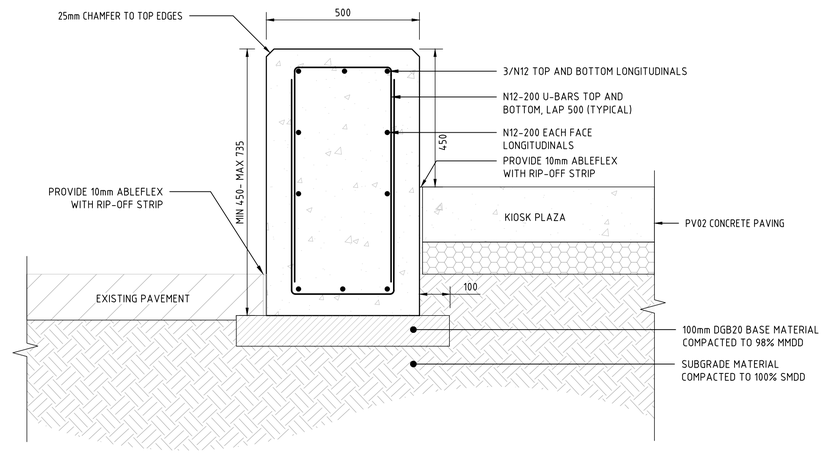
SCALE 1:10



DETAIL SECTION

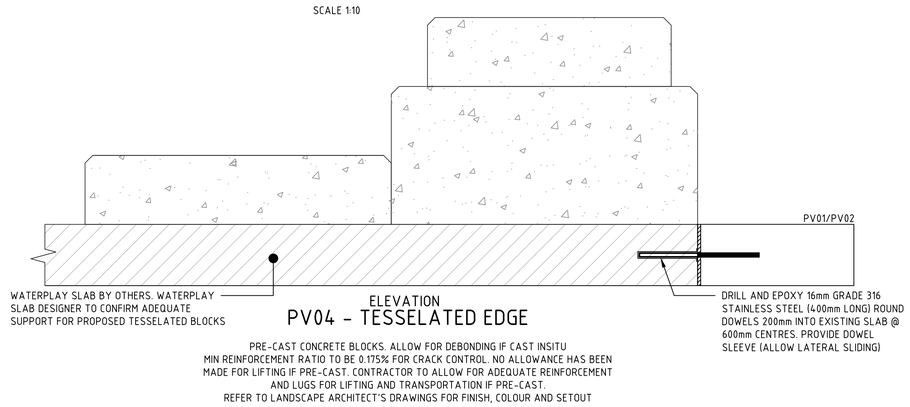
ED01 - SANDSTONE SEAT EDGE (RETAINING)

SCALE 1:10



WT02 - KIOSK SEAT EDGE - EXISTING PAVEMENT INTERFACE

SCALE 1:10



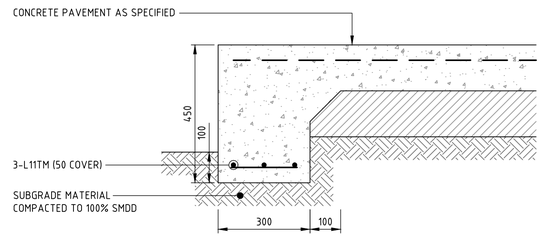
ELEVATION

PV04 - TESSELATED EDGE

PRE-CAST CONCRETE BLOCKS. ALLOW FOR DEBONDING IF CAST INSITU
MIN REINFORCEMENT RATIO TO BE 0.175% FOR CRACK CONTROL. NO ALLOWANCE HAS BEEN MADE FOR LIFTING IF PRE-CAST. CONTRACTOR TO ALLOW FOR ADEQUATE REINFORCEMENT AND LUGS FOR LIFTING AND TRANSPORTATION IF PRE-CAST.
REFER TO LANDSCAPE ARCHITECT'S DRAWINGS FOR FINISH, COLOUR AND SETOUT

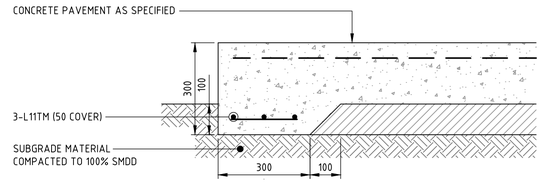
NOTES:

1. CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR REVIEW AND ACCEPTANCE BY NORTHROP PRIOR TO FABRICATION.
2. REFER TO PERFORMANCE SPECIFICATIONS NOTES ON DRAWING C01.12 FOR ALL FURNITURE



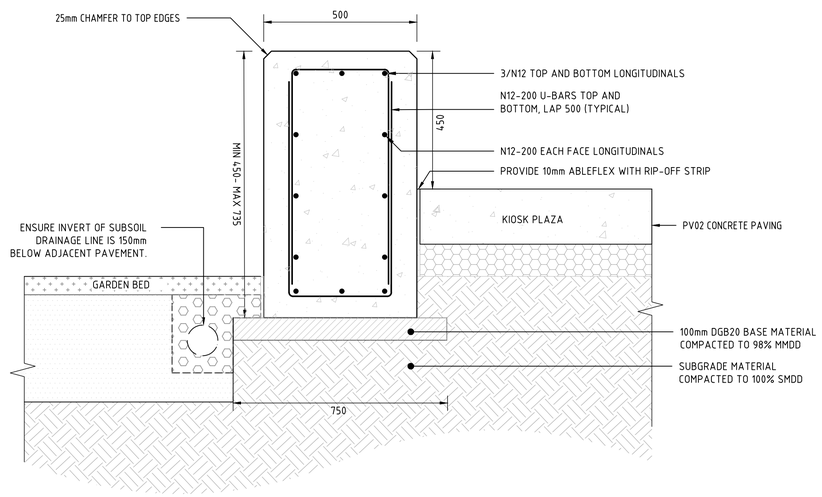
THICKENED EDGE DETAIL 'TE'

SELECT FILL COMPACTED TO 98% MMDD WHERE FILL IN EXCESS OF PAVEMENT THICKNESS



THICKENED EDGE DETAIL 'TE2'

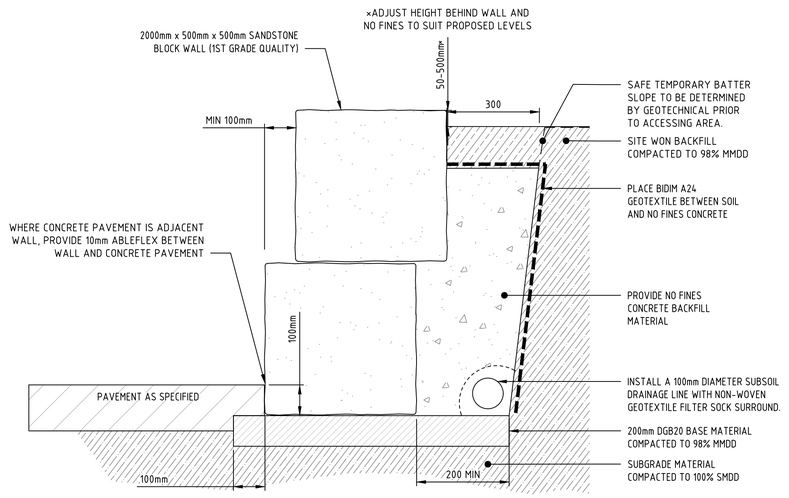
SELECT FILL COMPACTED TO 98% MMDD WHERE FILL IN EXCESS OF PAVEMENT THICKNESS



DETAIL SECTION

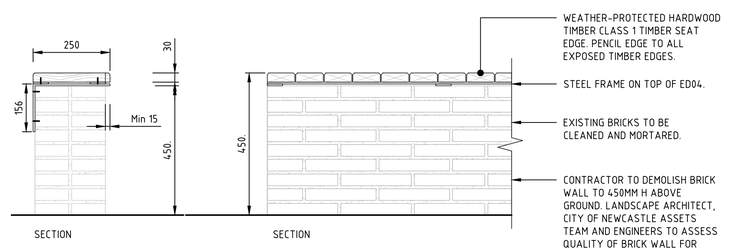
WT02 - KIOSK SEAT EDGE GB01 INTERFACE

SCALE 1:10



WT01 - SANDSTONE TWO-TIER RETAINING WALL

ALL EXISTING BRICKWORK TO BE RETAINED IS TO BE INSPECTED AND VERIFIED AS BEING STRUCTURALLY ADEQUATE AND FIT FOR PURPOSE BY A CHARTERED STRUCTURAL ENGINEER. PROPOSED SEATING LOCATIONS ARE ALSO TO BE VERIFIED AS SUITABLE.



ED05 - BRICK EDGE TIMBER SEAT

VERIFIER:
JOB MANAGER: C PIPER
DESIGNED: G WOOD
DRAWN: R KENNEDY

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR TENDER	RK		GW	20.12.23
2	ISSUED FOR 75% DD	RK		GW	28.03.24
3	ISSUED FOR 100% TENDER	DM		GW	06.09.24
4	ISSUED FOR 100% TENDER	DM		GW	03.10.24

CLIENT: City of Newcastle

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK LIVVI'S PLACE PLAYSPACE

NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

CIVIL DETAILS SHEET 3

JOB NUMBER: NL213165

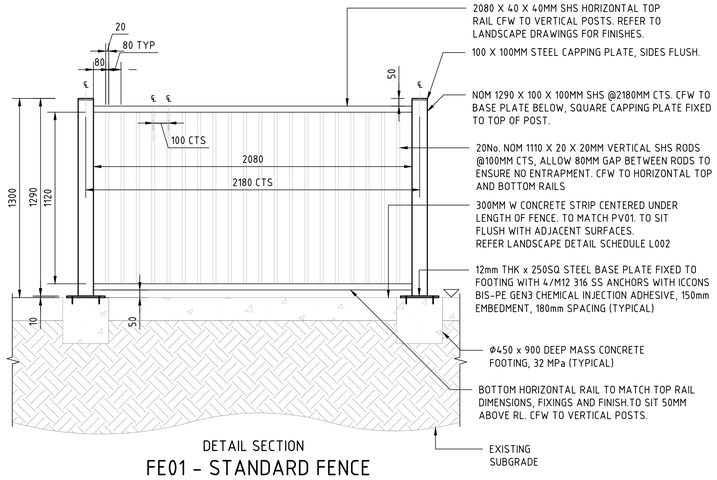
DRAWING NUMBER: DD-C09.03

REVISION: 4

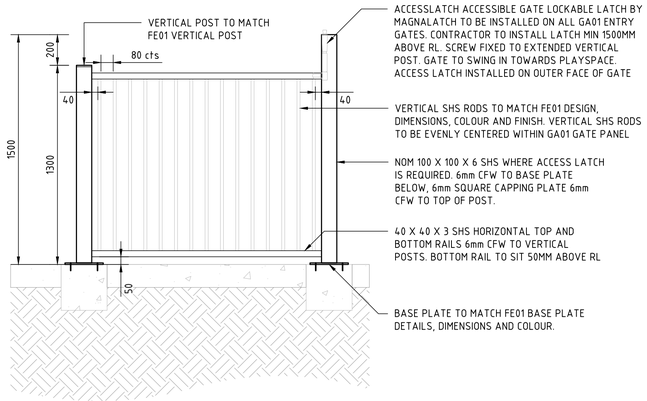
DRAWING SHEET SIZE = A1

Date : 03.10.2024 4:06 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\O - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C09.01 - CIVIL DETAILS.dwg

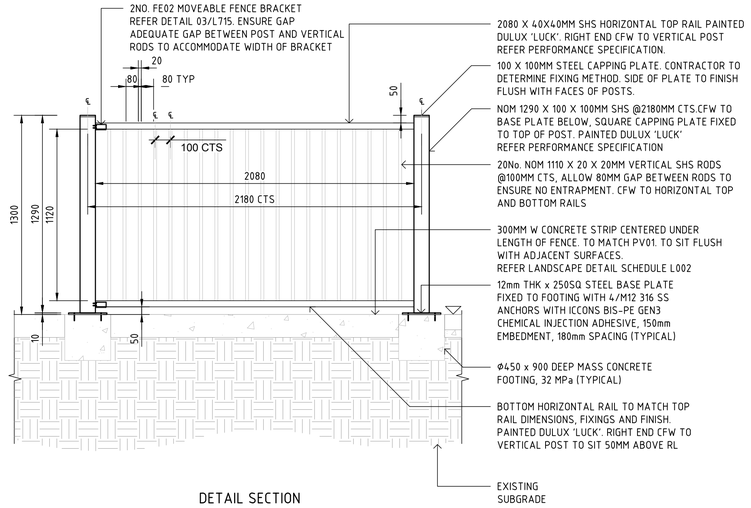
NOTES:
1. CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR REVIEW AND ACCEPTANCE BY NORTHROP PRIOR TO FABRICATION.
2. REFER TO PERFORMANCE SPECIFICATIONS NOTES ON DRAWING C01.12 FOR ALL FURNITURE



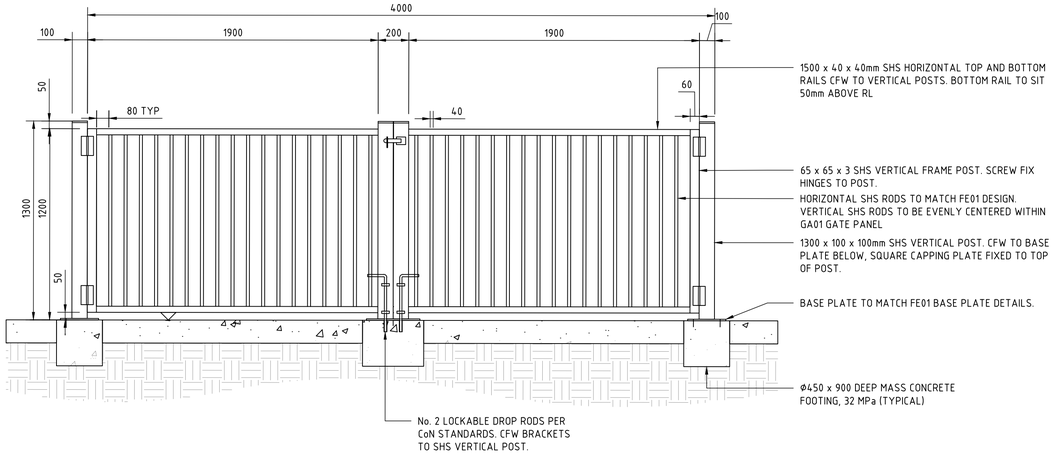
DETAIL SECTION
FE01 - STANDARD FENCE
SCALE 1:20



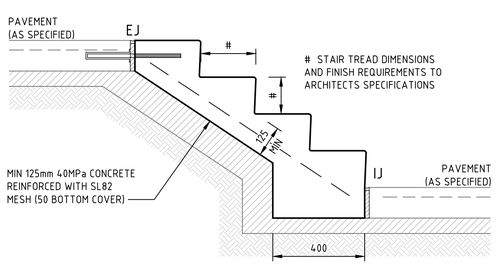
DETAIL SECTION
GA01 - ENTRY GATE
SCALE 1:20



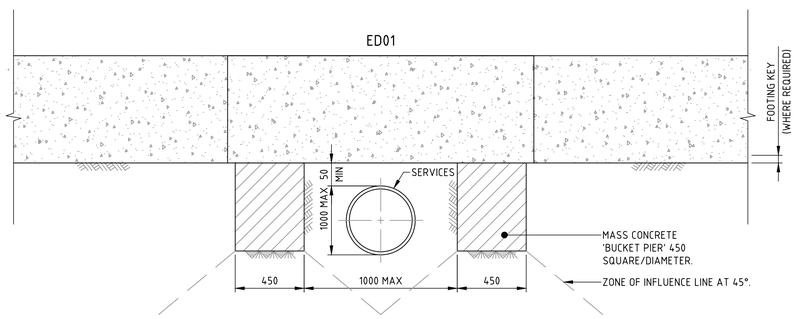
DETAIL SECTION
FE02 - MOVEABLE FENCE
SCALE 1:20



DETAIL SECTION
GA02 - DOUBLE MAINTENANCE GATE (4m)
SCALE 1:20



TYPICAL STAIR DETAIL



SERVICE BRIDGING DETAIL

DRAWN: R KENNEDY
DESIGNED: G WOOD
JOB MANAGER: C PIPER
VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR 75% DD	RK		GW	28.03.24
2	ISSUED FOR 100% TENDER	DM		GW	06.09.24
3	ISSUED FOR 100% TENDER	DM		GW	03.10.24

CLIENT: City of Newcastle
DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE
THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

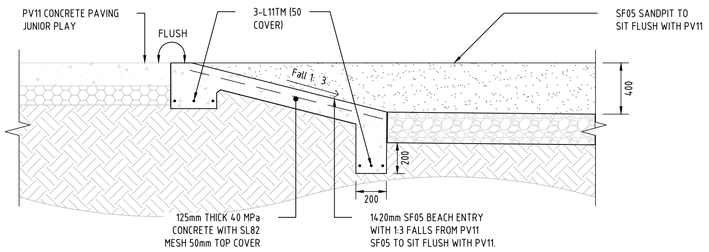
PROJECT: NEWCASTLE FORESHORE PARK LIVVI'S PLACE PLAYSPACE
NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
CIVIL DETAILS SHEET 4

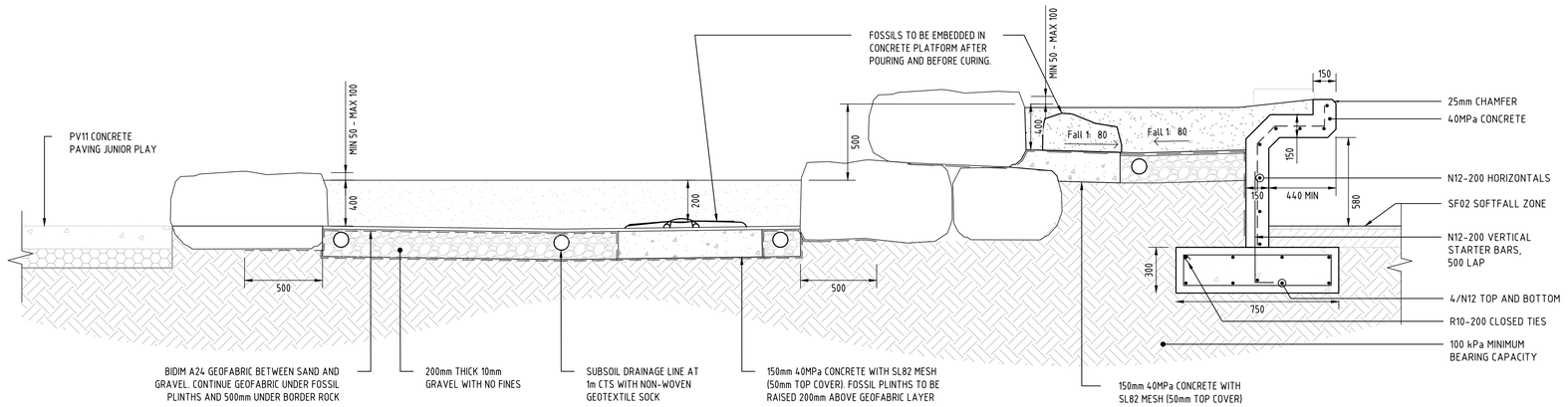
JOB NUMBER: NL213165
DRAWING NUMBER: DD-C09.04
REVISION: 3
DRAWING SHEET SIZE = A1

Date : 03.10.2024 4:06 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\O - Drawings\CIVIL\03-CAD\06- TENDER\NL213165-DD-C09.01 - CIVIL DETAILS.dwg

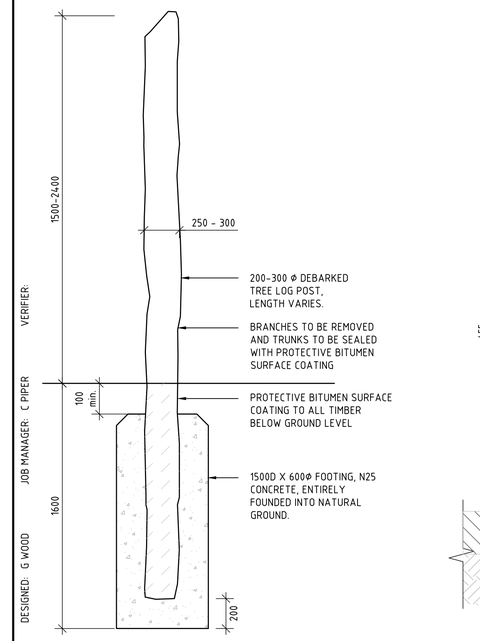
NOTES:
1. CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR REVIEW AND ACCEPTANCE BY NORTHROP PRIOR TO FABRICATION.
2. REFER TO PERFORMANCE SPECIFICATIONS NOTES ON DRAWING C01.12 FOR ALL FURNITURE



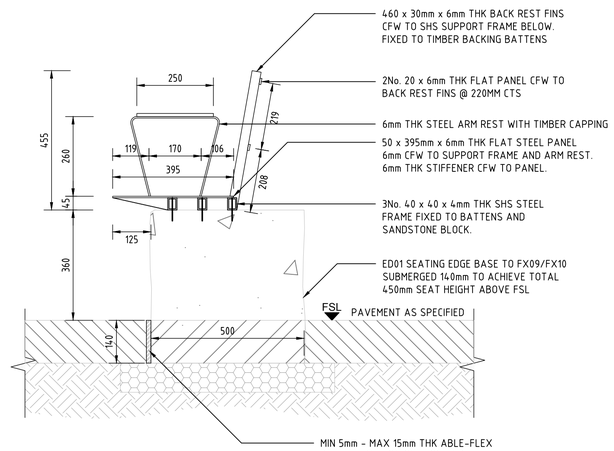
SECTION
SF05(B) - SAND PIT ENTRY



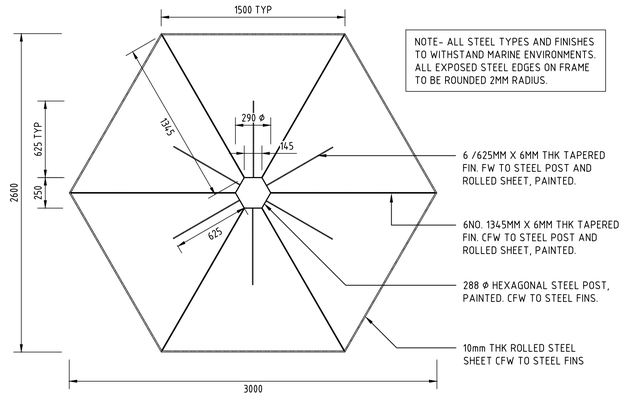
SECTION
SF05(A) - SAND PIT



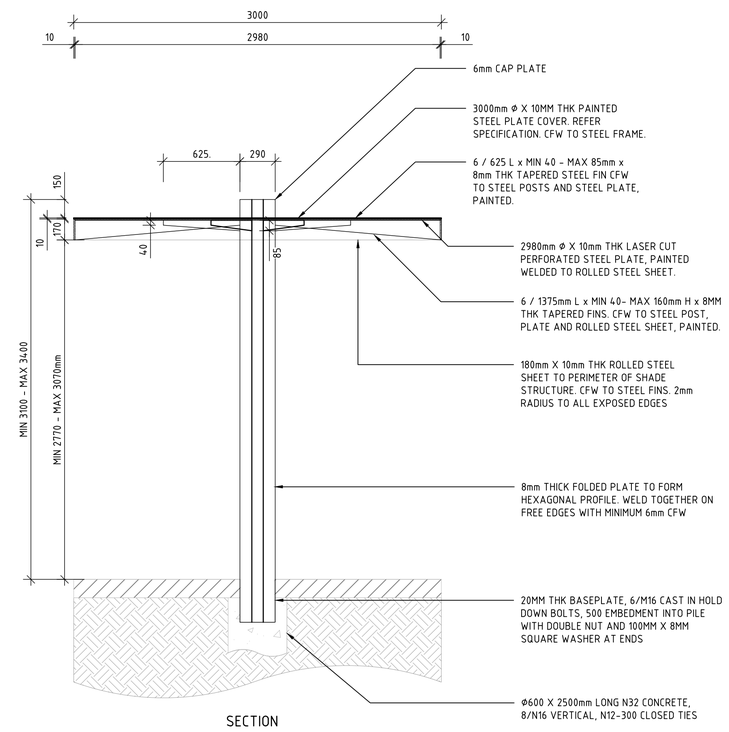
SECTION
CP06 - LOG POLE
SCALE 1:20



SECTION
FX09/FX10 - TIMBER SEAT TOP WITH ARMREST FRAME
SCALE 1:10



PLAN
FX07 - SHADE STRUCTURE - PANEL COVER
SCALE 1:25



SECTION
FX07 - SHADE STRUCTURE - GENERAL
SCALE 1:25

NOT FOR CONSTRUCTION

DESIGNED: G WOOD
DRAWN: R KENNEDY
JOB MANAGER: C PIPER
VERIFIER:

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR 75% DD	RK		GW	28.03.24
2	ISSUED FOR 100% TENDER	DM		GW	06.09.24
2	ISSUED FOR 100% TENDER	DM		GW	03.10.24

CLIENT: City of Newcastle
DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: TCL LANDSCAPE ARCHITECTURE

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PARK LIVVI'S PLACE PLAYSPACE
NEWCASTLE, N.S.W, 2300

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
CIVIL DETAILS SHEET 5

JOB NUMBER: NL213165
DRAWING NUMBER: DD-C09.05
REVISION: 3
DRAWING SHEET SIZE = A1

Date : 03.10.2024 4:06 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2021 Jobs\NL213165 - Newcastle Foreshore Park\O - Drawings\CIVIL\03-CAD\05- TENDER\NL213165-DD-C09.01 - CIVIL DETAILS.dwg

NEWCASTLE FORESHORE PLAYSPACE KIOSK

NEWCASTLE, NSW 2300
HYDRAULIC SERVICES



HYDRAULIC SERVICES DRAWING LIST

DRAWING No.	DRAWING TITLE
H000	COVER SHEET & DRAWING SCHEDULE
H001	GENERAL AND SPECIFICATION NOTES
H010	SITE PLAN - PART 1 - DRAINAGE & PRESSURE SERVICES
H100	GENERAL ARRANGEMENT PLAN DRAINAGE & PRESSURE SERVICES

DRAWN: D. FULLER
DESIGNED: S. LEE
JOB MANAGER: S. LEE
VERIFIER:

NOT FOR CONSTRUCTION

REV	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	FOR INFORMATIION	DF		SL	20.12.23
2	75% DETAILED DESIGN	AS		SL	25.03.24
A	100% DETAILED DESIGN	VY		MB	06.09.24

CLIENT: City of Newcastle

DRAWINGS NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: tonkin zulaikha greer

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL SETOUT TO ARCHITECT'S DRAWINGS. DIMENSIONS TO BE VERIFIED WITH ARCHITECT AND BUILDER BEFORE COMMENCING SHOP DRAWINGS OR SITE WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

NORTHROP
Newcastle
Level 1, 215 Pacific Highway , Charlestown N.S.W. 2290
Ph (02) 4943 1777 Email: newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PLAYSPACE KIOSK
NEWCASTLE, NSW 2300

DRAWING TITLE: HYDRAULIC SERVICES
COVER SHEET & DRAWING SCHEDULE

JOB NUMBER: NL213165
DRAWING NUMBER: H000
REVISION: A
DRAWING SHEET SIZE = A1

GENERAL

1. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH RELEVANT AUTHORITY REQUIREMENTS COUNCIL REGULATIONS, SUPERINTENDENT'S APPROVAL, THIS HYDRAULIC SPECIFICATION, AUSTRALIAN STANDARDS AND NATIONAL PLUMBING CODES AS.1596, AS.3500 & AS.5601

2. ALL WORK SHALL COMPLY WITH THE FOLLOWING AUSTRALIAN STANDARDS:
   A. AS3500.1 TO 4 - 2021
   B. AS5601

3. THIS PLANS SHALL BE READ IN CONJUNCTION WITH APPROVED ARCHITECTURAL, STRUCTURAL, MECHANICAL, ELECTRICAL AND LANDSCAPE PLANS AND SPECIFICATIONS.

4. THOROUGHLY EXAMINE THE DRAWINGS, CHECK UP ALL FIGURED DIMENSIONS IMMEDIATELY AFTER THE CONTRACT IS AWARDED, AND OBTAIN SUCH INFORMATION AND MEASUREMENTS AS MAY BE REQUIRED TO CARRY OUT THE WORK. NOTIFY THE SUPERINTENDENT OF ANY DISCREPANCIES AND HAVE THEM VERIFIED. CAREFULLY SUPERVISE, LAYOUT, CHECK AND DO ALL LEVELING AND MEASURING NECESSARY TO PROPERLY PLACE WORK. UNDER NO CIRCUMSTANCES SHALL PAYMENT BE MADE FOR REINSTALLATION OR ALTERATION OR WORK INCORRECTLY PLACED DUE TO INSUFFICIENT SUPERVISION AND CHECKING.

5. EXISTING SERVICES HAVE BEEN PLOTTED FROM SUPPLIED DATA. THE SUPERINTENDENT DOES NOT GUARANTEE THEIR ACCURACY AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO ESTABLISH THE LOCATION OF ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF ANY WORK. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT AUTHORITY.

6. DO NOT OBTAIN DIMENSIONS BY SCALING THE DRAWINGS. USE DIMENSIONED DRAWINGS ONLY. WHERE SOME DOUBT EXISTS SEEK CLARIFICATION OF THE SUPERINTENDENT.

7. ALL SERVICES SHALL BE FREE OF EACH OTHER AND EASILY REPLACEABLE FOR THEIR FULL LENGTH. PIPES SHALL BE SO ARRANGED WITH INSPECTION OPENINGS, VALVES, AND SIMILAR ITEMS OF EQUIPMENT PLACED TO BE ACCESSIBLE.

8. ALL PIPE SIZES SHALL CONFORM TO THE RELEVANT AUSTRALIAN STANDARDS AND BE IN ACCORDANCE WITH THE MATERIALS SPECIFIED IN THE MATERIALS SCHEDULE. PIPE SIZES SHOWN ON DRAWINGS AND/OR DETAILED IN THIS SPECIFICATION ARE DIAMETER NOMINAI (DN) AND ARE INTERNAL DIAMETERS. THE EQUIVALENT PIPE DN FOR THE DIFFERENT MATERIALS SHALL BE SELECTED USING THE TABLES AS SETOUT IN AS/NZS3500.1 AND AS/NZS3500.4 AND THE MANUFACTURERS DATA SHEETS.

9. WHEREVER POSSIBLE PIPES SHALL BE RUN PARALLEL WITH EACH OTHER, MINIMISE CROSSOVERS AND UNSIGHTLY GROUPINGS. ALL PIPES SHALL BE ACCURATELY SET OUT, FULLY DESIGNED AND COORDINATED PRIOR TO COMMENCING FABRICATION AND INSTALLATION.

10. WHERE DIRECTED, SAMPLES OF EACH KIND OF MATERIAL TO BE USED SHALL BE LABELLED AND SUBMITTED FOR APPROVAL DETAILING MANUFACTURE AND SOURCE OF SUPPLY. AFTER APPROVAL THE MATERIALS DELIVERED TO THE WORKS SHALL BE IN ACCORDANCE WITH THE APPROVED SAMPLES.

11. IN THE EVENT OF MATERIALS BEING A MIXED DESCRIPTION AND QUALITY, THE SUPERINTENDENT SHALL HAVE POWER TO ORDER TO HAVE THOSE PORTIONS OF THE MATERIALS WHICH ARE SUITABLE FOR THE WORKS, PICKED OUT, MARKED AND STACKED WHERE DIRECTED AND ALL DEFECTIVE OR UNSUITABLE MATERIALS REMOVED FROM THE SITE.

12. SITE MODIFICATIONS, DIVERSIONS AND/OR DISCONNECTIONS AFFECTING THE WORK SHALL BE REPORTED IMMEDIATELY. PROVIDE ALL NECESSARY ASSISTANCE FOR THE RESOLUTION OF SUCH DIFFICULTIES IN CONJUNCTION WITH THE SUPERINTENDENT AND THE AUTHORITIES.

13. DURING CONSTRUCTION, LEAVE ALL UNFINISHED WORK IN A SAFE CONDITION, PROTECTING THE WORKS AGAINST DAMAGE OR LOSS THROUGH ANY CAUSE WHATSOEVER. SEAL OFF OPEN ENDS OF PIPES IN SUCH A MANNER AS TO PREVENT THE ENTRY OF FOREIGN MATTER INTO THE LINES, UNTIL THE WORKS HAVE BEEN HANDED OVER ON COMPLETION.

14. THE CONTRACTOR SHALL PAY ALL NECESSARY FEES AND CHARGES AND OBTAIN APPROVAL CERTIFICATES ASSOCIATED WITH THE DESIGN DOCUMENTATION AND INSTALLATION OF HYDRAULIC SERVICES WORKS FROM THE RELEVANT AUTHORITY. SUBMIT ALL APPROVAL CERTIFICATES TO THE SUPERINTENDENT.

15. TENDERERS ARE ADVISED TO VISIT AND INSPECT THE SITE AND THE EXISTING AND/OR ADJACENT STRUCTURES PRIOR TO TENDERING TO ACQUAINT THEMSELVES WITH ITS NATURE, MEANS OF ACCESS, WORKING SPACE, NOTE LEVELS AND LOCAL CONDITIONS AND INCLUDE AND ALLOW FOR IN THE TENDER ALL NECESSARY ITEMS WHICH ARE IMPLIED BUT WHICH MAY NOT BE STATED. THE TENDERER ACKNOWLEDGES THAT BEFORE TENDERING HE INSPECTED THE SITE AND HAS BECOME CONVERSANT WITH ALL VISIBLE EXISTING CONDITIONS OF ACCESS TO THE SITE FOR BUILDING PURPOSES AND HAS ALLOWED FOR ALL SUCH FACTORS IN THEIR TENDER. NO CLAIMS ARISING FROM THE NEGLECT OF THE FOREGOING ON THE GROUNDS OF IGNORANCE OF THE AMOUNT AND KIND OF WORK INVOLVED AND THE CONDITIONS, UNDER WHICH THE WORKS WILL BE EXECUTED, WILL BE APPROVED.

16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE RECTIFICATION OF ALL DEFECTS IN THE WORK DUE TO FAULTY MATERIALS AND/OR WORKMANSHIP FOR THE DURATION OF THE TWELVE (12) MONTH DEFECTS LIABILITY PERIOD COMMENCING FROM THE DATE OF PRACTICAL COMPLETION. THE CONTRACTOR ON ADVICE SHALL MAKE DEFECTS GOOD IMMEDIATELY, UPON IDENTIFICATION AND RECEIPT FROM THE SUPERINTENDENT. ANY DEFECTS DISCOVERED DURING THE DEFECTS LIABILITY PERIOD WHICH ARE DUE TO DEFAULT OR NEGLIGENCE BY THE CONTRACTOR IN THE PERFORMANCE OR OBSERVANCE OF ANY OF HIS OBLIGATIONS, SHALL EXTEND THE PERIOD TO ENABLE SUCH DEFECTS TO BE MADE GOOD BY THE CONTRACTOR AND TO ALLOW THE WHOLE WORK AFTER BEING MADE GOOD IN EVERY WAY, TO BE PROVED SATISFACTORY.

17. WHEN IN THE OPINION OF THE SUPERINTENDENT, THE BUILDING AND THE WORKS ARE PRACTICALLY COMPLETED, A NOTICE OF PRACTICAL COMPLETION WILL BE ISSUED, STATING THE DATE UPON WHICH THE WORKS WERE PRACTICALLY COMPLETED. THIS DATE SHALL BE THE DATE FROM WHICH THE GUARANTEE, WARRANTY AND DEFECTS LIABILITY PERIODS SHALL OPERATE. THIS NOTICE WILL NOT BE ISSUED UNTIL THE SYSTEMS HAVE BEEN PROPERLY COMMISSIONED AND UNTIL THE CONTRACTOR HAS SUPPLIED OPERATING AND MAINTENANCE INSTRUCTIONS.

18. IN CASE OF DOUBT OR DISCREPANCY REFER TO SUPERINTENDENT FOR CLARIFICATION OR CONFIRMATION PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

19. ALL PLANS ARE TO BE READ IN CONJUNCTION WITH THE ENGINEERING PLANS, AND ANY OTHER PLANS OR WRITTEN INSTRUCTIONS THAT MAY BE ISSUED AND RELATING TO DEVELOPMENT AT THE SUBJECT SITE.

20. ON PRACTICAL COMPLETION THE CONTRACTOR SHALL ISSUE A CERTIFICATION STATEMENT FOR ALL HYDRAULIC SERVICES ESSENTIAL SERVICES INSTALLED BY THE CONTRACTOR AS REQUIRED BY THE BCA, LOCAL COUNCIL, AND AUSTRALIAN STANDARDS.

EXISTING SERVICES

1. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH RELEVANT AUTHORITY REQUIREMENTS, COUNCIL REGULATIONS, AND SUPERINTENDENT'S APPROVAL,

2. REFER ALSO TO GENERAL REQUIREMENTS SECTION OF THIS DRAWING.

3. THE CONTRACTOR SHALL COMPLY WITH ALL STATUTORY AND INDUSTRIAL REQUIREMENTS FOR PROVISION OF A SAFE WORKING ENVIRONMENT INCLUDING TRAFFIC CONTROL.

4. ALL EXISTING UTILITY SERVICES INDICATED ON THE DRAWINGS ORIGINATE FROM SUPPLIED DATA, THEREFORE THEIR ACCURACY AND COMPLETENESS IS NOT GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE AND CONFIRM THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY.

5. THE CONTRACTOR SHALL PROTECT AND MAINTAIN ALL EXISTING SERVICES THAT ARE TO BE RETAINED IN THE VICINITY OF THE PROPOSED WORKS. ANY AND ALL DAMAGE TO THESE SERVICES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR UNDER THE DIRECTION OF THE SUPERINTENDENT, AND AT NO EXTRA COST.

6. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR ADJUSTMENT (IF REQUIRED) OF EXISTING SERVICES IN AREAS AFFECTED BY WORKS.

7. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR THE CAPPING OFF, EXCAVATION AND REMOVAL (IF REQUIRED) OF EXISTING SERVICES IN AREAS AFFECTED BY WORKS UNLESS DIRECTED OTHERWISE ON THE DRAWINGS OR BY THE SUPERINTENDENT.

8. THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES SERVICES TO ALL BUILDINGS NOT AFFECTED BY THE WORKS ARE NOT DISRUPTED. INTERUPTION TO SUPPLY OF EXISTING SERVICES SHALL BE DONE SO AS NOT TO CAUSE ANY INCONVENIENCE TO THE PRINCIPAL.

9. PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL GAIN APPROVAL OF THE PROGRAM FOR THE RELOCATION AND/OR CONSTRUCTION OF TEMPORARY SERVICES AND FOR ANY ASSOCIATED INTERRUPTION OF SUPPLY.

10. THE CONTRACTOR SHALL CONSTRUCT TEMPORARY SERVICES TO MAINTAIN EXISTING SUPPLY TO BUILDINGS REMAINING IN OPERATION DURING WORKS TO THE SATISFACTION AND APPROVAL OF THE SUPERINTENDENT. ONCE THE DIVERSION IS COMPLETE AND COMMISSIONED THE CONTRACTOR SHALL REMOVE ALL SUCH TEMPORARY SERVICES AND MAKE GOOD TO THE SATISFACTION OF THE SUPERINTENDENT.

11. EXCAVATOR OPERATORS MUST WORK WITH A DEDICATED SPOTTER.

12. IDENTIFY THE LOCATION OF ALL EXISTING SERVICES WITH A SERVICES LOCATOR PRIOR TO COMMENCING EXCAVATION. NDD/POTHOLE IDENTIFIED SERVICES TO PHYSICALLY SIGHT AND IDENTIFY ALL SERVICES ALONG AND ADJACENT TO THE LINE OF EXCAVATIONT. **DO NOT EXCAVATE WITH MECHANICAL EQUIPMENT WITHIN 1m OF IDENTIFIED SERVICES.**

WATER SERVICES

1. REFER ALSO TO GENERAL REQUIREMENTS SECTION OF THE NOTES.

2. MATERIALS: REFER TO MATERIAL SCHEDULE SECTION OF THIS DRAWING

3. ALL WORKS TO BE IN ACCORDANCE WITH LOCAL RELEVANT COUNCIL REQUIREMENTS, SPECIFICATIONS, AUSTRALIAN STANDARDS. CONFLICTS SHALL BE REFERRED TO THE SUPERINTENDENT FOR DIRECTION.

4. ALL WORK TO BE INSTALLED IN ACCORDANCE WITH AS/NZS 3500.1 &4 AND TO THE LOCAL AUTHORITY REQUIREMENTS.

5. ALL MATERIALS TO BE IN ACCORDANCE WITH AS/NZS 3500.1 & 4 AND TO THE LOCAL AUTHORITY REQUIREMENTS.

6. CONTRACTOR TO ENSURE THAT ALL FIXTURES, FITTINGS AND TAPWARE ARE WATERMARK APPROVED.

7. ALL PIPE SIZES SHALL CONFORM TO THE RELEVANT AUSTRALIAN STANDARDS AND BE IN ACCORDANCE WITH THE MATERIALS SPECIFIED IN THE MATERIALS SCHEDULE. PIPE SIZES SHOWN ON DRAWINGS AND/OR DETAILED IN THIS SPECIFICATION ARE DIAMETER NOMINAI (DN) AND ARE INTERNAL DIAMETERS. THE EQUIVALENT PIPE DN FOR THE DIFFERENT MATERIALS SHALL BE SELECTED USING THE TABLES AS SETOUT IN AS/NZS3500.1 AND AS/NZS3500.4 AND THE MANUFACTURERS DATA SHEETS.

8. ALL HOSE COCKS TO BE INSTALLED WITH VACUUM BREAKER BACKFLOW PREVENTION AS A MINIMUM. HOSE TAPS LOCATED WITHIN AREAS OF A HIGHER HAZARD SHALL BE PROVIDED WITH APPROPRIATE BACKFLOW PREVENTION AS NOMINATED IN AS/NZS 3500.

9. ISOLATION VALVES, THERMOSTATIC MIXING VALVES AND TEMPERING VALVES ARE TO BE LOCATED WHERE SHOWN ON THE DRAWINGS AND IN ACCORDANCE WITH AS/NZS 3500

10. ALL HOSE COCKS LOCATED WITHIN 18m OF GREASE ARRESTORS SHALL BE INSTALLED WITH RZPD BACKFLOW PREVENTION DEVICE.

11. NO CHASES ALLOWED UNLESS APPROVED IN WRITING BY SUPERINTENDENT.

12. WHERE PIPES ARE IN CONTACT WITH DISSIMILAR MATERIALS THEY ARE TO BE PROTECTED AGAINST BI-METAL CORROSION.

13. ANY STORED OR CIRCULATED HOT WATER IS TO BE AT NO LESS THAN 60°C.

14. ALL HOT WATER PIPEWORK SHALL BE INSULATED IN ACCORDANCE WITHAS/NZS 3500.4 AND THE BCA SECTION J.

SANITARY/TRADEWASTE DRAINAGE

1. REFER ALSO TO GENERAL REQUIREMENTS SECTION OF THE NOTES.

2. MATERIALS: REFER TO MATERIAL SCHEDULE SECTION OF THIS DRAWING.

3. CONTRACTOR SHALL ALLOW FOR ADDITIONAL EXCAVATION (INCLUDING ROCK) AND BACKFILL OF PIPES, FITTINGS AND ALL JUMP-UPS TO THE LOCAL AUTHORITY REQUIREMENTS, INCLUDING THOSE TO BRANCH DRAINS.

4. ALL BRANCH LINES SHALL BE GRADED AND/OR LOWERED TO AVOID PENETRATING FOOTING BEAMS UNLESS SHOWN OTHERWISE. THE CONTRACTOR SHALL ALLOW FOR ADDITIONAL PIPE LENGTHS AND WORK INCLUDING CONSTRUCTION OF ADDITIONAL INSPECTION OPENINGS AS REQUIRED BY THE LOCAL AUTHORITY.

5. CO-ORDINATE WITH STRUCTURAL DRAWINGS. NO STEEL REINFORCING BARS TO BE CUT WITHOUT PRIOR WRITTEN APPROVAL FROM STRUCTURAL ENGINEER.

6. EXISTING DRAINS SHOWN ARE TO BE ABANDONED AND FITTINGS/PIPE SEALED OFF AT MANHOLES OR ON MAIN LINES.

7. AN OVERFLOW GULLY SHALL BE INSTALLED TO PROVIDE A SAFE POINT OF RELEASE IN THE EVENT OF BLOCKAGE. THE HEIGHT OF GRATE BELOW LOWEST INTERNAL OPENING AND ABOVE FINISHED GROUND LEVEL SHALL BE IN ACCORDANCE WITH AS/NZS 3500.2.

8. PROVIDE INTERNAL AND EXTERNAL CLEAROUT FITTINGS WHERE SHOWN ON THE DRAWINGS. INTERNAL - CHROME PLATED SCREWED BRASS SEALED ACCESS COVER SET FLUSH IN FLOOR FINISH EXTERNAL - PVC SEALED BOLTED TRAP SCREW ACCESS COVER SET FLUSH IN SURFACE FINISH OR WHEN IN A LANDSCAPE AREA SET IN PRECAST CONCRETE SURROUND.

9. INSTALL INSPECTION OPENINGS (IO's) IN ALL PIPE WORK TO PROVIDE A POINT OF ACCESS FOR MAINTENANCE. IO's SHALL BE LOCATED IN ACCORDANCE WITH THE REQUIREMENTS OF AS/NZS 3500.2

WORKS AS EXECUTED

1. REFER ALSO 'GENERAL REQUIREMENTS' SECTION OF NOTES.

2. THE CONTRACTOR SHALL MAINTAIN AN ACCURATE SET OF RECORDS OF THE SERVICE AS IT IS CONSTRUCTED. ALL PIPELINE POSITIONS AND LEVELS SHALL BE RECORDED BY SURVEY.

3. THE SITE RECORDS OF THE INSTALLATION SHALL FORM THE BASIS OF THE 'WORKS AS EXECUTED' DRAWINGS. WaE DRAWINGS SHALL BE PREPARED IN CAD FORMAT AND SUBMITTED IN .DWG AND .PDF TO THE CONSULTANT FOR REVIEW.

4. THE SURVEY PICKUP OF THE INSTALLED PIPEWORK SHALL BE DONE AT EVERY CHANGE OF DIRECTION AND AT EVERY FUSION FITTING JOINT ON STRAIGHT RUNS OF PIPE WORK BETWEEN CHANGES OF DIRECTION.

5. THE CONSULTANT DRAWINGS HAVE BEEN PREPARED BASED ON EXISTING SERVICES INFORMATION FROM AUTHORITY RECORDS AND/OR SURVEY. THE CONTRACTOR IS TO VERIFY ALL PIPEWORK LAYOUTS ON SITE AND SHOW ALL VARIATIONS TO NEW AND EXISTING PIPEWORK ON THE 'WORKS AS EXECUTED' DRAWINGS.

MATERIALS SPECIFICATION SCHEDULE

SERVICE	LOCATION	MATERIAL	COMMENT	COMPLIANCE
SANITARY DRAINAGE	INGROUND	uPVC PIPES AND FITTINGS. JOINTS: SOLVENT CEMENT WELDED. 100mm: 6m CLASS SN6	BEDDING: 100mm CLEAN SAND COMPACTED BACKFILL: 300mm CLEAN SAND MINIMUM 150mm SEPARATION VERTICAL AND HORIZONTAL	AS1260, AS3500 WATERMARK BCA, NCC PLUMBING CODE OF AUSTRALIA LOCAL AUTHORITY
SANITARY PLUMBING/AERIAL DRAINAGE	ABOVE GROUND	uPVC PIPES AND FITTINGS. JOINTS: SOLVENT CEMENT WELDED.		AS4198, AS3500 WATERMARK BCA, NCC PLUMBING CODE OF AUSTRALIA LOCAL AUTHORITY
COLD WATER SERVICE	INGROUND	CLASS PE100 SDR11 PN16 PIPE (BLUE STRIPE) SUPPLIED IN STRAIGHT LENGTHS AND JOINTED WITH FUSION WELDED FITTINGS NOTE: USE ROTARY SCRAPER ONLY TO PREPARE PIPE ENDS FOR JOINTING. ***"POTATOE PEELER" TYPE SHAVERS NOT TO BE USED.***	BEDDING: 100mm CLEAN SAND COMPACTED BACKFILL: 300mm CLEAN SAND MINIMUM 150mm SEPARATION VERTICAL AND HORIZONTAL	AS4130, AS2033, AS3500 WATERMARK BCA, NCC PLUMBING CODE OF AUSTRALIA LOCAL AUTHORITY
	ABOVE GROUND	TYPE B COPPER TUBE AND COPPER/BRASS FITTINGS. JOINTS: 5% SILVER SOLDER ***OR*** MECHANICAL COMPRESSION FITTINGS		AS1432, AS3500 WATERMARK BCA, NCC PLUMBING CODE OF AUSTRALIA LOCAL AUTHORITY
VALVES	WATER	DR BRASS BALL WITH UNION FOR REMOVAL		AS/NZS 5601, AGA APPROVED, AS3500 WATERMARK BCA, NCC PLUMBING CODE OF AUSTRALIA LOCAL AUTHORITY
INGROUND WARNING TAPE	ALL INGROUND SERVICES	DETECTABLE UNDERGROUND MARKING TAPE	LAY OVER ALL SERVICES AT 300mm ABOVE SERVICE.COLOUR AND LABELLED IDENTIFIABLE TO THE SERVICE TYPE	AS2648, AS1335, AS3500 BCA, NCC PLUMBING CODE OF AUSTRALIA LOCAL AUTHORITY

NOTE: ALL PIPE SIZES SHOWN ON DRAWING ARE DN (internal nominal diameter) SELECT THE EQUIVALENT MINIMUM INTERNAL DIAMETER OR LARGER FOR THE MATERIAL TYPE SPECIFIED AND TO BE INSTALLED.

ABBREVIATIONS

AFFL	ABOVE FINISHED FLOOR LEVEL
BFW	BUCKET FLOOR WASTE
BSN	BASIN
CO	CLEAR OUT
CO/VR	CLEAR OUT/VERTICAL RISE
CV	CONTROL VALVE
CW	COLD WATER SERVICE
DP	DOWNPIPE
ex.	EXISTING
FFL	FINISHED FLOOR LEVEL
FW	FLOOR WASTE
HT	HOSE TAP
IL	INVERT LEVEL
IO	INSPECTION OPENING
IS	INSPECTION SHAFT
OFG	OVERFLOW GULLY
RL	RELATIVE LEVEL
RPZD	REDUCED PRESSURE ZONE DEVICE
SMH	SEWER MANHOLE
SUR	SURFACE LEVEL
SV	STOP VALVE
SVPB	STOP VALVE IN PATH BOX
TD	TUNDISH
TW	TRADE WASTE
TWV	TRADE WASTE VENT
VP	VENT PIPE
WB	WATER BASIN
WC	WATER CLOSET

DRAINAGE SERVICES LEGEND

- SANITARY DRAINAGE
- AUTHORITIES SEWER
- SANITARY VENT
- TRADE WASTE
- TRADE WASTE VENT

PRESSURE SERVICES LEGEND

- COLD WATER - EXISTING
- COLD WATER - AMENITIES
- COLD WATER - KIOSK
- COLD WATER - WATER PLAY
- HOT WATER - AMENITIES
- WARM WATER - AMENITIES

SYMBOLS

- STOP/CONTROL VALVE
- PIPE DROPPER TO BELOW
- PIPE RISER TO ABOVE
- PIPE END CAP
- SMH — SEWER MANHOLE
- HOSE TAP
- OFG — OVERFLOW GULLY
- FLOOR WASTE
- REFLUX VALVE
- IN-GROUND INSPECTION OPENING
- CLEAROUT - EXTERNAL
- BACKFLOW PREVENTION ASSEMBLY - RPZD
- THERMOSTATIC MIXING VALVE
- SERVICE RISER TAG - (xxx / zzz)
  WHERE xxx DENOTES SERVICE TYPE, zzz DENOTES PIPE SIZE AND FILLED BLACK TIP DENOTES FLOW DIRECTION (TOP FOR UPWARDS FLOW, BOTTOM FOR DOWNWARDS FLOW)

NOT FOR CONSTRUCTION

VERIFIER:
JOB MANAGER: S. LEE
DESIGNED: S. LEE
DRAWN: D. FULLER

REV	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	FOR INFORMATIION	DF		SL	20.12.23
2	75% DETAILED DESIGN	AS		SL	25.03.24
A	100% DETAILED DESIGN	VY		MB	06.09.24

CLIENT: City of Newcastle
DRAWINGS NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: tonkin zulaikha greer

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL SETOUT TO ARCHITECT'S DRAWINGS. DIMENSIONS TO BE VERIFIED WITH ARCHITECT AND BUILDER BEFORE COMMENCING SHOP DRAWINGS OR SITE WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

NORTHROP
Newcastle
Level 1, 215 Pacific Highway , Charlestown N.S.W. 2290
Ph (02) 4943 1777 Email: newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PLAYSPACE KIOSK
NEWCASTLE, NSW 2300

DRAWING TITLE: HYDRAULIC SERVICES
GENERAL AND SPECIFICATION NOTES

JOB NUMBER: NL213165
DRAWING NUMBER: H001
REVISION: A
DRAWING SHEET SIZE = A1

ALLOW TO DISCONNECT REDUNDANT SERVICES TO BUILDING.

1. CAP OFF PROPERTY SEWER INSPECTION SHAFT TO HUNTER WATER REQUIREMENTS.

2. LOCATE EXISTING COLD WATER FEED TO BUILDING. DISCONNECT AND REMOVE REDUNDANT PIPE WORK TO BUILDING AND EXTEND SERVICE TO SUPPLY QCV'S.

VERIFIER:

JOB MANAGER: S. LEE

DESIGNED: S. LEE

DRAWN: D. FULLER

EXTENT OF WORKS

AMENITIES AND KIOSK

WATER PLAY PLANTROOM

VENT PIPE RISES ON WALL IN PLANTROOM

1m³ WASTE WATER PUMP STATION WITH DUAL PUMPS AND CONTROL PANEL. LOCATE CONTROL PANEL IN PLANTROOM. ALINE PUMPS MODEL KPPS-1200-D PUMP DUTY 1.5 L/sec @ 10 m/H

SRM 50

DN20 COLD WATER SUPPLY TO BUBBLER

RISING MAIN DISCHARGES TO OFG AT BUILDING

RELOCATED WATER METER

DN25 COLD WATER SUPPLY WITH QCV FIXED TO GMS POST @ 450 AFGL

DN20 COLD WATER SUPPLY TO BUBBLER

INDICATIVE LOCATION OF EXISTING WATER SERVICES (Ex.W) BASED ON FORESHORE PARK MASTER SURVEY PROVIDED BY NCC. ALLOW TO SERVICE SEARCH, POT HOLE AND VISUALLY IDENTIFY THE EXACT LOCATION, SIZE AND MATERIAL ON SITE AND DIVERT AS REQUIRED.

RELOCATE EXISTING WATER METER ASSEMBLY TO OUT SIDE OF FENCE LINE

ex. W

WATER SUPPLY CONNECTION POINT TO TOWER FOR CONNECTION BY OTHERS.

WATER SUPPLY CONNECTION POINT TO TOWER FOR CONNECTION BY OTHERS.

DN20 COLD WATER SUPPLY TO BUBBLER

DN25 COLD WATER SUPPLY WITH QCV FIXED TO GMS POST @ 450 AFGL

QCV

50

NOT FOR CONSTRUCTION

REV	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	FOR INFORMATIION	DF		SL	20.12.23
2	75% DETAILED DESIGN	AS		SL	25.03.24
A	100% DETAILED DESIGN	VY		MB	06.09.24

CLIENT: City of Newcastle

DRAWINGS NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: tonkin zulaikha greer

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD

ALL SETOUT TO ARCHITECT'S DRAWINGS. DIMENSIONS TO BE VERIFIED WITH ARCHITECT AND BUILDER BEFORE COMMENCING SHOP DRAWINGS OR SITE WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

0 2000 4000 6000 8000 10000 1:200 @ A1

NORTHROP
Newcastle
Level 1, 215 Pacific Highway , Charlestown N.S.W. 2290
Ph (02) 4943 1777 Email: newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: NEWCASTLE FORESHORE PLAYSPACE KIOSK
NEWCASTLE, NSW 2300

DRAWING TITLE: HYDRAULIC SERVICES
SITE PLAN - PART 1 - DRAINAGE & PRESSURE SERVICES

JOB NUMBER: NL213165
DRAWING NUMBER: H010
REVISION: A
DRAWING SHEET SIZE = A1

Appendix G

Flood Impact Assessment

Torrent Consulting

Torrent Consulting Pty Ltd
PO Box 57
Wallsend NSW 2287

ABN 11 636 418 089

www.torrentconsulting.com.au

Our Ref: DJW: L.T2548.003.docx

20 August 2024
City of Newcastle
12 Stewart Avenue
Newcastle West NSW 2302
Attention: Michael Cavanagh

Dear Michael

RE: FORESHORE PARK FLOOD IMPACT ASSESSMENT

Background

Torrent Consulting was engaged by the City of Newcastle (CN) to undertake a Flood Impact Assessment for the proposed redevelopment of Foreshore Park, Newcastle East (the Project), which includes the construction of a play space, and filling of an existing artificial lagoon (Frog Pond) between the Newcastle Train Sheds and Wharf Road, as presented in Figure 1.

Foreshore Park is relatively flat and low-lying, as presented in Figure 2, with the contributing catchment area being locally confined to the hills comprising Newcastle East, draining an area of around 0.5 km².

A TUFLOW model was developed to simulate the local catchment processes contributing runoff to the Site. This information was used to summarise the existing flood conditions and establish the potential flood risks at the Site.

The proposed development was incorporated into the TUFLOW model, with the results compared to existing flood conditions for the purpose of a relative Flood Impact Assessment.

Model Development

For this assessment, a TUFLOW combined hydrological and hydraulic model was developed that covers the contributing upstream catchment, downstream to the edge of Newcastle Harbour, as presented in Figure 3.

The model utilised the NSW Spatial Services LiDAR data product, downloaded via the ELVIS Foundation Spatial Data portal to define the catchment topography. A survey Digital Elevation Model (DEM) covering Foreshore Park was also included in the model. The model was constructed using a 2 m horizontal grid cell resolution, with the sub-grid sampling (SGS) routine enabled to define model elevations from a 1 m resolution LiDAR DEM, and from the 0.5 m resolution survey DEM, which is a suitable resolution for capturing overland flow paths and other topographical features within the park.

The local pit and pipe drainage network was provided by Council and incorporated into the model as 1D elements, dynamically linked to the 2D domain.

Due to the primarily urban catchment, a single urban land use coverage was applied within the model and assigned a Manning's 'n' roughness of 0.03. A depth varied Manning's roughness was applied to better represent the influence of the surface roughness under shallow flow conditions.

Large buildings were represented as physical obstructions, blocking out flows.

Downstream boundaries of the model were configured as stage discharge boundaries at grades ranging between 0.1% and 20%.

Design rainfall was applied directly to the TUFLOW model DEM, generating catchment runoff.

The TUFLOW model was used to simulate the catchment rainfall-runoff process, utilising the ensemble storm method outlined in the ARR 2019 guidelines.

Flood Modelling and Mapping

The TUFLOW model of the catchment was simulated (using the HPC solver) for the full range of design rainfall events for storm durations ranging from 15 minutes to 6 hours. The design rainfall depths were sourced from the BoM IFD (Intensity Frequency Duration) portal. Due to the relatively small size of the contributing catchment, no Areal Reduction Factor (ARF) was applied.

Rainfall losses were modelled using the Green-Ampt infiltration method, with a three-layer soil model comprising a 0.1 m deep topsoil, 0.2 m transition zone and a variable depth subsoil layer. The depth of the subsoil layer was derived from the September 2019 CSIRO gridded soil depth mapping dataset.

The model area was nominated at 70% impervious, with the Green-Ampt losses interpolated accordingly.

The ensemble method involves the simulation of ten rainfall temporal patterns for each design event magnitude and duration, with the average condition of the ten being adopted for design purposes. The TUFLOW model simulations were analysed at the Site to identify the critical storm duration, i.e. that which produces the peak flood flow for each design event magnitude. The 45-minute duration was identified as being critical for the 20% AEP and 10% AEP events, the 30-minute duration was critical for the 5% AEP and 2% AEP events, the 25-minute duration was critical for the 1% AEP event, and the 20-minute duration was critical for the 0.5% AEP and the 0.2% AEP flood events.

The Probable Maximum Flood (PMF) was simulated using the Generalised Short Duration Method (GSDM), with the 15-minute duration found to provide the critical flood duration at the Site. The simulated peak design flood flows at the Site are summarised in Table 1.

Table 1 – Modelled Peak Design Flood Flows at the Play Space

Design Event	Flow (m^3/s)
1.0 EY	0.01
0.5 EY	0.20
20% AEP	0.45
10% AEP	0.79
5% AEP	0.94
2% AEP	0.97
1% AEP	0.98
0.5% AEP	1.01
0.2% AEP	1.04
PMF	3.1

The proposed surface changes within the play space footprint, and the filling of the lagoon were included within the model, along with proposed changes to the local piped drainage network, with the design events re-simulated to establish post-development flood conditions.

The modelled peak flood extents for the 5% AEP, 1% AEP and PMF events under post-development conditions are presented in Figure 4. Figure 5, Figure 6, and Figure 7 are presented for additional flooding context and show the modelled peak flood depths 5% AEP, 1% AEP and PMF events, respectively.

As Foreshore Park is relatively flat and essentially comprised of interconnected storage areas, the modelled hazard classification is largely depth driven as local velocities do not exceed 0.9 m/s up to the 1% AEP event. Therefore, only the hazard mapping is presented within the main part of the report as modelled hazard levels better illustrate the flood risk within the Project area.

Figure 8, Figure 9, and Figure 10 present the flood hazard classification at the Site for the 5% AEP, 1% AEP and PMF events, respectively. The flood hazards have been determined in accordance with Guideline 7-3 of the Australian Disaster Resilience Handbook 7 Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia (AIDR, 2017). This produces a six-tier hazard classification, based on modelled flood depths, velocities, and velocity-depth product. The hazard classes relate directly to the potential risk posed to people, vehicles, and buildings, as presented in Chart 1.

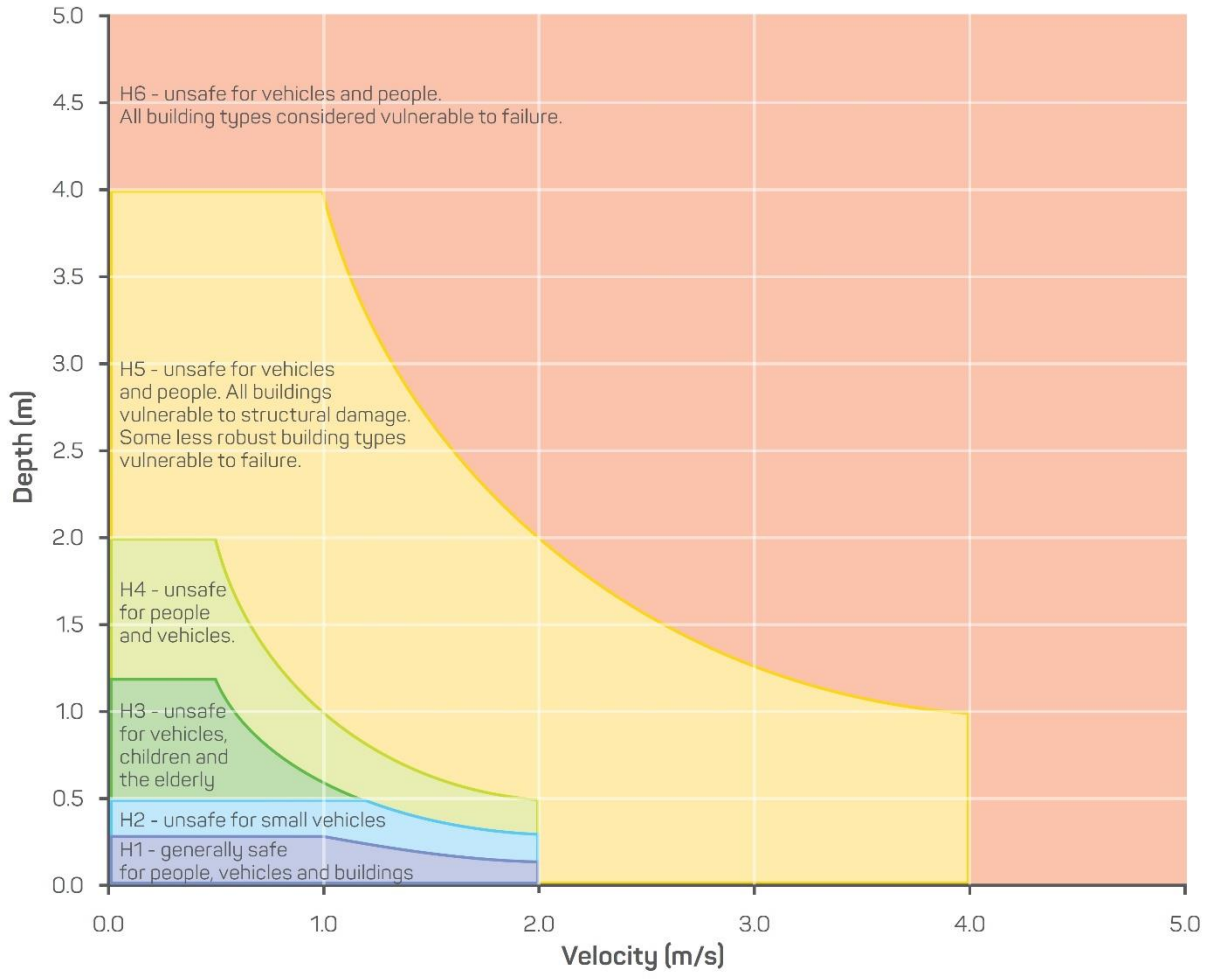


Chart 1 – General Flood Hazard Vulnerability Curves (AIDR, 2017)

For additional context, the flood depth and hazard for all additional design events is presented in Appendix A, along with the modelled flood velocity for all simulated design events.

Flood conditions at the Site do not present any tangible risk, as local catchment flooding is contained to low-lying areas that could be readily evacuated to adjacent high ground during a significant event. The mapped flood hazards do not exceed H2 within the Project area at the 1% AEP, which does not present a tangible risk to life. The H3 hazard mapped within the Project area at the PMF is depth driven, as flood velocities do not exceed 0.6 m/s, with anyone in these areas during a flood event likely to witness rising water and respond by moving to higher ground.

Council has requested advice on an appropriate Finished Floor Level (FFL) for a proposed pump room within the Project area. To ensure long-term flood immunity, using the 0.5% AEP level to set an appropriate FFL will act as a proxy for future climate change. And so, it recommended the FFL of the proposed pump room be at or above the 0.5% AEP level of 2.5 m AHD.

Flood Impact Assessment

The modelled flood levels and flood velocities for the post-development scenario were compared to the simulated existing flood levels to determine the relative flood impacts.

The flood mapping shows that there are three distinct areas of ponded flood water – one at the train sheds, one at the lagoon and a depression west of the existing play area (where the main stormwater pipe is located). The flood water can only move from one area to the other via the stormwater drainage network and/or overland if the surface water reaches a high enough level.

Topographical changes proposed for the Project results in redistribution of these flow paths, however, the impacts to the existing flood conditions are effectively just redistributing water within the broader Foreshore Park area and do not propagate upstream to the neighbouring properties.

Due to the low velocities modelled within Foreshore Park and the Project area under existing conditions, localised changes to flood velocity do not present any tangible increase to flood risk. Modelled changes to flood velocity are due to the redistribution of flow. Localised velocity increases occur in areas already subject to very low velocities, and such, peak velocities do not exceed 1.0 m/s within the Project area under post-development conditions. As such, flood velocity impact mapping has not been shown in the main part of this report, with flood velocity impacts for all design flood events presented in Appendix B.

Figure 11, Figure 12, and Figure 13 present the modelled peak flood level impacts for the 5% AEP, 1% AEP, and PMF events, respectively. Flood level impacts for additional design events are presented in Appendix B.

The changes to surface levels within the proposed Play Space interrupts the existing flow path connecting the train sheds to the area west of the existing play area. Floodwater currently spills from the train sheds to the north-west via the existing footpath from around the 20% AEP event, at a control level of around 2.22 m AHD.

Under post-development conditions, the control level will be increased to 2.33 m AHD, preventing flows from the train sheds until around the 10% AEP event, which results in increased flood levels at the train sheds. This level increase in turn pushes more water overland to the lagoon and propagates south into the Bond Street carpark.

Overland flows from the depression to the west of the Play Space will also be interrupted by the proposed works. Minor level increases will occur in this area up to around the 5% AEP event due to the higher control level. However, with more flow being directed from the train sheds toward the lagoon, flood levels are reduced in the depression at higher magnitude events.

The impact of increased flows toward the lagoon will be exacerbated by the proposed partial filling of the lagoon. Subsequent increased flood levels within the footprint of the lagoon results in additional flows spilling north to the carpark on Wharf Road.

Flood level impacts within the Bond Street and Wharf Road car parks do not present an increase to flood risk in these areas, as there is no tangible change to the flood hazard classification within either of the parking areas for any of the modelled flood events.

Table 2 summarises the peak change to flood levels within the main areas that are impacted by the proposed development, showing peak level impacts in the depression to the west of the proposed Play Space, the train sheds, the lagoon, and within the Wharf Road and Bond Street car parks for all simulated design events.

Table 2 – Modelled Peak Flood Level Impacts (mm)

Design Event	Depression	Train Sheds	Lagoon	WR Car Park	BS Car Park
1.0 EY	280	15	90	0	13
0.5 EY	164	31	129	0	0
20% AEP	170	38	220	0	13
10% AEP	112	41	470	0	22
5% AEP	30	34	270	0	45
2% AEP	-33	26	220	40	19
1% AEP	-45	25	130	88	18
0.5% AEP	-26	34	123	78	7
0.2% AEP	-46	38	76	73	0
PMF	-73	28	31	15	0

Conclusion

The redevelopment of Foreshore Park, Newcastle East requires a Flood Impact Assessment to ensure the proposed redevelopment does not significantly alter the existing flood conditions and result in adverse changes to the existing flood risk profile. The assessment has included development of a TUFLOW combined hydrological and hydraulic model to simulate the rainfall-runoff process for the local catchment and establish design flood conditions within the Project area for the existing and post-development scenarios.

Existing flood conditions within the Project area present a low to medium flood risk, with a peak hazard of H3 mapped at the PMF event. While an H3 hazard classification is considered unsafe for children and the elderly, the nature of flooding within the Project area will allow suitable opportunity for anyone within the area to move to higher ground if local depressions were to begin filling with water. Further, it is not expected that the Site will be occupied during the torrential rainfall required to generate flooding.

The proposed pump room is susceptible to flood damage, and so an FFL at or above the 0.5% AEP flood level of 2.5 m AHD is recommended to minimise the risk of damage during a flood event. 2.6 m AHD should be sufficient, as a minimal freeboard is appropriate given the limited sensitivity (or uncertainty) in the design flood levels.

The Flood Impact Assessment has found that flood impacts resulting from constructing the Play Space and partially filling the lagoon redistribute local flood storage and overland flow paths. However, the impacts of this do not present a significant change to the existing flood hazard or flood risk within the Project footprint and surrounding area.

As flood conditions within Foreshore Park are primarily due to low-lying storage areas connected by overland flow paths, velocities do not exceed 1.0 m/s under post development conditions at the 1% AEP event. As such, the modelled flood hazards are depth driven, with the relatively minor changes in flood levels doing little to change the existing flood hazard classification.

We trust that this report meets your requirements. For further information or clarification please contact the undersigned.

Yours faithfully

Torrent Consulting



Director



Title:

Study Locality

0 30 60 m

approx. scale

Figure: 1

Revision: A

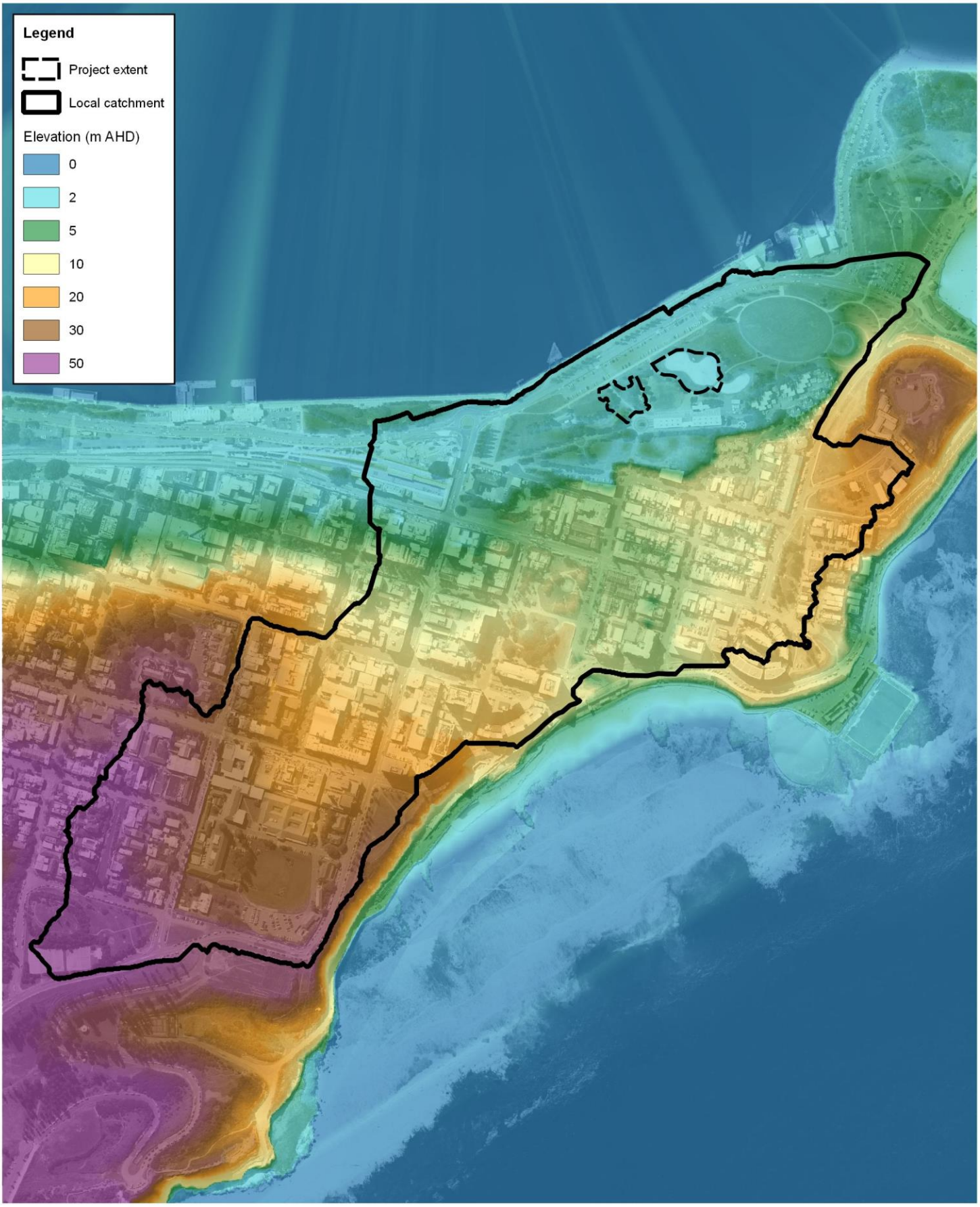
Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING

www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_001_240806_Locality.qgz



Title:

Local Catchment Topography

0 100 200 m

approx. scale

Figure: 2

Revision: A

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING

www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_002_240806_Topography.qgz



Title:

TUFLOW Model Configuration

0 200 400 m

approx. scale

Figure: 3

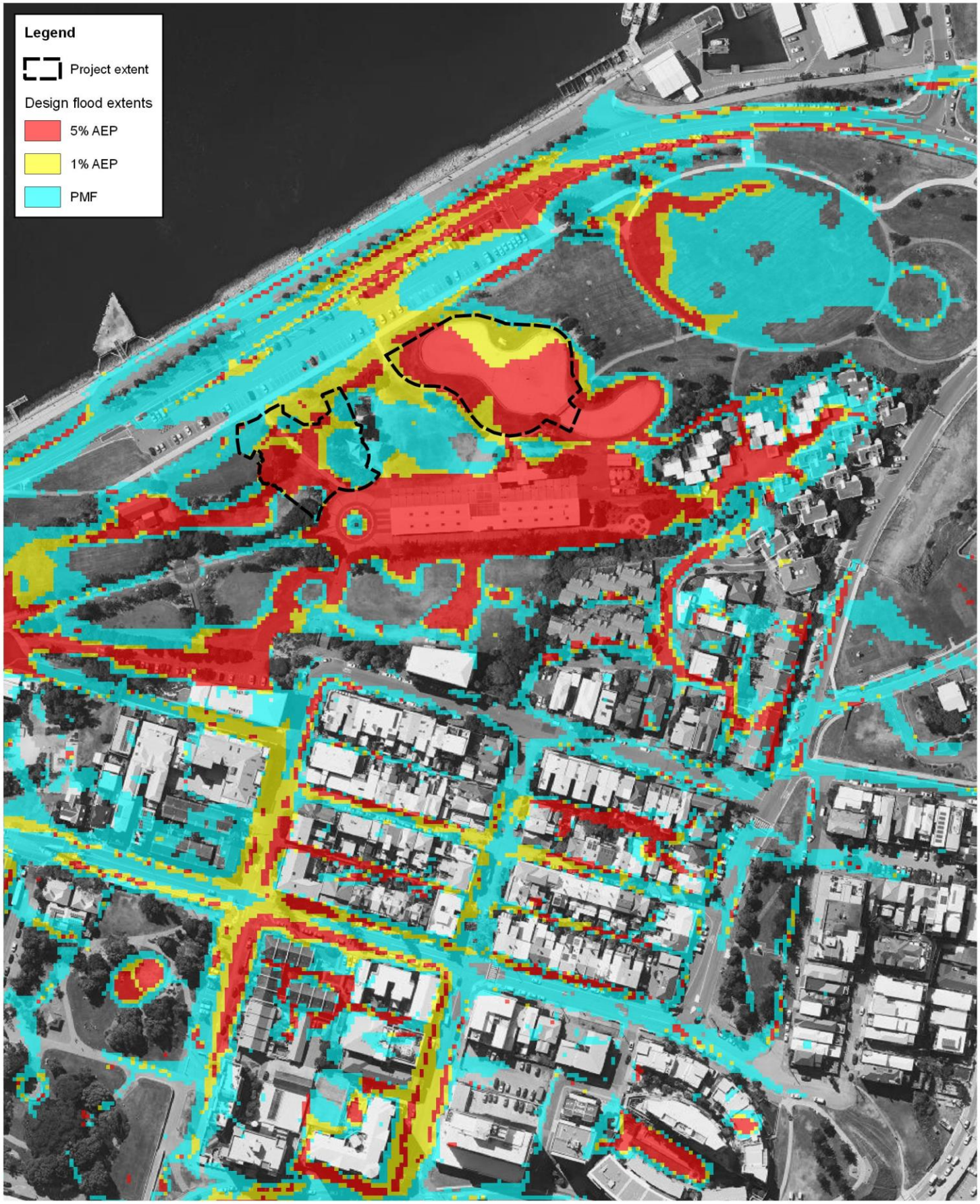
Revision: A

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_003_240806_TUFLOW.qgz



Title:

Design Flood Extents
Post-development Conditions

0 60 120 m

approx. scale

Figure: 4

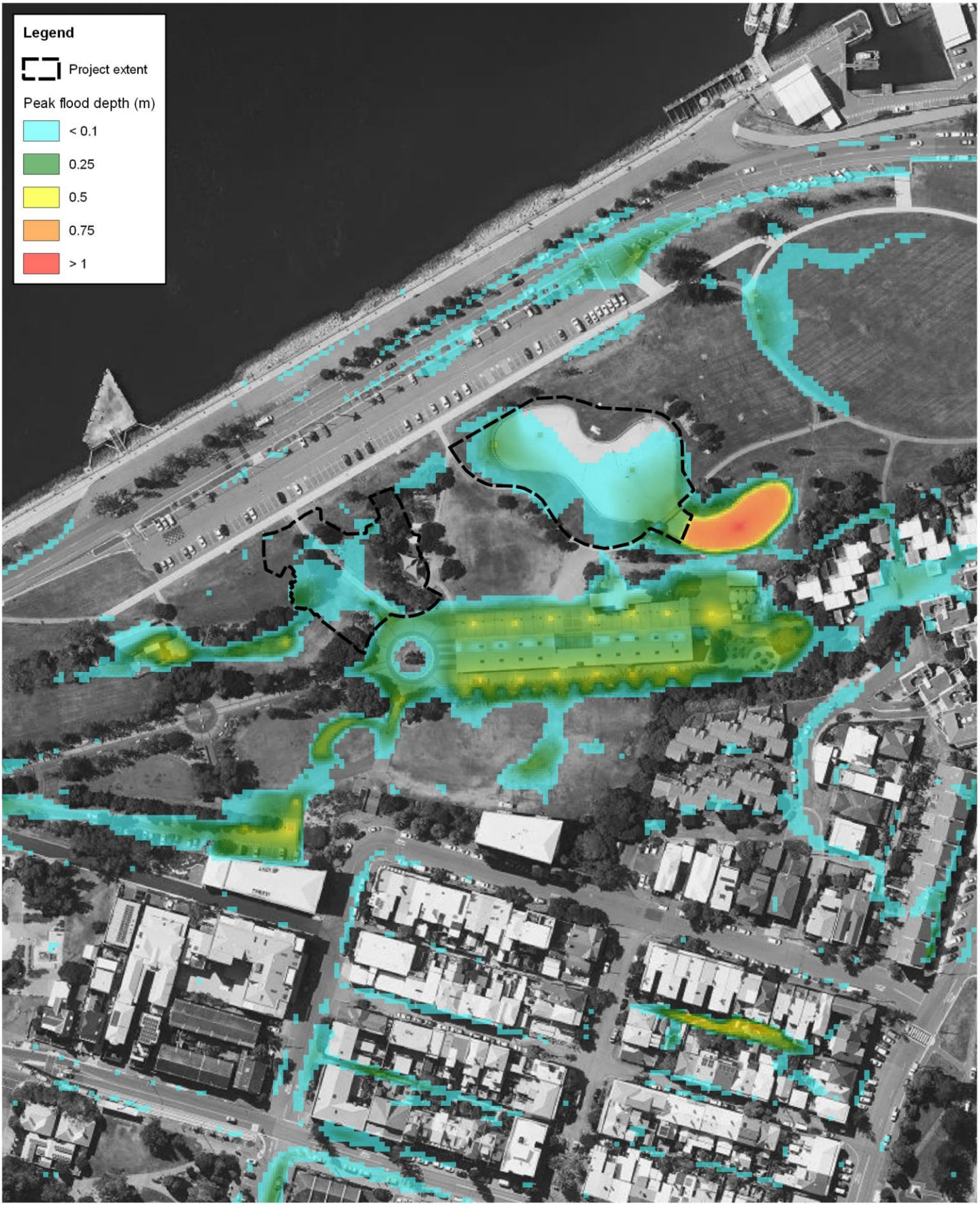
Revision: A

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_004_240806_Extents.qgz



Title:

5% AEP Peak Flood Depths
Post-development Conditions

0 50 100 m

approx. scale

Figure: 5

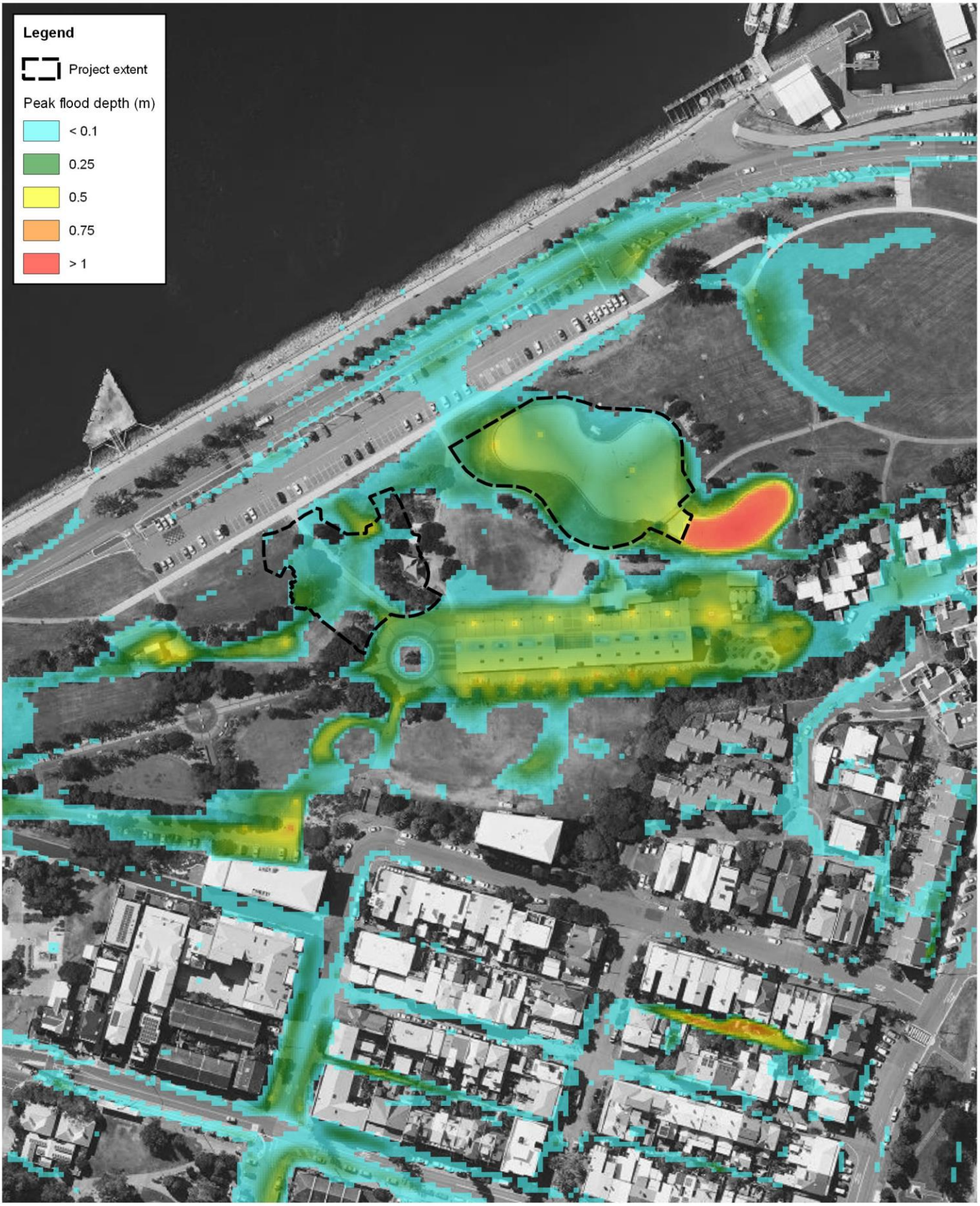
Revision: A

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_005_240806_20y_levels.qgz



Title:

1% AEP Peak Flood Depths
Post-development Conditions

0 50 100 m

approx. scale

Figure: 6

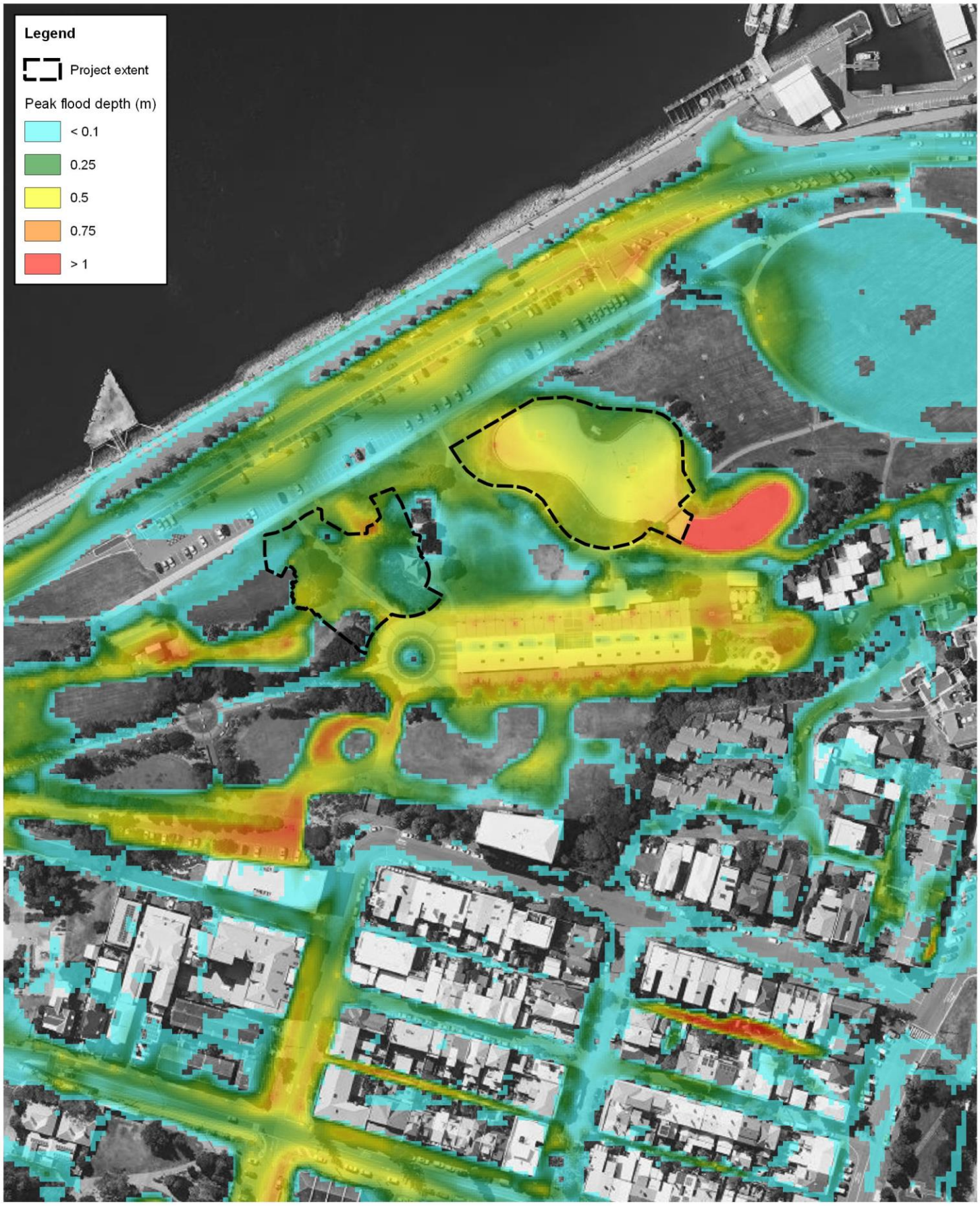
Revision: A

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_006_240806_100y_levels.qgz



Title:

PMF Peak Flood Depths
Post-development Conditions

0 50 100 m

approx. scale

Figure: 7

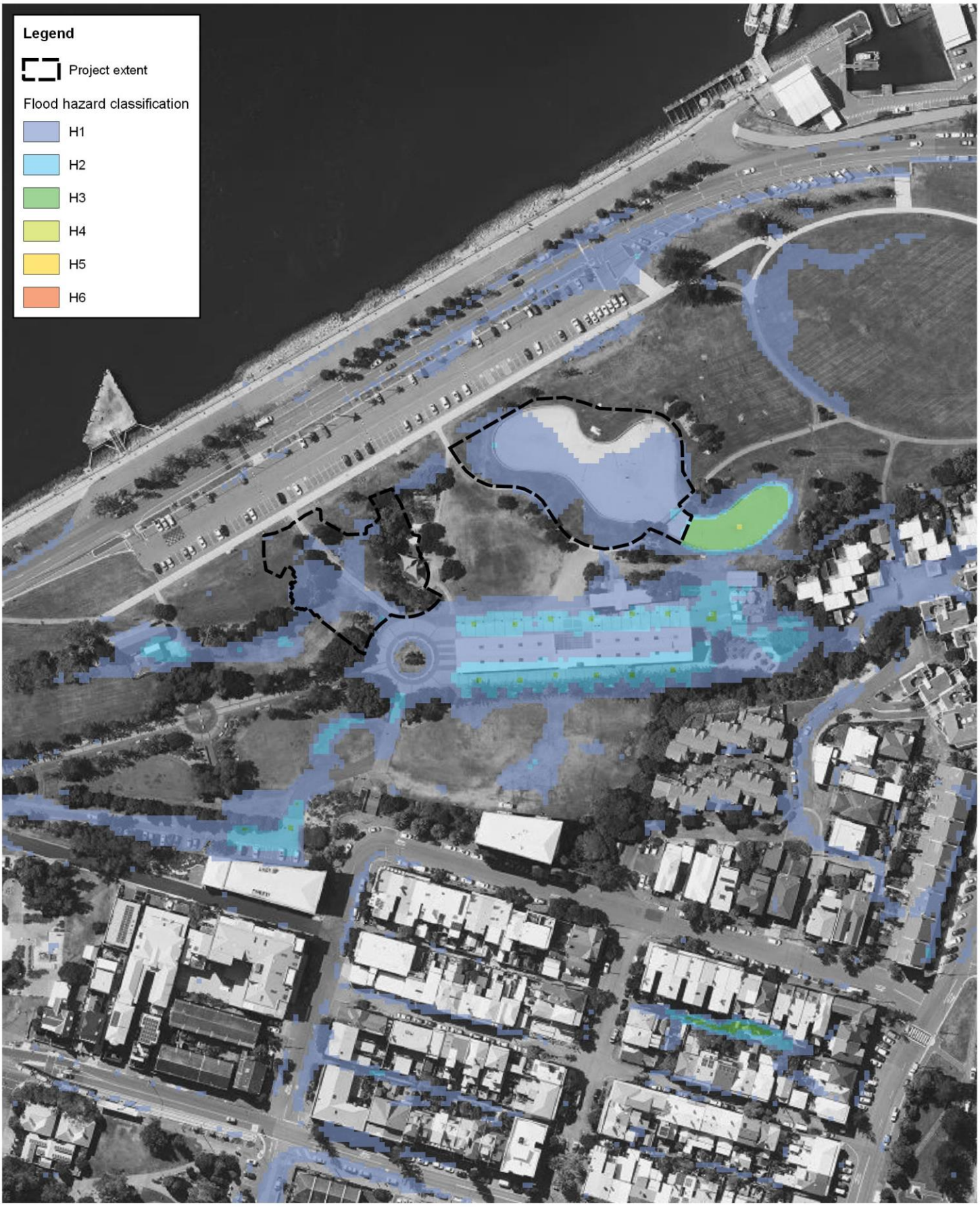
Revision: A

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_007_240806_PMF_levels.qgz



Title:

5% AEP Flood Hazard Classification
Post-development Conditions

0 50 100 m

approx. scale

Figure: 8

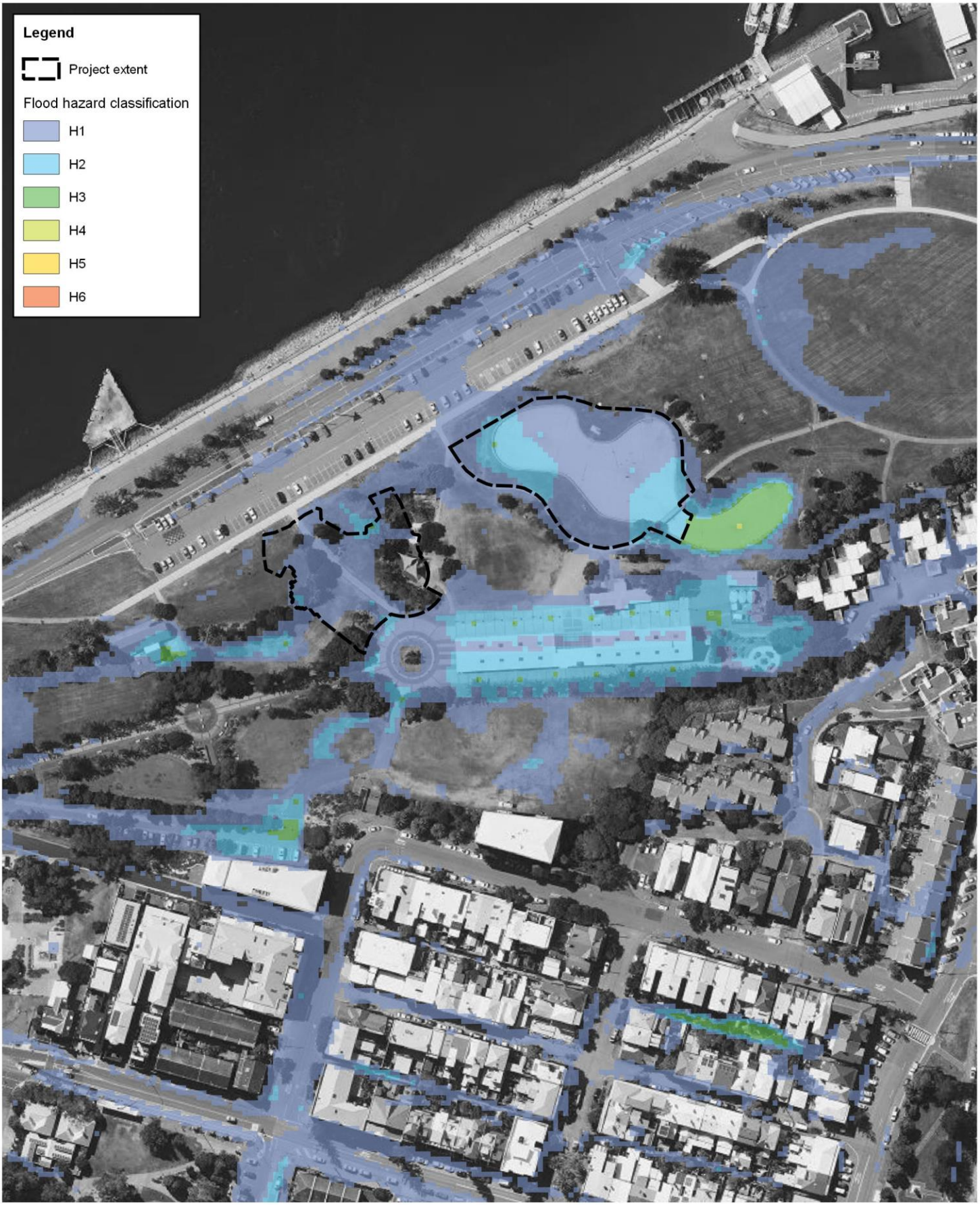
Revision: A

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_008_240806_20y_hazard.qgz



Title:

1% AEP Flood Hazard Classification
Post-development Conditions

0 50 100 m

approx. scale

Figure: 9

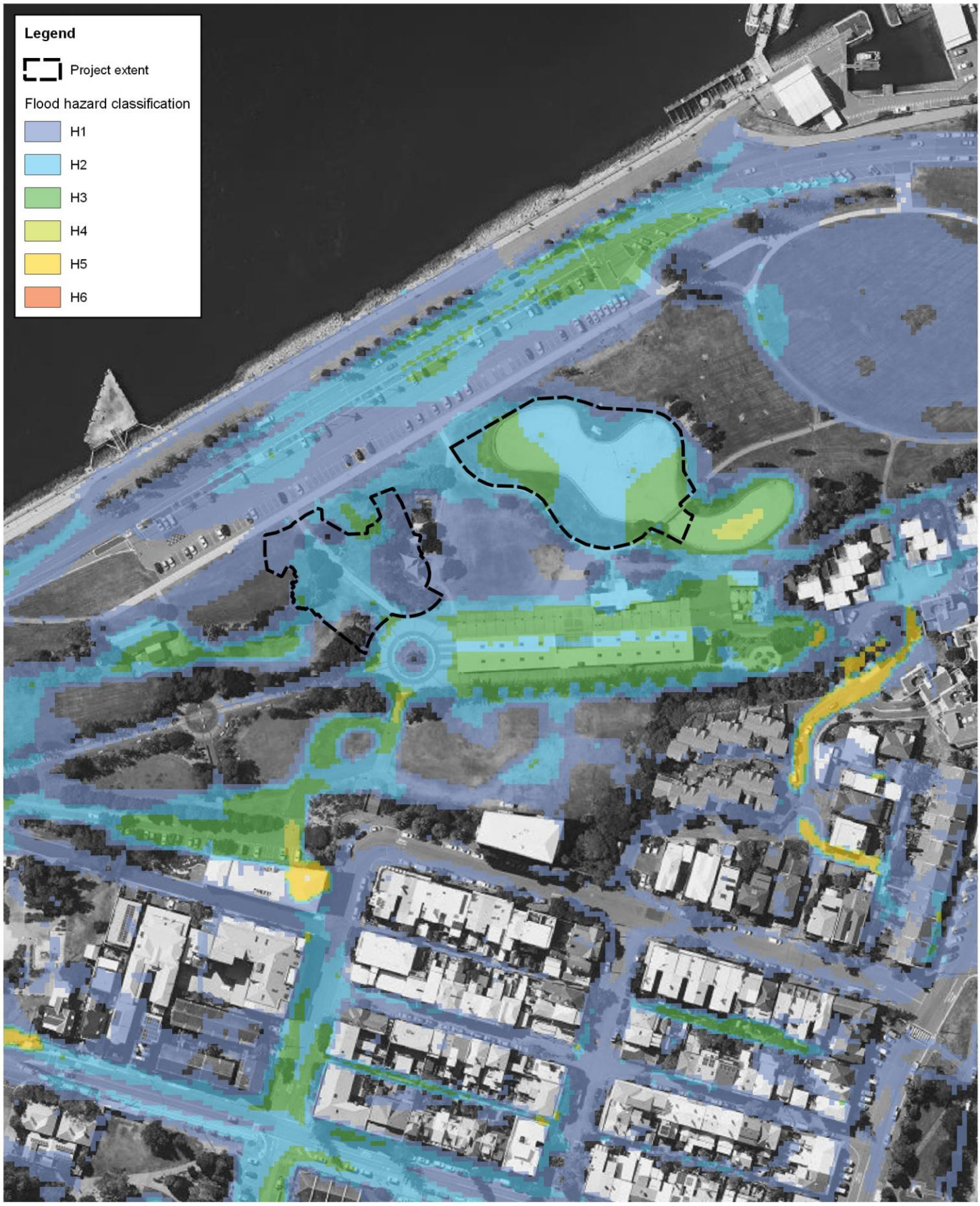
Revision: A

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_009_240806_100y_hazard.qgz



Title:

PMF Flood Hazard Classification
Post-development Conditions

0 50 100 m

approx. scale

Figure: 10

Revision: A

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_010_240806_PMF_hazard.qgz



Title:

5% AEP Peak Flood Level Impact
Post-development Conditions

0 50 100 m

approx. scale

Figure: 11

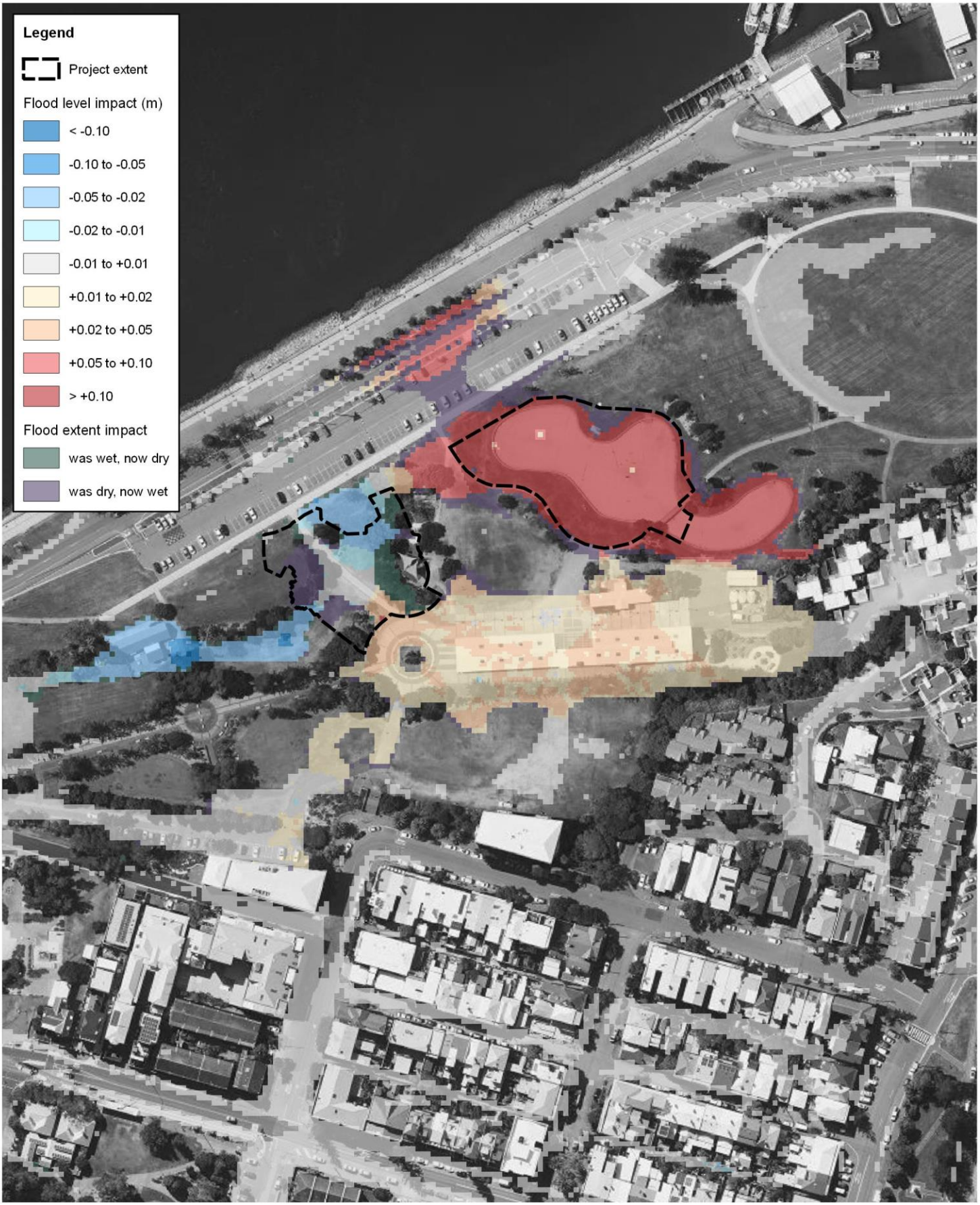
Revision: A

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_011_240806_20y_h_impact.qgz



Title:

1% AEP Peak Flood Level Impact
Post-development Conditions

0 50 100 m

approx. scale

Figure: 12

Revision: A

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_012_240806_100y_h_impact.qgz



Title:

PMF Peak Flood Level Impact
Post-development Conditions

0 50 100 m

approx. scale

Figure: 13

Revision: A

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_013_240806_PMF_h_impact.qgz

Appendix A Post-Development Flood Conditions



Title:

1EY Peak Flood Depths
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A1**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A1_240806_1y_levels.qgz



Title:

0.5EY Peak Flood Depths
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A2**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A2_240806_2y_levels.qgz



Title:

20% AEP Peak Flood Depths
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A3**

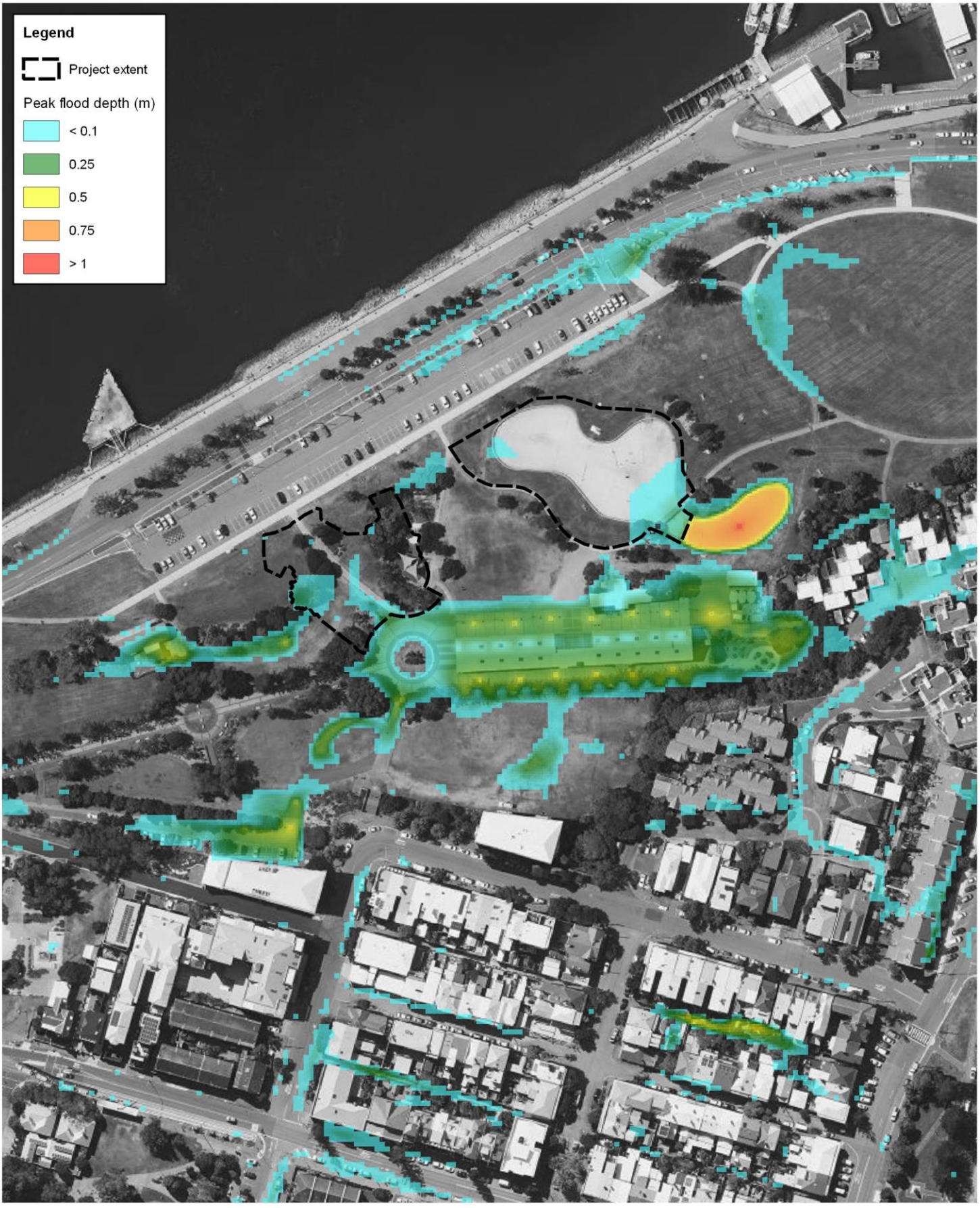
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A3_240806_5y_levels.qgz



Title:

10% AEP Peak Flood Depths
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A4**

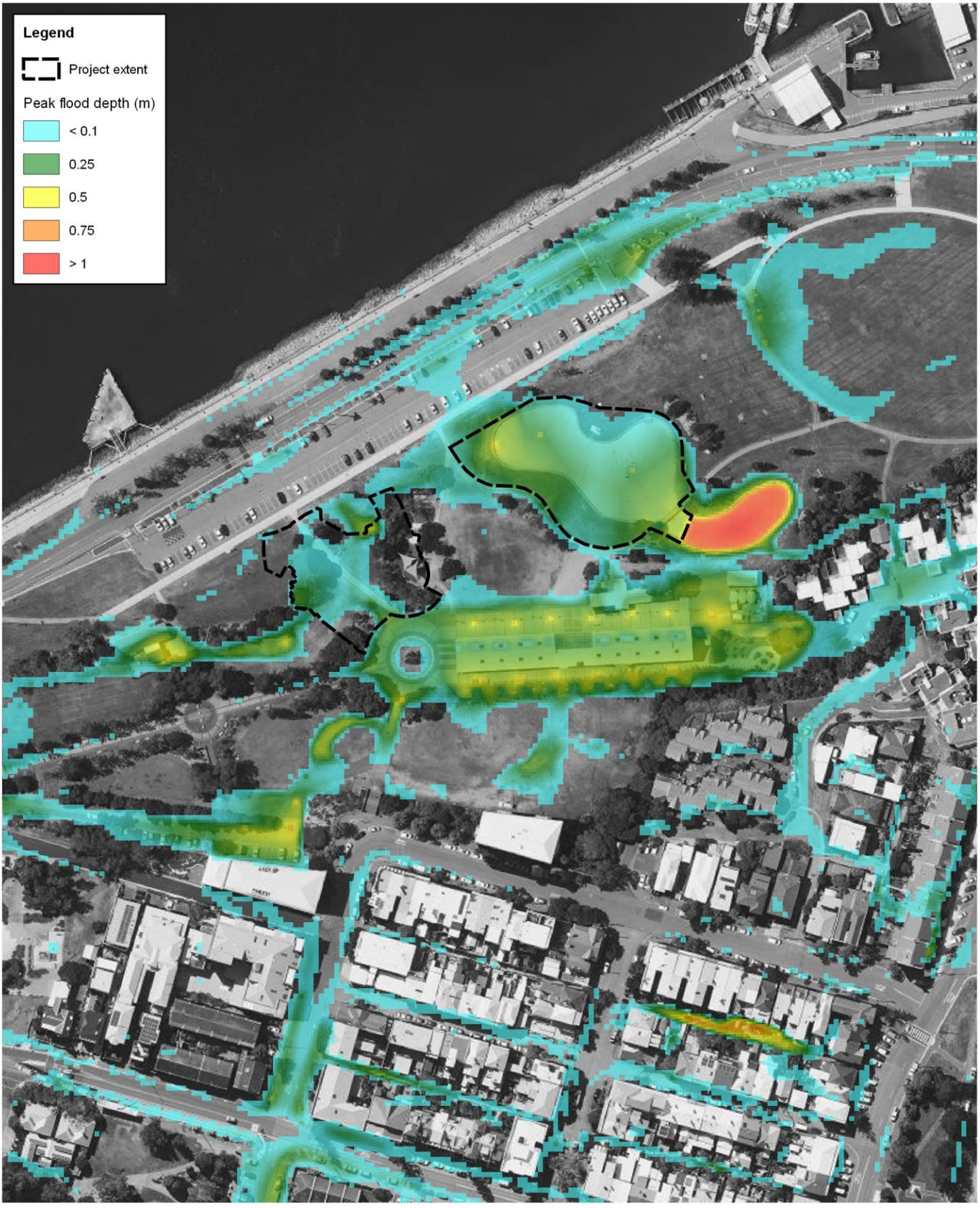
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A4_240806_10y_levels.qgz



Title:

2% AEP Peak Flood Depths
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A5**

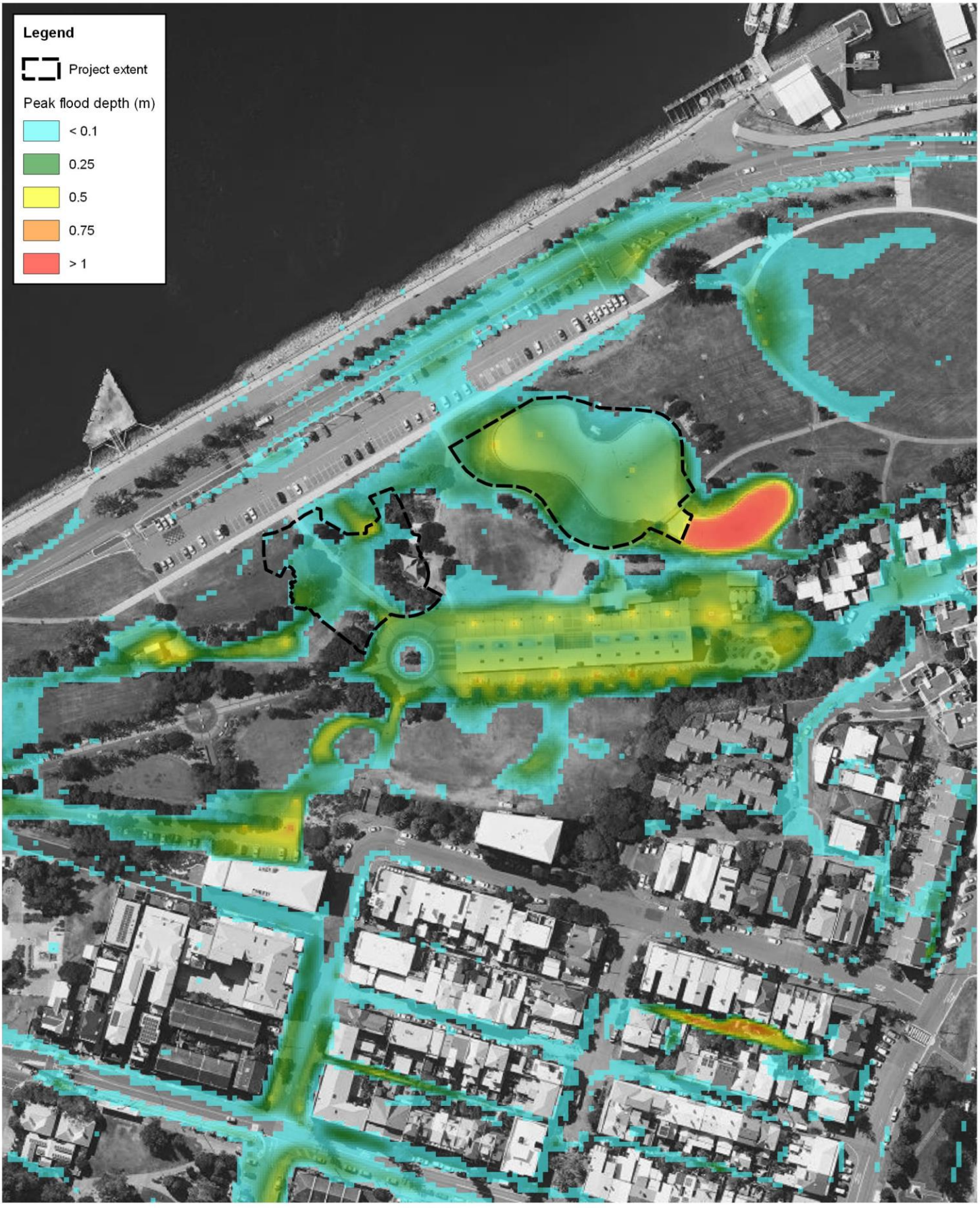
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A5_240806_50y_levels.qgz



Title:

0.5% AEP Peak Flood Depths
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A6**

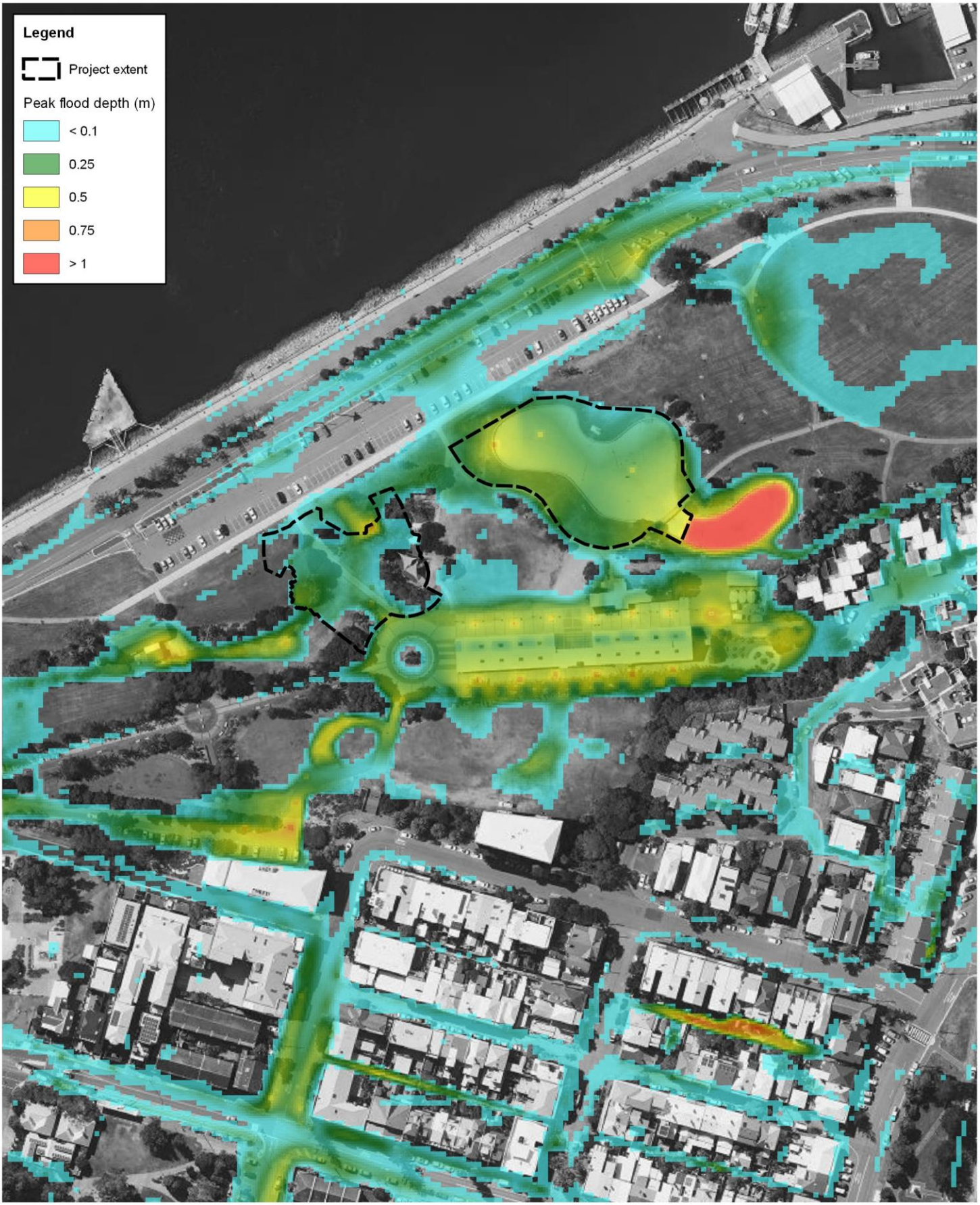
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A6_240806_200y_levels.qgz



Title:

0.2% AEP Peak Flood Depths
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A7**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A7_240806_500y_levels.qgz



Title:

1EY Peak Flood Velocity
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A8**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A8_240806_1y_velocity.qgz



Title:

0.5EY Peak Flood Velocity
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A9**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A9_240806_2y_velocity.qgz



Title:

20% AEP Peak Flood Velocity
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A10**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A10_240806_5y_velocity.qgz



Title:

10% AEP Peak Flood Velocity
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A11**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A11_240806_10y_velocity.qgz



Title:

5% AEP Peak Flood Velocity
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A12**

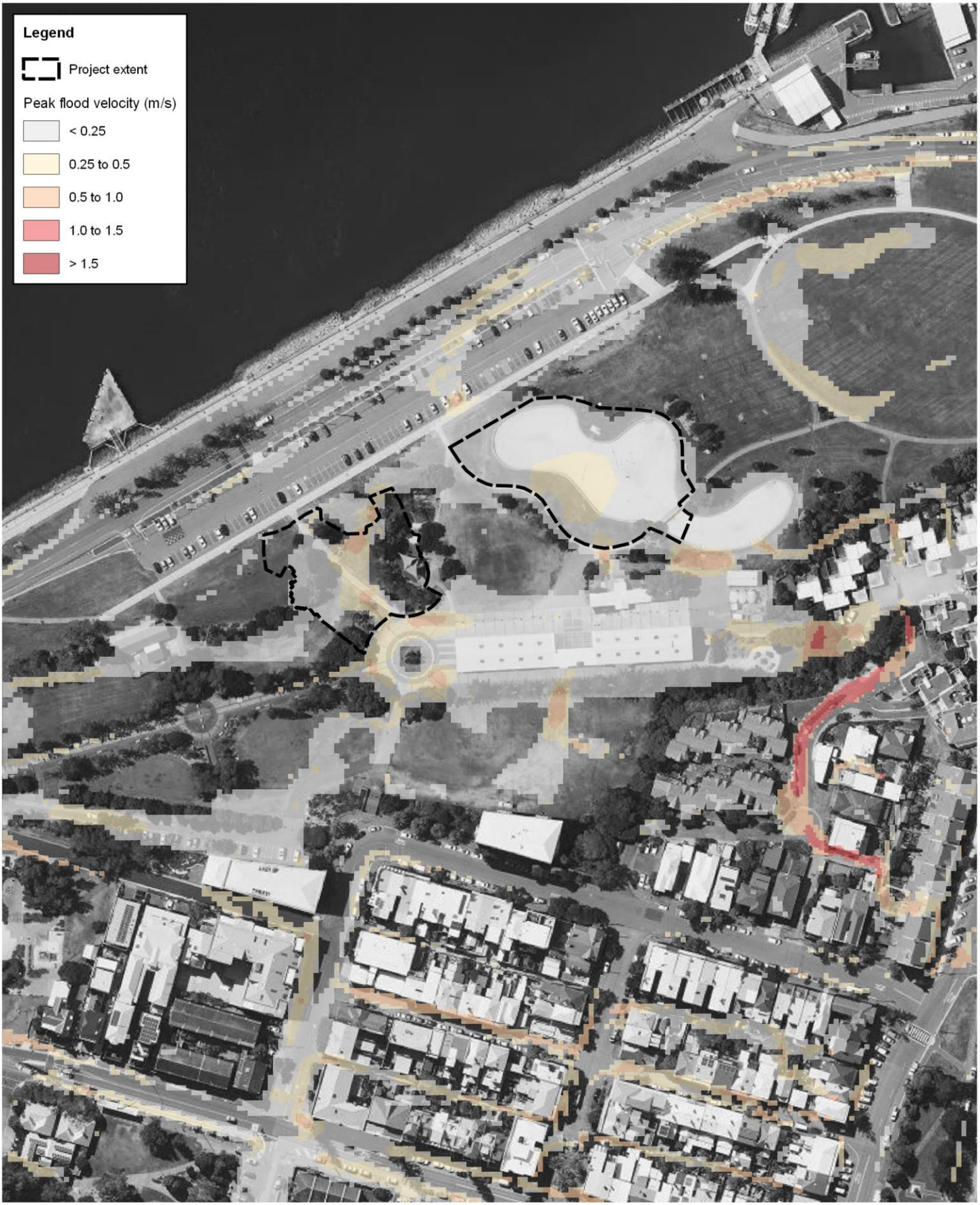
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A12_240806_20y_velocity.qgz



Title:

2% AEP Peak Flood Velocity
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A13**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A13_240806_50y_velocity.qgz



Title:

1% AEP Peak Flood Velocity
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A14**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A14_240806_100y_velocity.qgz



Title:

0.5% AEP Peak Flood Velocity Post-development Conditions

0 50 100 m

approx. scale

Figure: **A15**

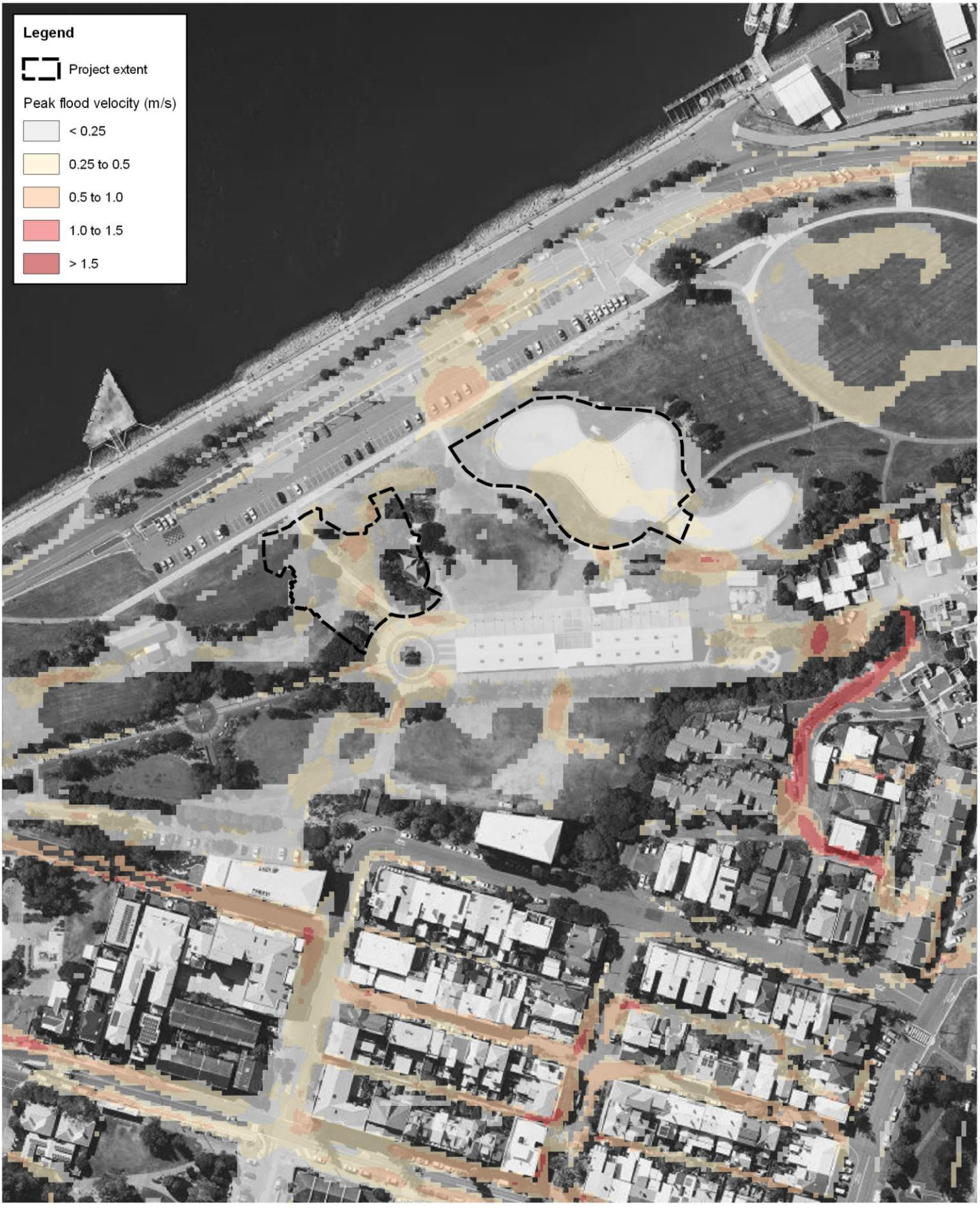
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A15_240806_200y_velocity.qgz



Title:

0.2% AEP Peak Flood Velocity Post-development Conditions

0 50 100 m

approx. scale

Figure: **A16**

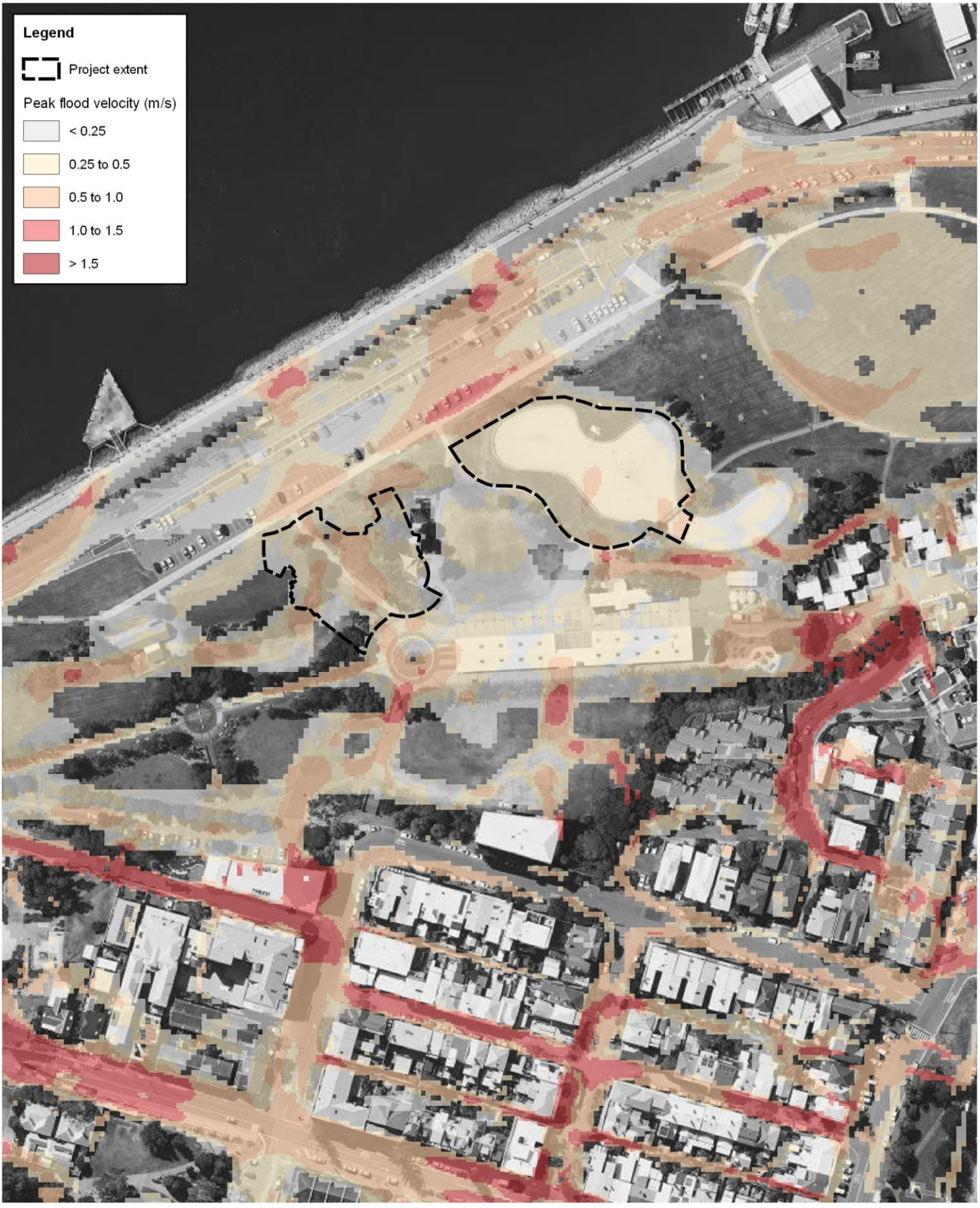
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A16_240806_500y_velocity.qgz



Title:

PMF Peak Flood Velocity
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A17**

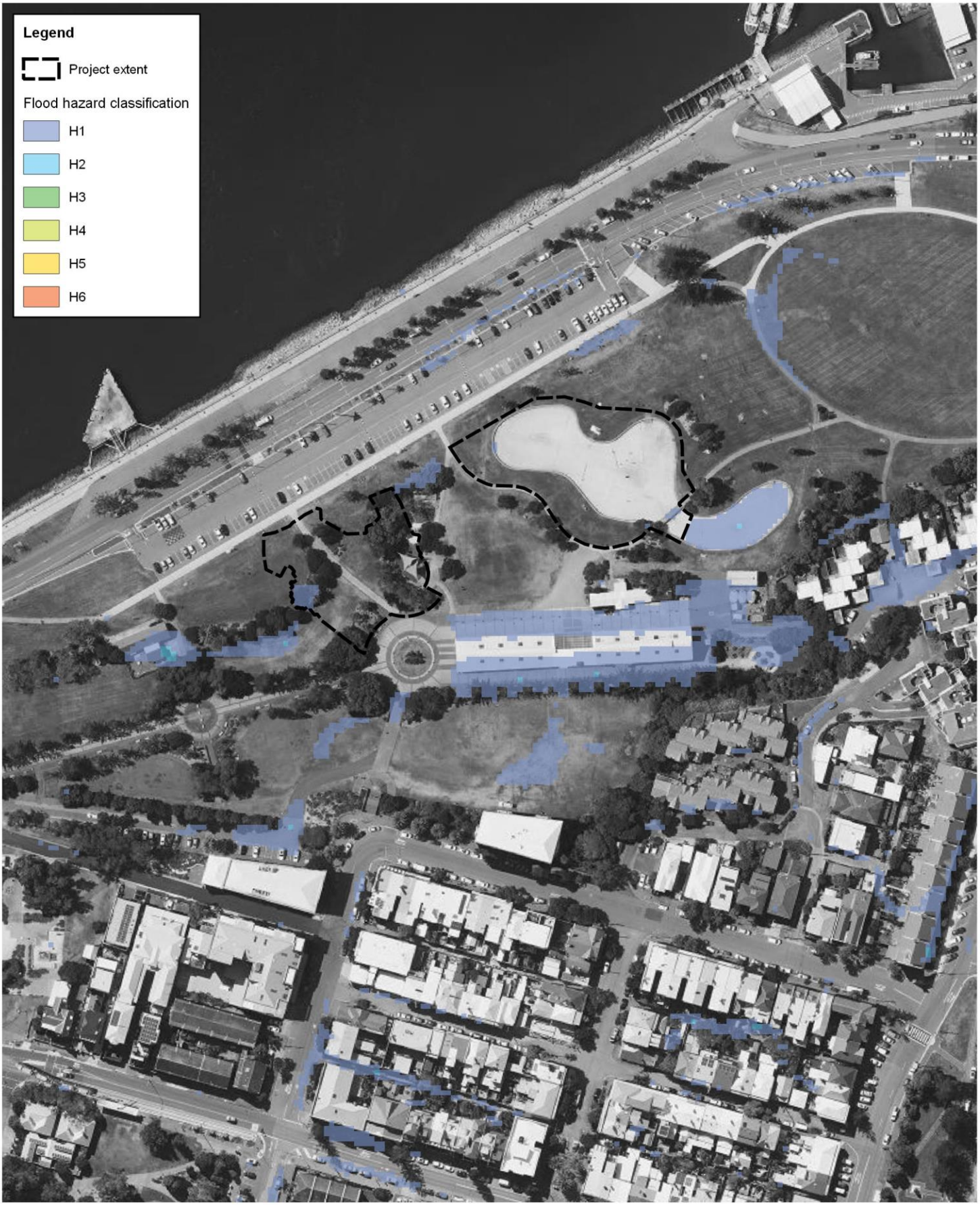
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A17_240806_PMF_velocity.qgz



Title:

1EY Peak Flood Hazard Classification
Post-development Conditions

0 50 100 m

approx. scale

Figure: **A18**

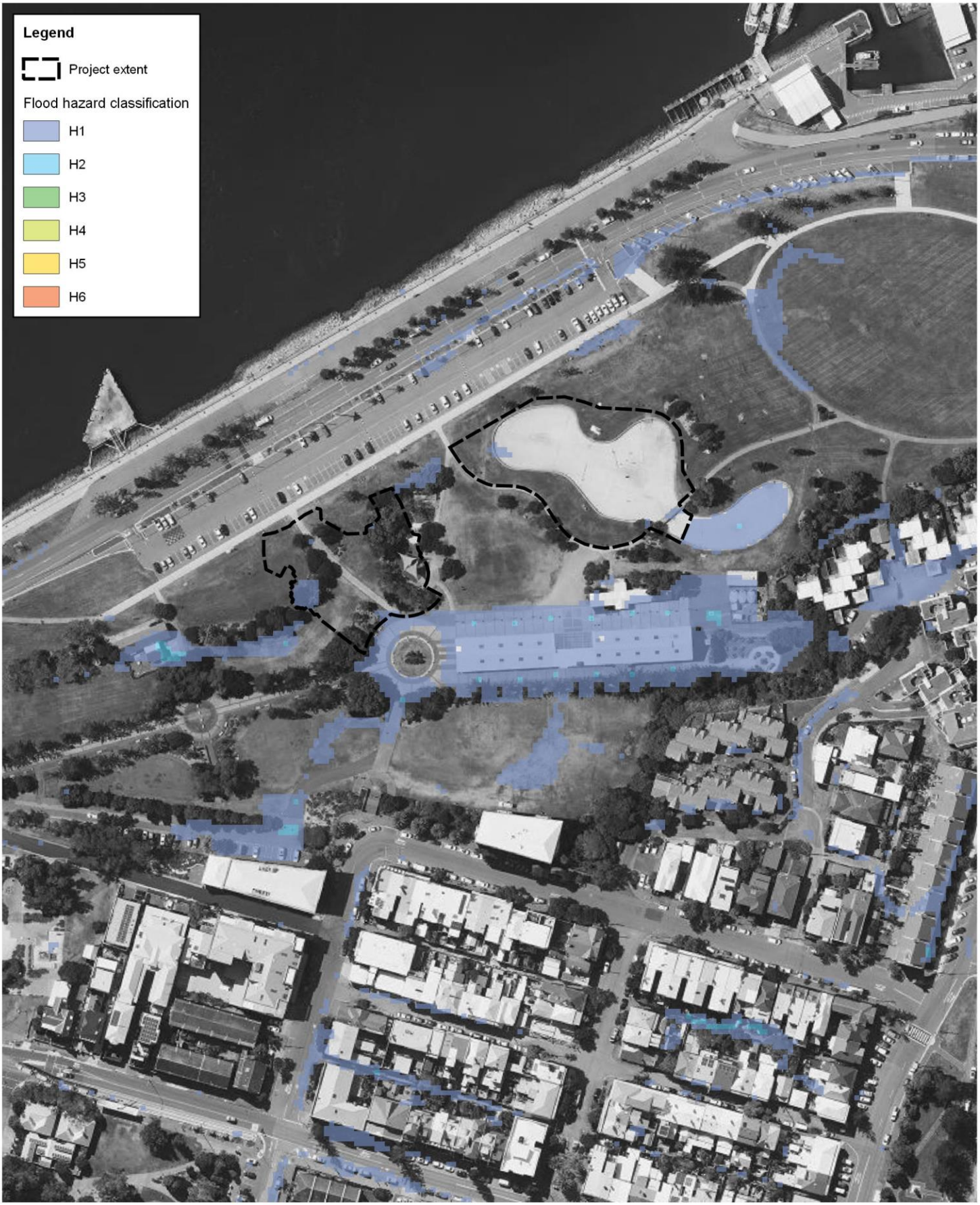
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A18_240806_1y_hazard.qgz



Title:

0.5EY Peak Flood Hazard Classification Post-development Conditions

0 50 100 m

approx. scale

Figure: **A19**

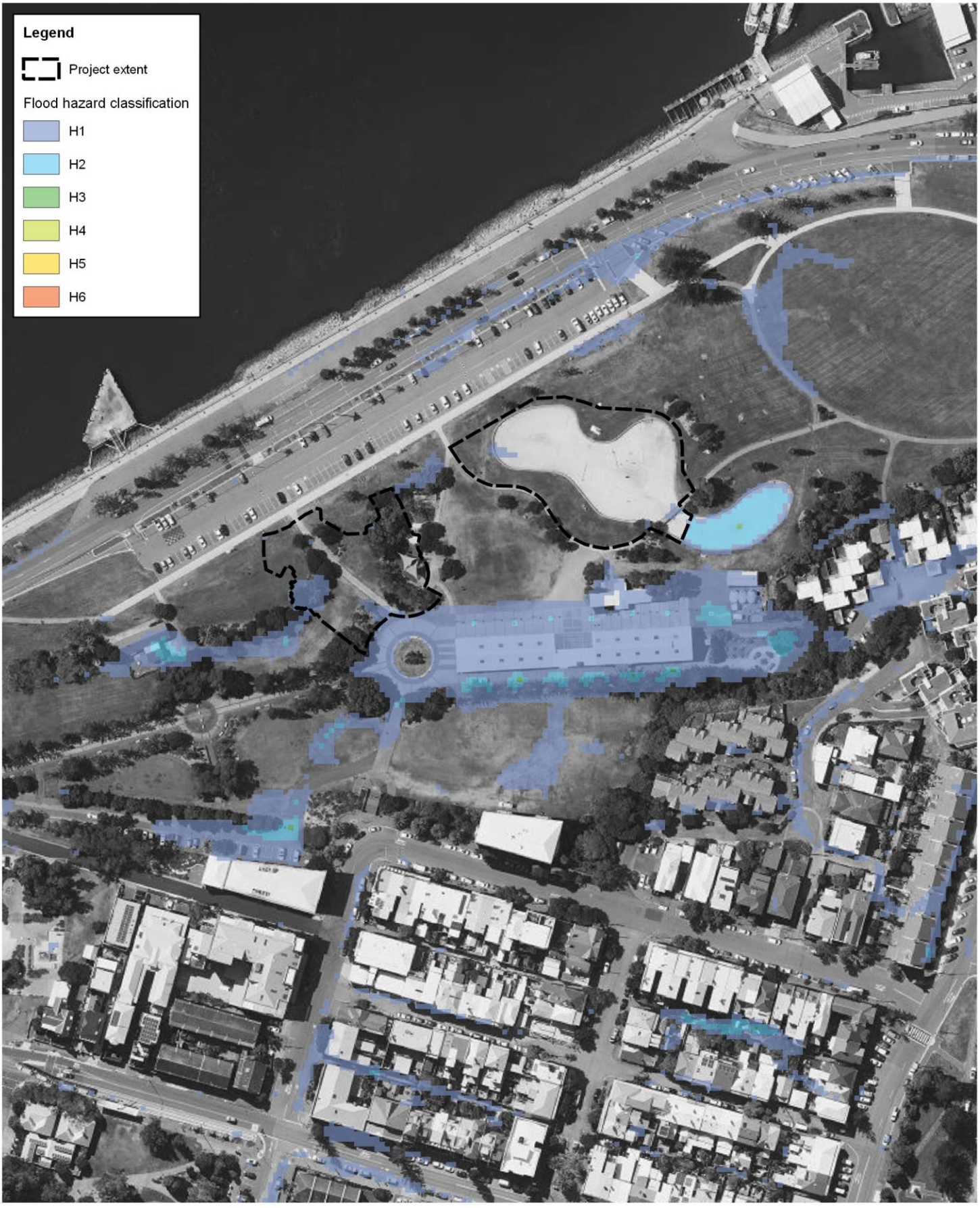
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A19_240806_2y_hazard.qgz



Title:

20% AEP Peak Flood Hazard Classification Post-development Conditions

0 50 100 m

approx. scale

Figure: **A20**

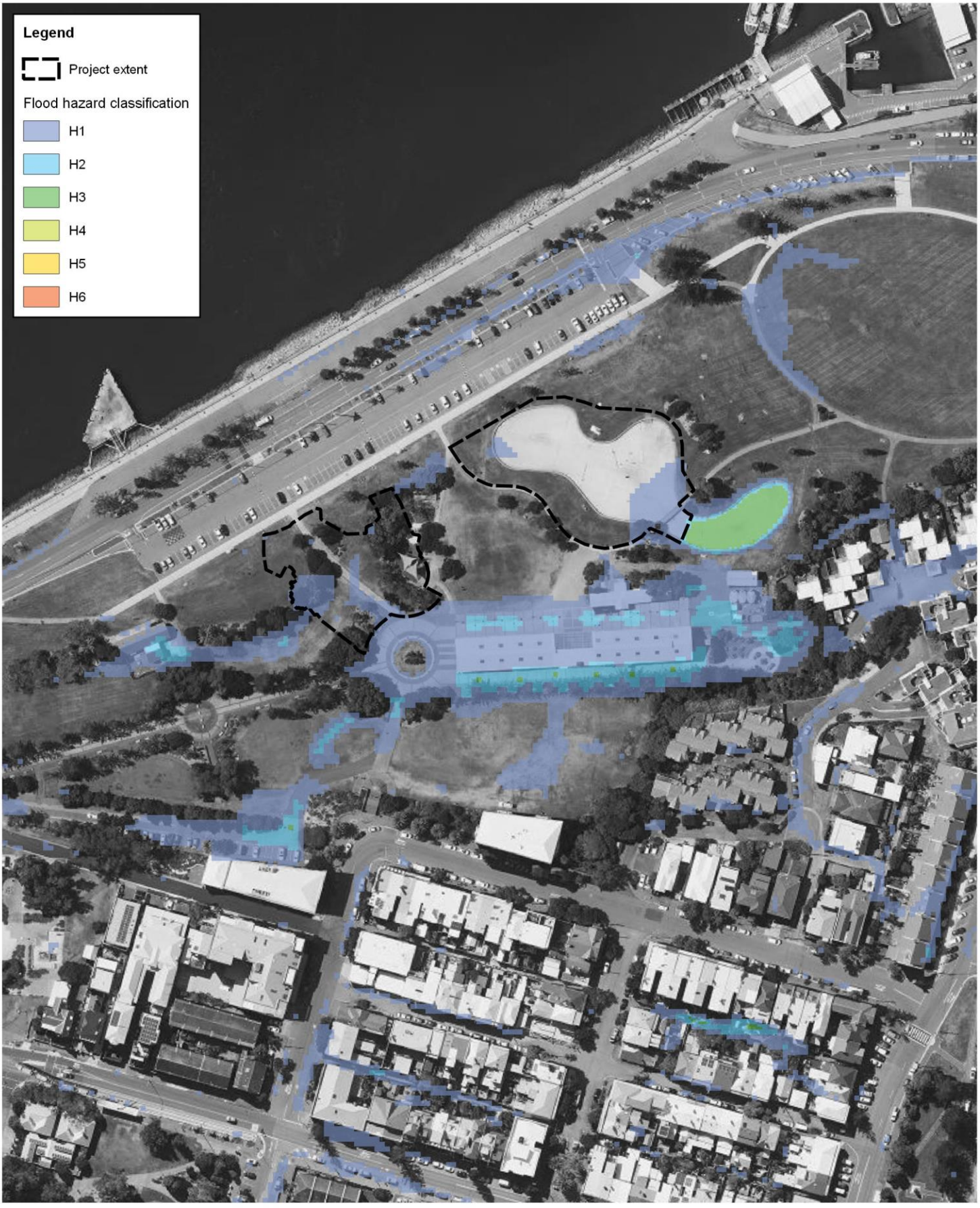
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A20_240806_5y_hazard.qgz



Title:

10% AEP Peak Flood Hazard Classification Post-development Conditions

0 50 100 m

approx. scale

Figure: **A21**

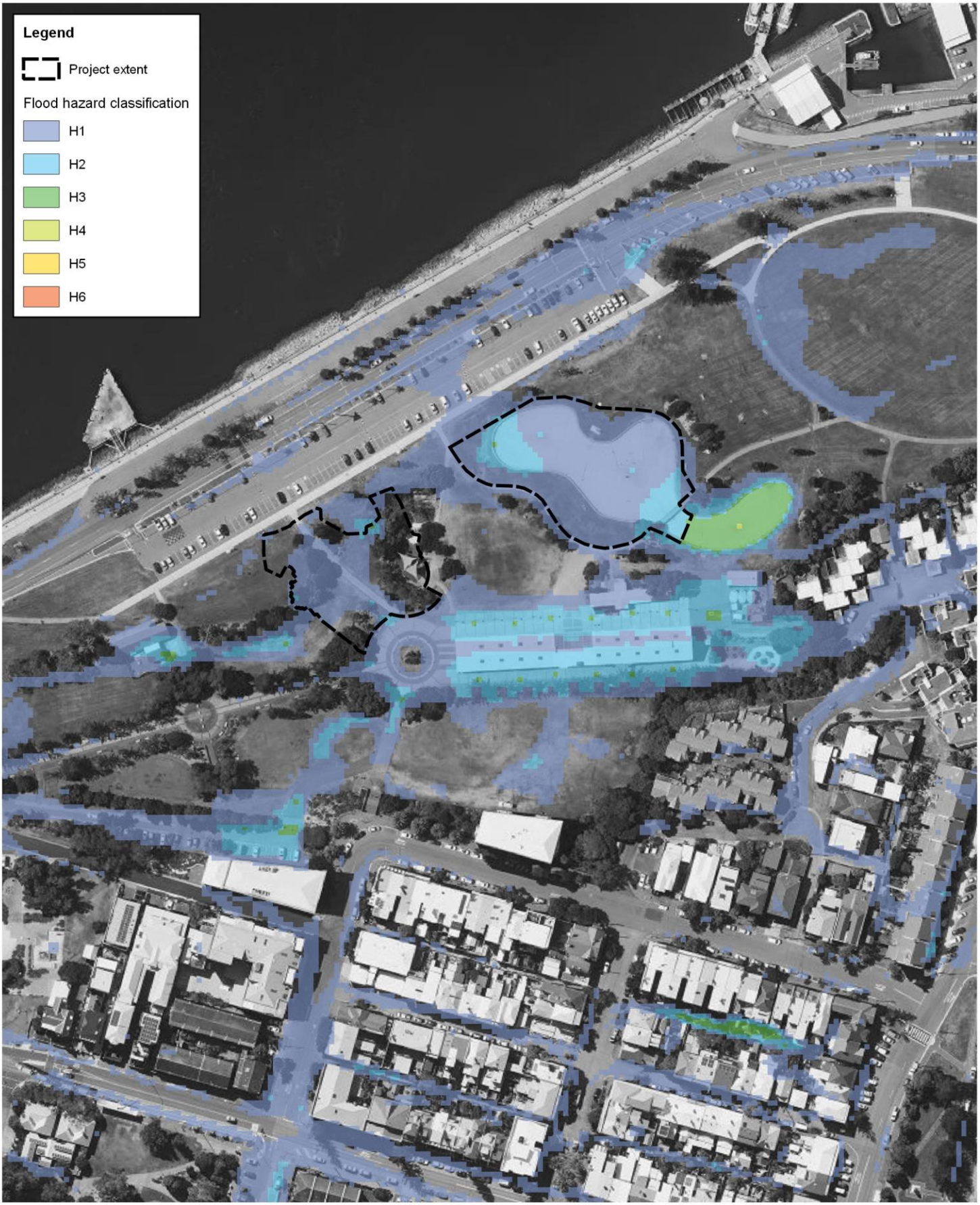
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A21_240806_10y_hazard.qgz



Title:

2% AEP Peak Flood Hazard Classification Post-development Conditions

0 50 100 m

approx. scale

Figure: **A22**

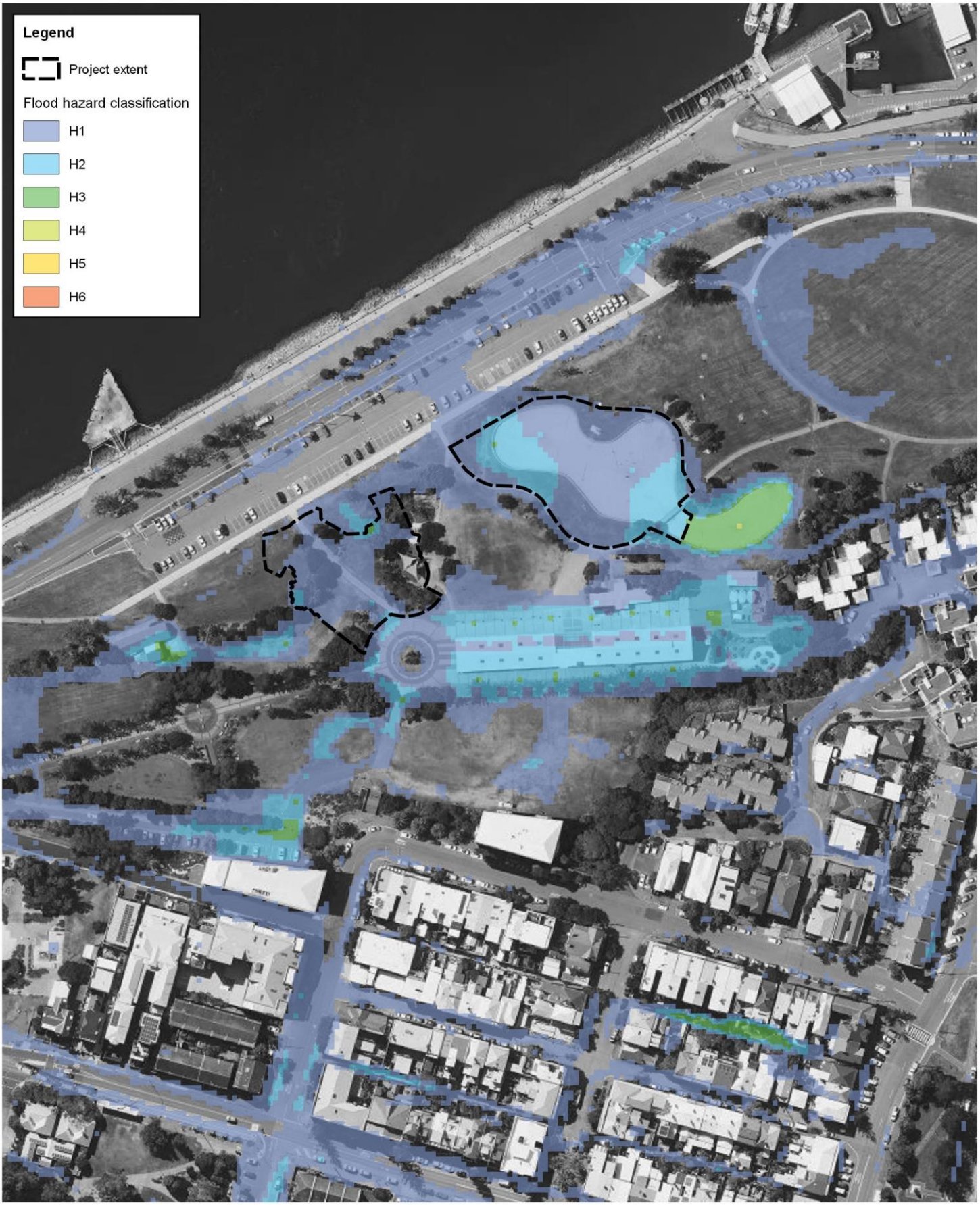
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A22_240806_50y_hazard.qgz



Title:

0.5% AEP Peak Flood Hazard Classification Post-development Conditions

0 50 100 m

approx. scale

Figure: **A23**

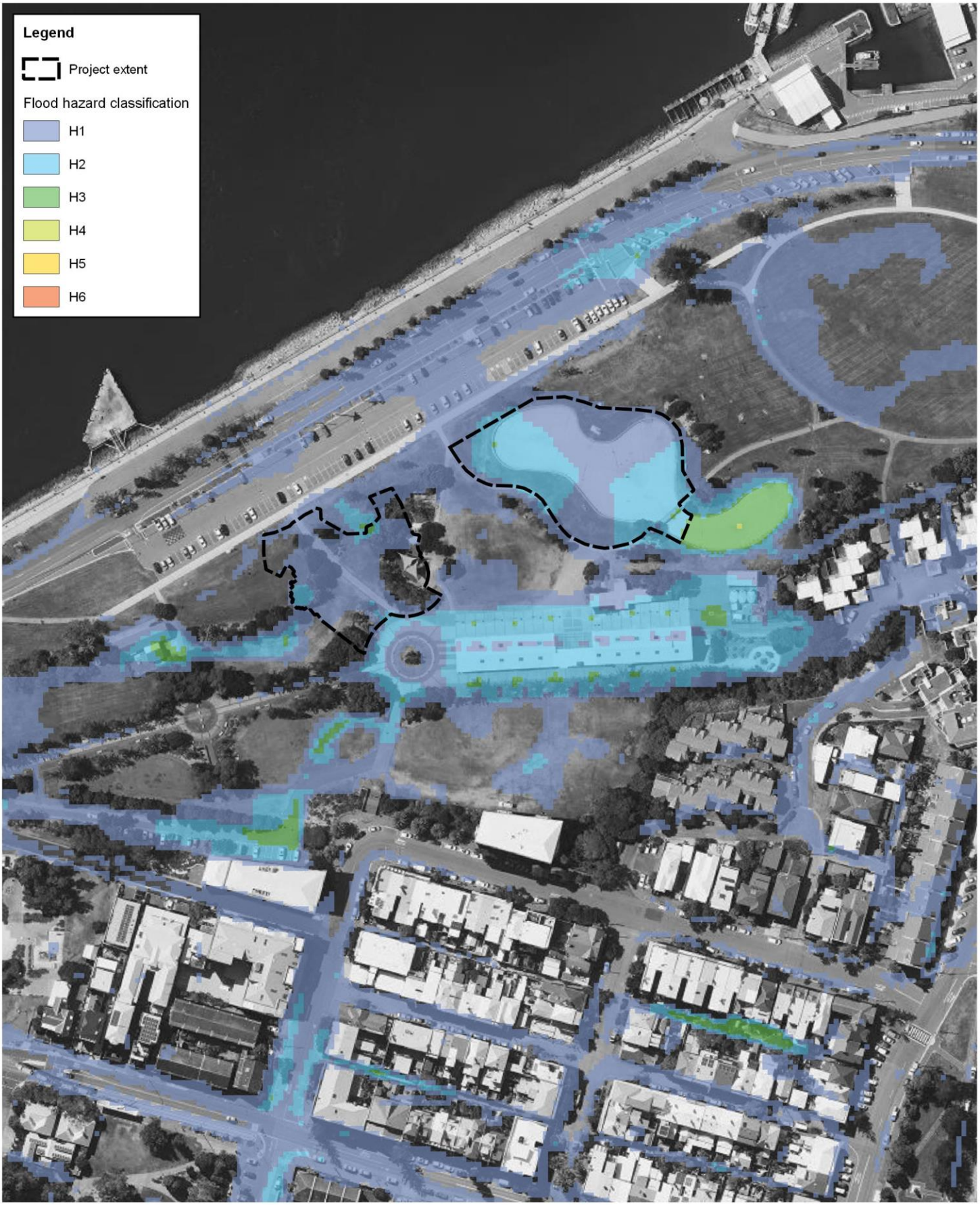
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A23_240806_200y_hazard.qgz



Title:

0.2% AEP Peak Flood Hazard Classification Post-development Conditions

0 50 100 m

approx. scale

Figure: **A24**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_A24_240806_500y_hazard.qgz

Appendix B Flood Impact Mapping



Title:

1EY Peak Flood Level Impact
Post-development Conditions

0 50 100 m

approx. scale

Figure: **B1**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B1_240806_1y_h_impact.qgz



Title:

0.5EY Peak Flood Level Impact Post-development Conditions

0 50 100 m

approx. scale

Figure: **B2**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B2_240806_2y_h_impact.qgz



Title:

20% AEP Peak Flood Level Impact
Post-development Conditions

0 50 100 m

approx. scale

Figure: **B3**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B3_240806_5y_h_impact.qgz



Title:

10% AEP Peak Flood Level Impact Post-development Conditions

0 50 100 m

approx. scale

Figure: **B4**

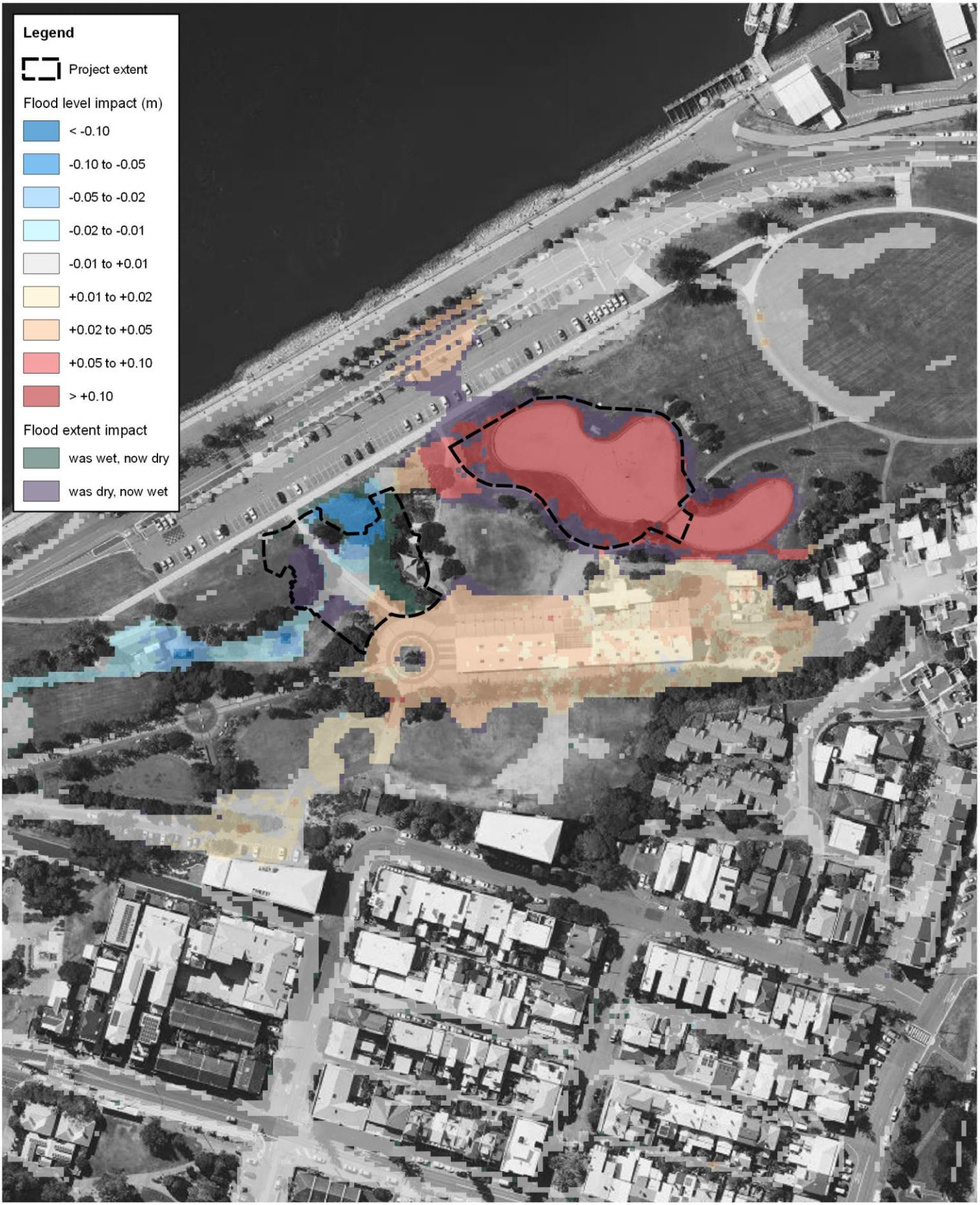
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B4_240806_10y_h_impact.qgz



Title:

2% AEP Peak Flood Level Impact
Post-development Conditions

0 50 100 m

approx. scale

Figure: **B5**

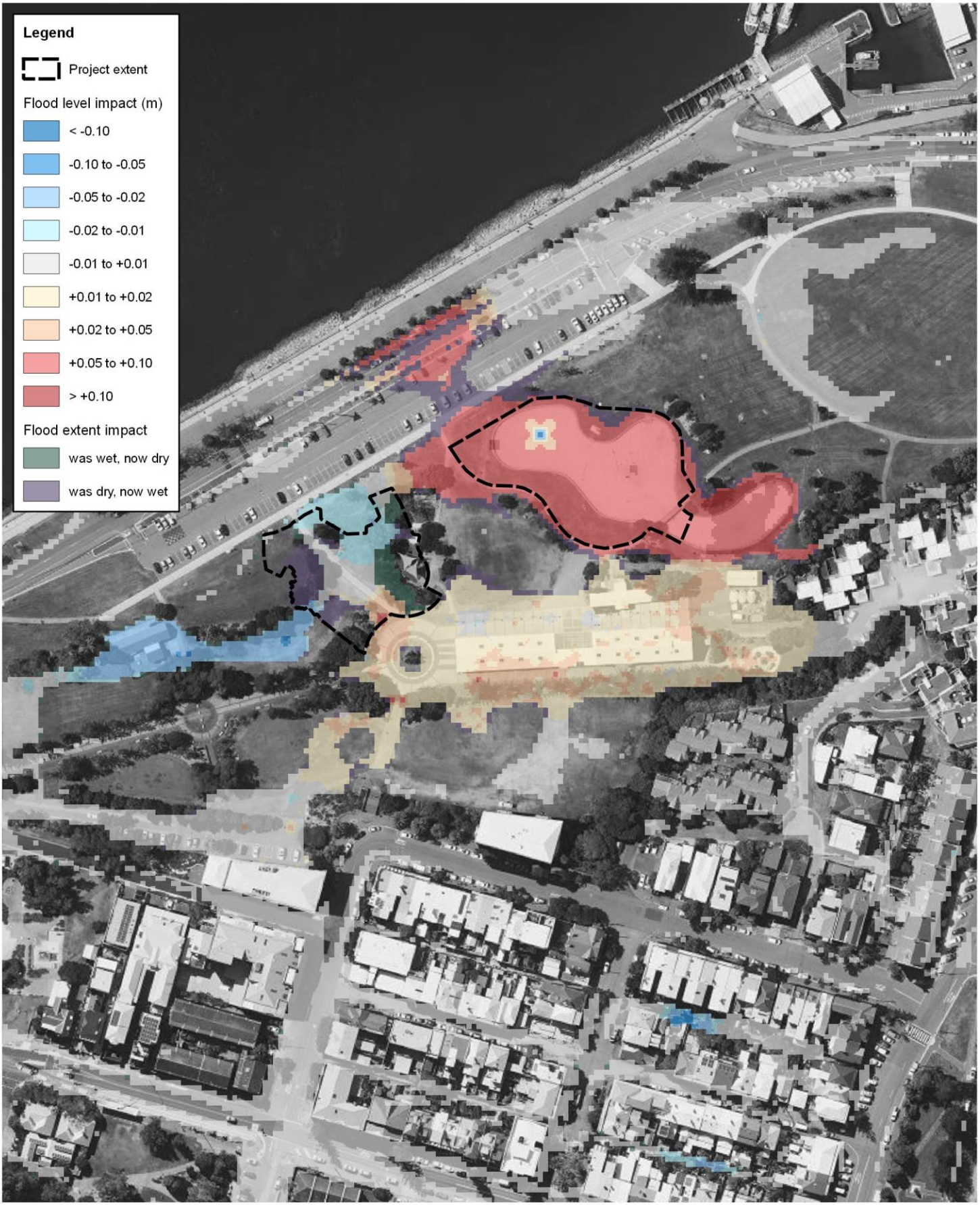
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B5_240806_50y_h_impact.qgz



Title:

0.5% AEP Peak Flood Level Impact Post-development Conditions

0 50 100 m

approx. scale

Figure: **B6**

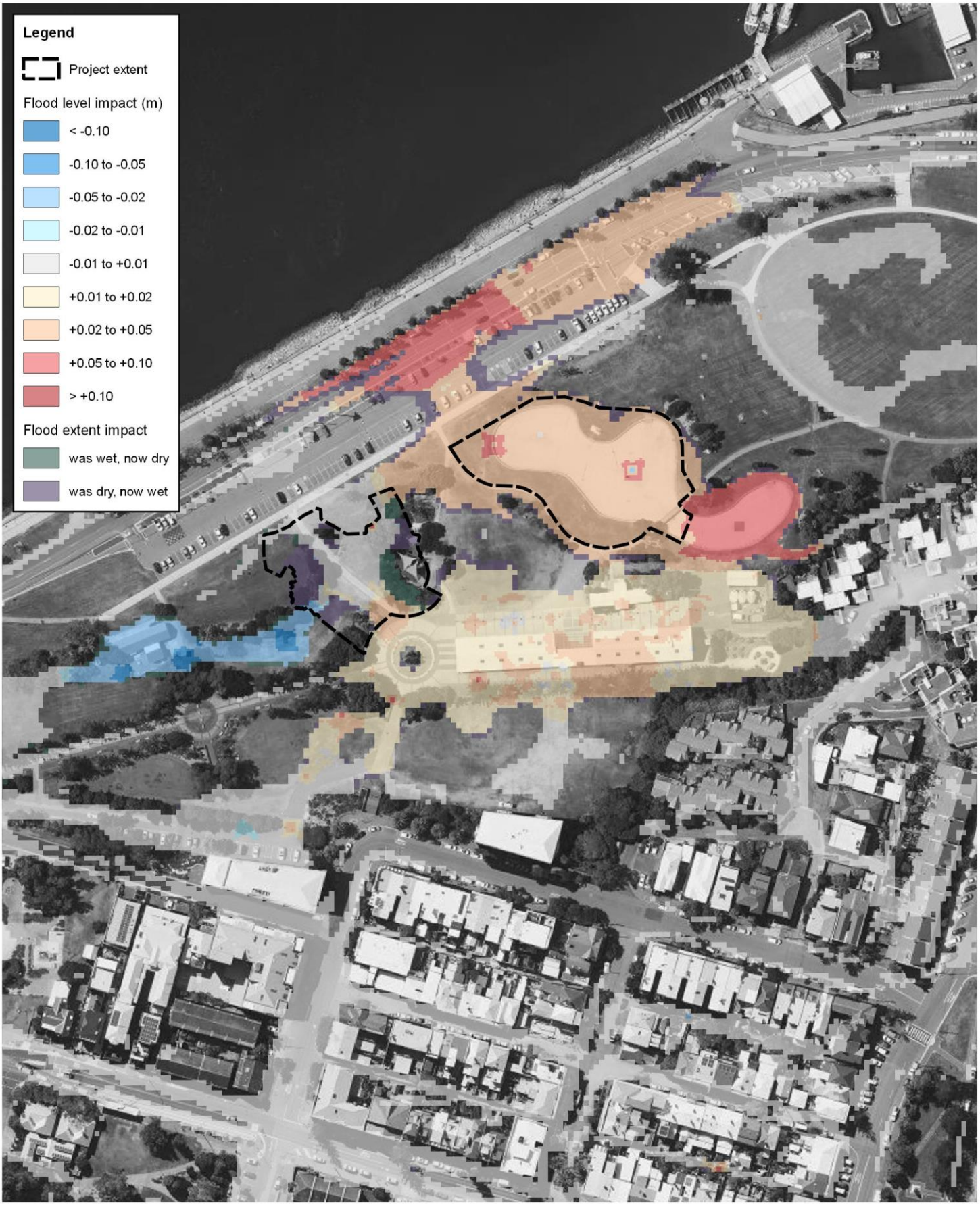
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B6_240806_200y_h_impact.qgz



Title:

0.2% AEP Peak Flood Level Impact
Post-development Conditions

0 50 100 m

approx. scale

Figure: **B7**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B7_240806_500y_h_impact.qgz



Title:

1EY Peak Flood Velocity Impact
Post-development Conditions

0 50 100 m

approx. scale

Figure: **B8**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B8_240806_1y_v_impact.qgz



Title:

0.5EY Peak Flood Velocity Impact Post-development Conditions

0 50 100 m

approx. scale

Figure: **B9**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B9_240806_2y_v_impact.qgz



Title:

20% AEP Peak Flood Velocity Impact Post-development Conditions

0 50 100 m

approx. scale

Figure: **B10**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B10_240806_5y_v_impact.qgz



Title:

10% AEP Peak Flood Velocity Impact Post-development Conditions

0 50 100 m

approx. scale

Figure: **B11**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B11_240806_10y_v_impact.qgz



Title:

5% AEP Peak Flood Velocity Impact Post-development Conditions

0 50 100 m

approx. scale

Figure: **B12**

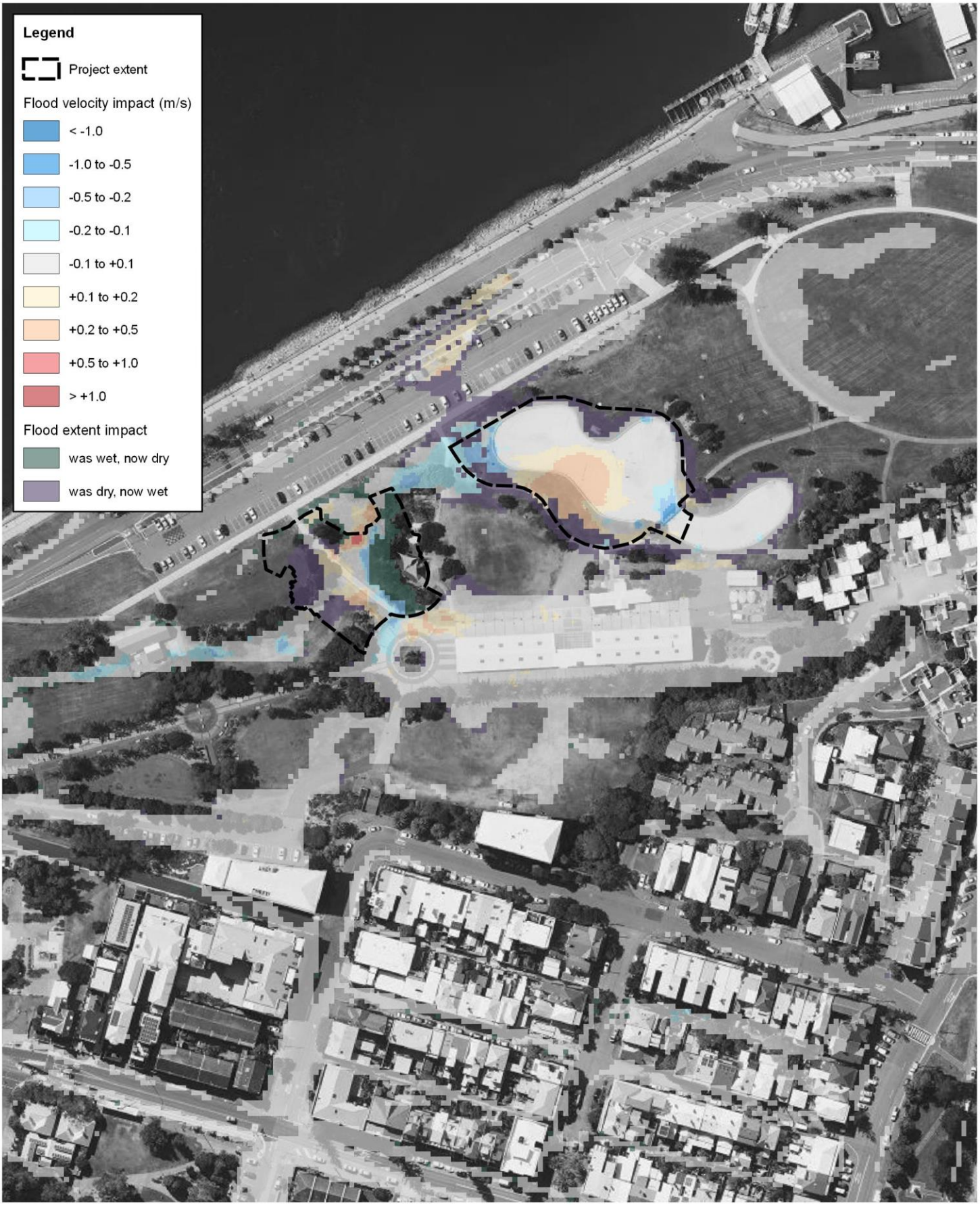
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B12_240806_20y_v_impact.qgz



Title:

2% AEP Peak Flood Velocity Impact Post-development Conditions

0 50 100 m

approx. scale

Figure: **B13**

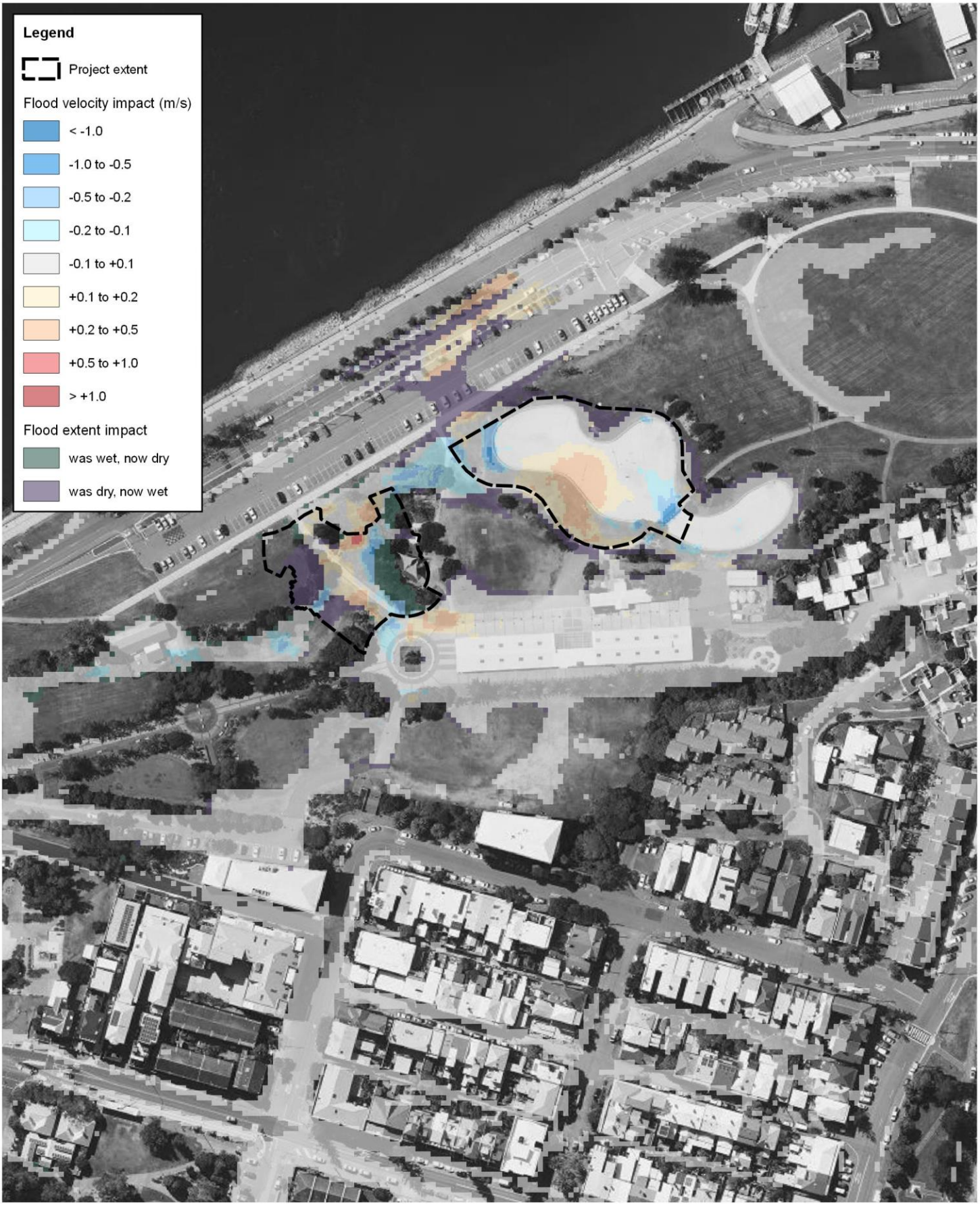
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B13_240806_50y_v_impact.qgz



Title:

1% AEP Peak Flood Velocity Impact Post-development Conditions

0 50 100 m

approx. scale

Figure: **B14**

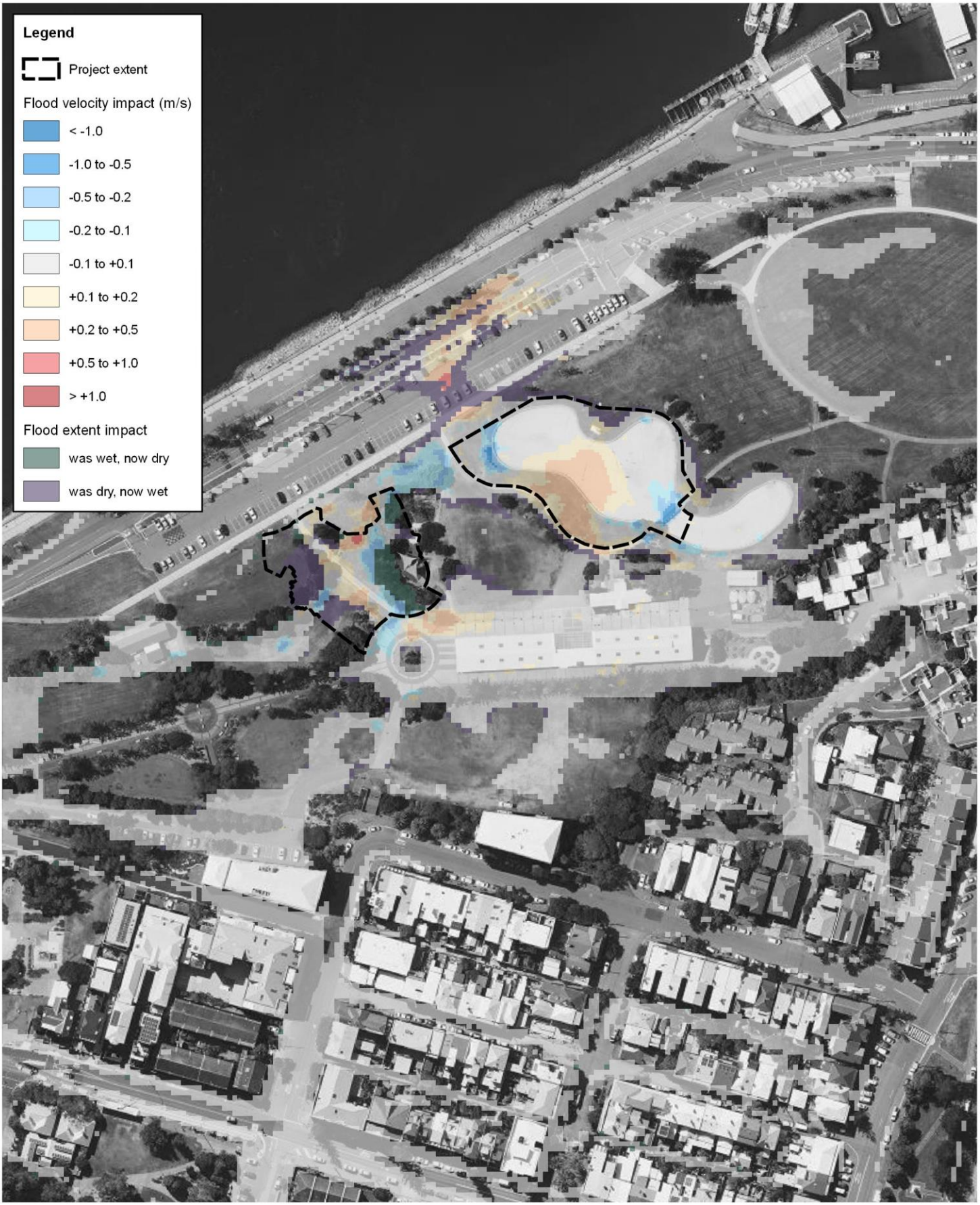
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B14_240806_100y_v_impact.qgz



Title:

0.5% AEP Peak Flood Velocity Impact Post-development Conditions

0 50 100 m

approx. scale

Figure: **B15**

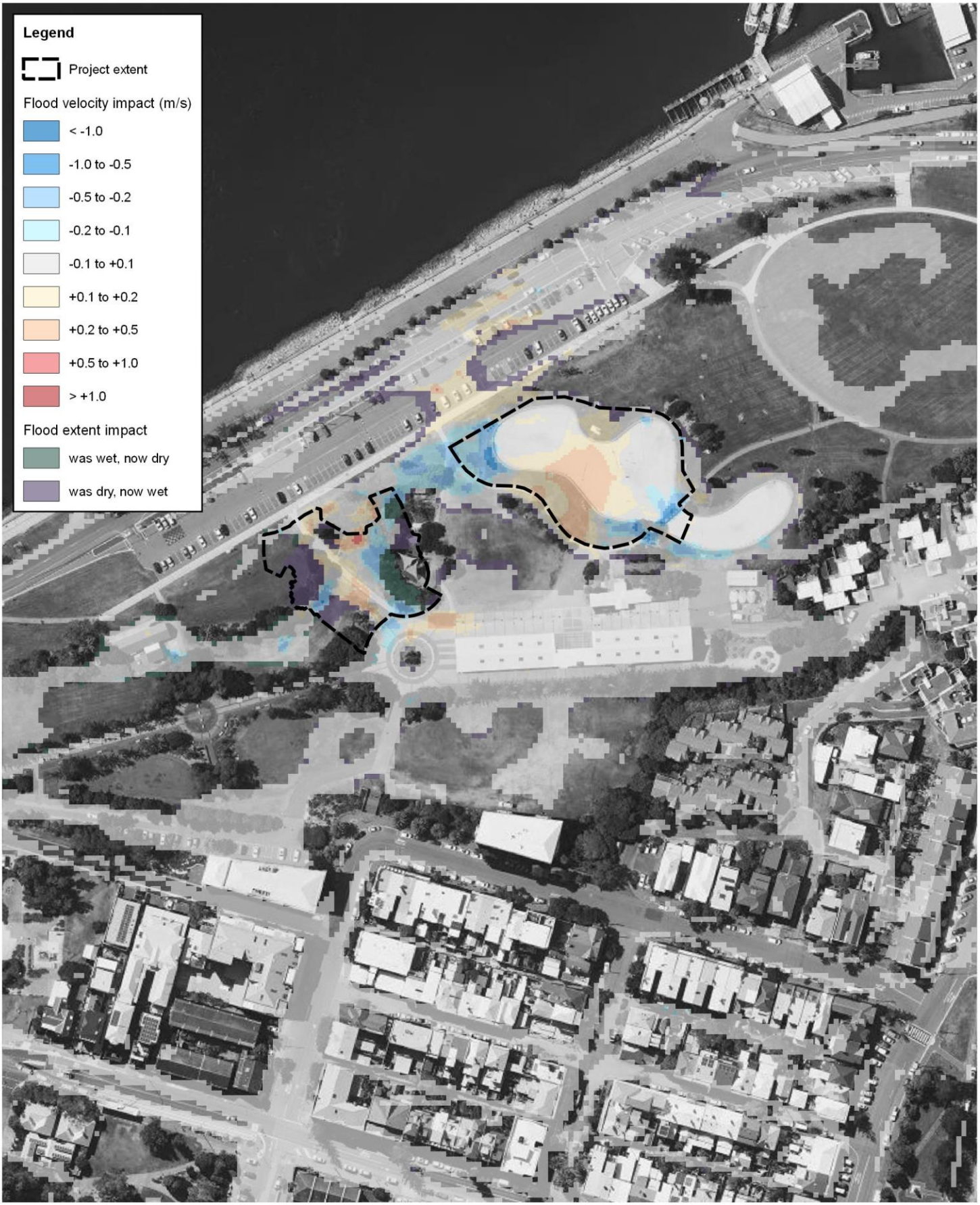
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B15_240806_200y_v_impact.qgz



Title:

0.2% AEP Peak Flood Velocity Impact Post-development Conditions

0 50 100 m

approx. scale

Figure: **B16**

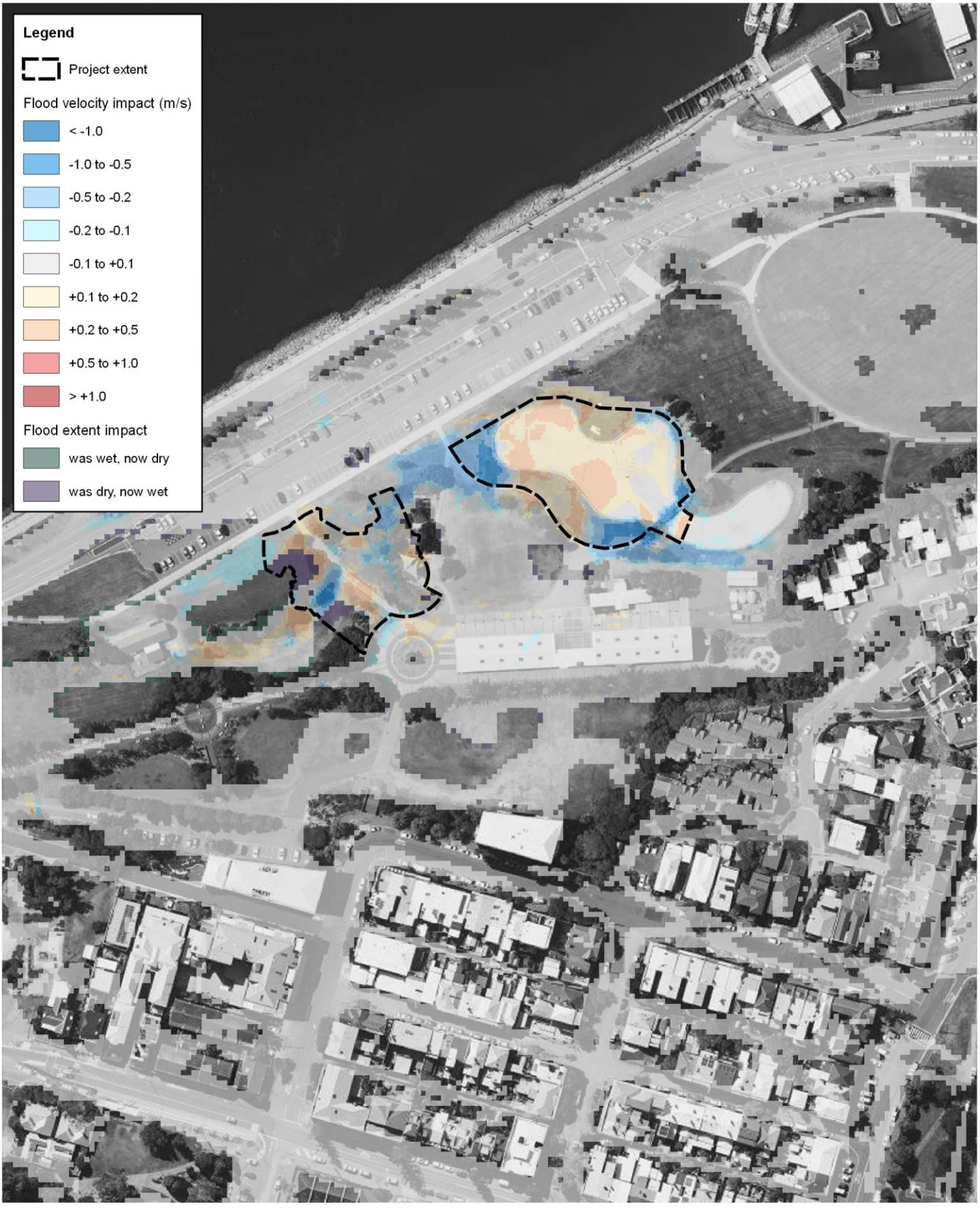
Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B16_240806_500y_v_impact.qgz



Title:

PMF Peak Flood Velocity Impact
Post-development Conditions

0 50 100 m

approx. scale

Figure: **B17**

Revision: **A**

Information shown on this figure is compiled from numerous sources and may not be complete or accurate. Torrent Consulting cannot be held responsible for the misuse or misinterpretation of any information and offers no warranty guarentees or representations of any kind in connection to its accuracy or completeness. Torrent Consulting accepts no liability for any loss, damage or inconvenience caused as a result of reliance on the information.

N

Torrent CONSULTING
www.torrentconsulting.com.au

Filepath: Z:\Projects\T2548_Foreshore_Park\GIS\T2548_B17_240806_PMF_v_impact.qgz

Appendix H

Access and Inclusion

Funktion

18th September 2024

Livvi's Place Playspace, Newcastle East
Access & Inclusion Review

Background

This review of the 100% tender landscape architecture design documentation addresses the requirements for access by people with a disability or who are older, to the proposed new Livvi's Place Playspace in Newcastle East.

We have reviewed the landscape plans, issued by T.C.L, to assess the level of accessibility and compliance with the relevant codes, standards and legislation. The designs have been assessed to ensure that equitable and dignified access for people with disabilities can be provided.

In carrying out an accessibility assessment, the main objective is to ensure access is provided through the provision of accessible facilities and continuous paths of travel to and within all areas of the play space.

A key element of accessibility through the area is the provision of a continuous accessible and safe path providing unhindered movement for all users. Surfaces, gradients, widths, edging, slip resistance and alternate routes to areas with steep gradients are key factors in the provision of a continuous accessible path of travel.

Design Requirements & Guidance

While there are no mandatory accessible design requirements that govern all aspects of outdoor environments and play spaces, the following documents provide various specifications that can be applied to built elements in the outdoor environment.

Design requirements are based on the access provisions and guidelines in the following documents:

- The Disability Discrimination Act 1992 (DDA)
- AS1428.1 (2021) Design for access and mobility Part 1: General requirements for access – New building work.
- AS1428.2 (1992) Design for access and mobility Part 2: Enhanced and Additional requirements - Buildings and facilities
- AS1428.4 (2009) (Incorporating Amendment No 1): Design for access and mobility Part 4.1: Means to assist the orientation of people with vision impairment -tactile ground surface indicators
- AS2890.6 (2009) Parking Facilities - Off-street parking for people with disabilities
- Australian Human Rights Commission Guideline on the Application of the Premises Standards (2013)
- Australian Human Rights Commission Advisory Note on streetscape, public outdoor areas, fixtures, fittings and furniture February 2013

The following policies and frameworks also provided design guidance for this project:

- City of Newcastle Disability Inclusion Action Plan 2022-2026
- Everyone Can Play – A Guideline to Create Inclusive Play Spaces
- Better Placed – NSW Government Architect, 2017
- Greener Places – NSW Government Architect, 2017

www.funktion.com.au
t 9011 8128
PO Box 1214
Manly NSW 1655
ABN 846 2198 9946

18th September 2024

Universal Access

Access to high-quality parks, open space, and other landscapes is an important social and environmental justice issue. The design of the play space can respond to visitors' increasing diversity in age and ability by being usable by the widest range of people in the widest range of situations, without separate or special design, extending the benefits of universal design to all users. The design process, programming, and ongoing outreach play key roles in ensuring the play space is inclusive and serves the needs of diverse users.

Accessible and inclusive design can enable access for those excluded from certain activities and remove barriers - whether actual or perceived - which restrict the ability to visit public places and participate equitably in a range of social, work and recreational activities.

The creation of welcoming and easy to use environments enhances mobility and wayfinding and reduces physical and psychological barriers. By recognising different requirements and mobility levels, a balanced range of alternatives can be formulated that accurately reflects and accommodates the needs of visitors to the area, enhancing the quality of the visitor experience.

Easy to Use
The design is simple and intuitive to use regardless of the person's experience, knowledge and language level. It requires minimal effort and strength, ultimately enhancing function and independence.

Offers Choice
Delivering a range of options ensures people can choose how they want to use and enjoy places without fuss or exception.



Comfortable
Designs that are effortless to use, enhance well-being, mental and physical health. Providing experiences that are more enjoyable and healthy, improving overall quality of life.

Embraces Diversity
Design that appeals to more people broadens participation. It welcomes and inspires a wide variety of people by creating a sense of belonging and desirability.

Safe
Well designed spaces encourage participation by minimizing hazards that can cause anxiety and injury, enhancing confidence, peace of mind and security.

Principles of Universal Access

adapted from Easy Access to Historic Landscapes 2005, English Heritage

www.funktion.com.au
t 9011 8128
PO Box 1214
Manly NSW 1655
ABN 846 2198 9946

18th September 2024

Proposed Design



Design Development 100% Tender: TCL

www.funktion.com.au
t 9011 8128
PO Box 1214
Manly NSW 1655
ABN 846 2198 9946

18th September 2024

Proposed Design and Accessibility

In May 2020 City of Newcastle (CN) commenced the Harbour Foreshore Masterplan (HFM), in accordance with the Foreshore Plan of Management. A key deliverable for the HFM was a regional play space to replace the existing local scale playground. CN obtained a partnership with Variety the Children's Charity (VCC) to deliver an inclusive play space.

The play space will incorporate a variety of play opportunities including an industrial play area, Awabakal & Worimi area, coastal waterplay area, sand dunes and various play equipment. An amenities building will service both the play space and the broader park. The current concept draws on uniquely Novocastrian themes including pre-European Awabakal life on the harbour.

Objectives of the project included:

- Design an inclusive play space for all ages and abilities for the community as defined by the Everyone Can Play Guidelines and referring to the detailed community engagement report on how the space is desired to be used, by whom with key elements and themes coming from the kids and community will be the basis to planning.
- Design excellence that considers locality and the challenges of the site

Guiding Principles for Access and Inclusion

Through their Disability Inclusion Action Plan 2022-2026, City of Newcastle have indicated their intention to integrate universal access into strategic planning and design to anticipate the diverse needs and aspirations of local residents and visitors well into the future. The result is better environments that are sustainable and inclusive for everyone. The following principles for access and inclusion underpin this review.

- People Centred Approach - the user is at the centre of the design process
- Universal Design - access for the entire community
- User Journey - whole of journey accessibility
- Equal and Equivalent Access - provision of dignity and rights for people with a disability
- Engagement of people with a disability - gather input from a wide range of users and ensure people with a disability are able to participate in the consultation processes

Documentation Reviewed

The landscape architecture documentation prepared by T.C.L was reviewed for this Access and Inclusion Review – see Appendix for drawing list.

www.funktion.com.au
t 9011 8128
PO Box 1214
Manly NSW 1655
ABN 846 2198 9946

18th September 2024

Design Review

Ref	Feature	Comments
01	**Links to Play space**	
1.1	Parking and links into play space	• Although not in the scope of this project, accessible parking is available in the existing foreshore carpark, near the play space entrances. • Continuous accessible paths of travel link accessible parking to the play space entrance points.
02	**Pathway Network**	
2.1	Accessible links and levels	• The play space has a clear layout, making it easy to understand by a first time user • The entry points are clear and well defined from inside and outside the play space • A clear, easily identified 'orientation' path links to, in and around the play space that links to access points and key activity areas • The accessible pathway network has a consistent width and surface finish, with gentle slopes, accessible gradients and accessible cross falls that comply with AS1428.1 • The primary pathways are indicated to have accessible gradients (generally no steeper than 1:21), cross falls and edges to meet AS1428.1, with adequate width and passing space to cater for activity by different users including parents with prams and people using mobility aids. • There is a steeper section (1:15) next to the flying fox • The minimum crossfall of primary pathways is indicated to be 2% to comply with AS1428.1 **Recommendation:** • Provide a different colour surface finish to the steeper section next to the flying fox to highlight the level change
2.2	Pathways - details	• The width of primary pathways is indicated to be 2.1 - 3m wide • Provision for passing spaces that comply with AS1428.1 (1800mm x 2070mm) is included along pathways. • Provision of level landings minimum 1500mm x 1500mm every 15m along 1:21 walkways and at change in direction of pathways + pathway connections is indicated. • To meet AS1428.1, the ground abutting the sides of the walkways are indicated to have a firm and level surface at the same level and grade of the walkway for minimum 600mm, or provision of a barrier

www.funktion.com.au
t 9011 8128
PO Box 1214
Manly NSW 1655
ABN 846 2198 9946

		• Level transitions between surfaces are proposed. Construction tolerance of 3mm is allowable or 5mm with beveled edges is acceptable.

2.3	Surfaces	• Accessible pathway surfaces are indicated to be:
		  ○ PV01 Concrete paving – primary pathways
		  ○ PV02 Concrete paving – awabekal & worimi area, kiosk seating, picnic spaces
		  ○ PV03 Concrete paving – waterplay
		  ○ PV03A/B/C Concrete paving – waterplay tessellations
		  ○ PV04 Tessellated Edge – water play
		  ○ PV06 Granitic Gravel Paving – junior play
		  ○ PV07 Treetop Walk – coloured minimesh
		  ○ PV08 Junior Play Entrance concrete paving
		  ○ PV09 Concrete Paving
		  ○ PV10 permeable paving – undercover walkway
		  ○ PV11 concrete paving – junior play
		  ○ PV12 concrete paving – pump room hardstand
		  ○ SF02 Rubberised Soft fall – play spaces
		  ○ ED02 – Interps Feature Insert
		• These surfaces have the potential to offer firm, level, slip resistant surfaces (in wet and dry conditions and over time), with level transitions between surfaces (5mm with beveled edges is acceptable) to meet AS1428.1 clause 7.2.
		• The pathway surfaces, edges and surrounding planting and textures differentiate particular zones, define the pathway hierarchy and may assist with wayfinding for people with low vision.

2.4	Grated pits	• Grated pits are shown in some of the pedestrian pathways, garden beds and lawn; a proprietary fixture is specified with heel guard - to meet AS1428.1 clause 7.5 (drainage grates on accessible path of travel are required to have openings no more than 13mm wide with the long dimension transverse to the direction of trave)
2.5	Fence and gate	• Custom gate is specified with an accessible gate mechanism that can be operated by an adult using a wheelchair or mobility device
03	**Picnic tables and other fixtures**	
3.1	Picnic Areas and fixtures	• Picnic areas are indicated to be linked to the primary pathway network by an accessible path of travel • 3 x accessible drinking fountains are proposed, in each section of the play space, with adequate circulation space around them. • The bins are indicated to be linked to an accessible path of travel

www.funktion.com.au
t 9011 8128
PO Box 1214
Manly NSW 1655
ABN 846 2198 9946

		• Bins have an opening max 1350mm above the ground – could be reached by people using wheelchairs and have adequate circulation space in front • Shelters are indicated • Accessible picnic tables (Hobsons Setting DDA) are specified at The Meeting Place **Recommendations:** • Provide luminance contrast of drinking fountains against the ground surface so they are easier for people with low vision to see.
3.2	Play elements	• The play space provides various play opportunities for a variety of age groups • Accessible paths of travel are shown, linking to all play elements in the industrial play area, Awabakal & Worimi area, coastal waterplay area and sand dunes • Accessible play elements have been specified in consultation with stakeholders and include wheelchair accessible trampolines, accessible flying fox, quiet spaces, water play, Ganya camps, raised sandpit • The cog tower is accessible for mobility aid users via the treetop walkway • The treetop walkway is accessible - 1540mm wide; 1:21 / 1:14 gradient, handrails and landings every 15m • There is circulation space around the majority of play elements • Contrasting colours around the raised tessellated edges (western side), to highlight the change in level. PV04 is to be a dark brown colour to contrast with the adjacent light sandy colours.
3.3	Wheelchair charging points	• Wheelchair power bollards are proposed in two picnic spaces with MLAK key access • There are 2 x Power Bollards also proposed in the Meeting Place area and one proposed in the Sand Dunes area within the northern Kiosk cave.
04	**Amenities**	
4.1	Amenities Building	• A new amenities building is proposed, which will include unisex accessible sanitary facilities, a Changing Places facility, a family bathroom and cubicles suitable for a person with an ambulant disability. • The amenities building is easy to locate and has level access from the play space • The amenities design is capable of complying with AS1428.1, the BCA and the Changing Places Design Guide (a separate access review of the building has been undertaken).
4.2	Stairs at amenities building	• Stairs, handrails and nosings are proposed to comply with AS1428.1 **Recommendation:**

www.funktion.com.au
t 9011 8128
PO Box 1214
Manly NSW 1655
ABN 846 2198 9946

		• Ensure TGSIs provide luminance contrast to meet AS1428.4.1
05	**Seating**	

5.1	Seating types and locations	• Various options for seating are provided including individual and group arrangements
		• Seating is proposed to be provided throughout the playspace, at regular intervals along pathways, under shade and near different areas within the playground.
		• Seating types are indicated to include:
		  ○ ED01 Seat edge with wheelchair / pram seating nodes
		  ○ WT01 Retaining wall
		  ○ WT02 Seat edge amenities / kiosk 500mm (H)
		  ○ FN04 & FN05 picnic setting (DDA) in quiet spaces and The Meeting Place
		  ○ FX09 Timber seat top
		  ○ FX10 – timber seat top (wide)
		• Clear space adjacent to the seats to accommodate people who use wheelchairs or prams is provided, including wheelchair nooks in the seating walls
		• A proportion of seats are proposed to include armrests and backrests in accordance with AS1428.2 clause 27.2.
		• Quiet seating areas are provided
		Recommendation:
		• Provide wheelchair seating spaces at the Awabakal and Worimi table

06 Information		
6.1	Information & Signage	Information and signage have not been reviewed. **Recommendations:** • Provide information about the play space which is available to plan a visit • Provide signage that is easy to read, using simple language and graphics and high colour contrast • Locate signage at a height that is easy to read for all play space users, Including children and people in wheelchairs • Provide pictographs and braille on key instructional and safety signage • Provide communication boards to promote alternative forms of communication • Provide wayfinding from local light rail or bus connections to the play space • Make the signs easy to find through use of luminance contrast

www.funktion.com.au
t 9011 8128
PO Box 1214
Manly NSW 1655
ABN 846 2198 9946

18th September 2024

		• Consider including tactile maps at a height suitable for children, showing path layout and landmarks. The map could indicate the location of toilets, carpark and public transport links • Consider use Braille, pictograms and large, legible text

Conclusion

Having reviewed the 100% tender landscape design documentation, it is our opinion that at this stage of the design, the access provisions for people with physical and sensory disabilities in the proposed new Livvi's Place play space complies with the of the intent of the Disability Discrimination Act 1992 (DDA), the functional accessibility requirements of AS1428.1 2009 and the Australian Human Rights Commission Advisory Note on streetscape, public outdoor areas, fixtures, fittings and furniture.

The provision of access for people with a disability in the proposed new work provides continuous accessible paths of travel and the equitable provision of accessible facilities to provide inclusive design to meet the anticipated requirements of visitors to the play space.

The play space provides inclusive play opportunities in line with the guidance provided in "Everyone Can Play" - A Guideline to Create Inclusive Play Spaces.

I certify that I am an appropriately qualified and competent person practicing in the relevant area of work. I have recognised relevant experience in the area of work being reviewed. My company is holding appropriate current insurance policies.

Please contact me if you require further information.

[redacted]

www.funktion.com.au
t 9011 8128
PO Box 1214
Manly NSW 1655
ABN 846 2198 9946

Appendix 1

M2202_LIVVI'S PLACE PLAYSPACE

GENERAL LANDSCAPE WORKS

NEWCASTLE EAST, NSW, 2300

ISSUED: 16.08.2024 100% DOCUMENTATION D&C ISSUE REV: P1

GENERAL NOTES

THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE TECHINICAL SPECIFICATION AND THE FINISHES AND FURNITURE SCHEDULED PROVIDED AS PART OF THIS DRAWING SET.

THE CONTRACTOR AND SUB-CONTRACTORS SHALL VERIFY ALL DIMENSIONS, LINES, LEVELS, AND EXISTING SERVICE LOCATIONS PRIOR TO COMMENCEMENT ON SITE, PREPARATION OF DETAIL/SHOP DRAWINGS, AND FABRICATION OF CONSTRUCTION/BUILDING COMPONENTS.

CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS PRIOR TO FABRICATION AND INSTALLATION. IF ANY ANOMALIES ARISE THE CONTRACTOR IS TO ADVISE THE ENGINEER AND LANDSCAPE ARCHITECT IMMEDIATELY.
ALL DIMENSIONS ARE IN MM. DO NOT SCALE OFF DRAWINGS.

CONTRACTOR IS TO PROVIDE SHOP DRAWINGS (CAD DRAFTED TO SCALE WITH ADEQUATE NOTES AND DIMENSIONS FOR REVIEW AND FABRICATION) TO THE LANDSCAPE ARCHITECT AND ENGINEER. FIXING COMPONENTS AND DETAILS TO BE CONFIRMED THROUGH THE SHOP DRAWING PROCESS.

ALL WELDS TO BE 4MM CFW ELECTRODE TO AS/NZ 1554, PART 1 AND 2 AS APPROPRIATE. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS/NZ 4100 STEEL STRUCTURES.
SHOP WELD WITH CFW ALL JOINS. ALL BUTT WELDS SHALL BE FULL PENETRATION. UNLESS SPECIFIED OTHERWISE ALL FABRICATION TOLERANCES SHALL BE WITHIN +/- 1.0MM AND ALL.

ANGULAR TOLERANCES SHALL BE +/- 1.0MM.
GRIND SMOOTH ALL EDGES TO MAKE NEAT JOINS. REMOVE GLOBULES OF WELD METAL, WELD SLAG AND ALL FOREIGN MATTER.

FINISH VISIBLE JOINTS MADE BY WELDING USING METHODS, APPROPRIATE TO THE CLASS OF WORK, INCLUDING GRINDING OR BUFFING BEFORE FURTHER TREATMENT.

CONTRACTOR SHALL SUPPLY AND INSTALL ALL STAINLESS STEEL SCREWS, BOLTS, NUTS , WASHERS, HINGES, LOCKS, RIVETS AND FIXINGS.

WHERE FIXING TYPES OR STRUCTURAL SPACINGS HAVE NOT BEEN NOMINATED, CONTRACTOR TO ENSURE THAT ENGINEER HAS APPROVED ANY SIZINGS AND SPACINGS INSTALLED.

ALL PRECAST CONCRETE SURFACES TO BE A MINIMUM 'CLASS 1' FINISH. REFER TO ENGINEER'S DRAWINGS FOR CONCRETE STRENGTH AND REINFORCING.

PRECAST CONCRETE UNITS WILL REQUIRE STEEL REINFORCEMENT - DESIGN TO BE PROVIDED BY THE FABRICATOR FOR THE ENGINEER'S APPROVAL. CONTRACTOR TO ALLOW FOR DH10 REINFORCEMENT AT 150C/C ON EACH FACE.

HUNTER WATER APPROVALS IN RELATION TO SEWER BELOW.

CONTRACTOR TO ENSURE ALL EXPOSED STEEL ELEMENTS AND FIXINGS ARE TO WITHSTAND MARINE ENVIRONMENTS.

DRAWING LIST

DRAWING	Drawing Title	Scale	Rev	Scope
GENERAL LANDSCAPE WORKS PACKAGE				
L001	Title Sheet	N/A	P1	General Landscape
L002	Landscape Detail Type Schedule	N/A	P1	General Landscape
L003	Furniture and Fixtures Schedule	N/A	P1	General Landscape
L004	Play Elements Schedule	N/A	P1	General Landscape
L050	Key Plan	1:400	P1	General Landscape
L051	Overall Surfaces Plan	1:400	P1	General Landscape
L052	Overall Tree Removal Plan	1:400	P1	General Landscape
L100	Demolition Plan Sheet 1 of 5	1:100	P-	General Landscape
L101	Demolition Plan Sheet 2 of 5	1:100	P-	General Landscape
L102	Demolition Plan Sheet 3 of 5	1:100	P-	General Landscape
L103	Demolition Plan Sheet 4 of 5	1:100	P-	General Landscape
L104	Demolition Plan Sheet 5 of 5	1:100	P-	General Landscape
L200	Setout Plan Sheet 1 of 5	1:100	P-	General Landscape
L201	Setout Plan Sheet 2 of 5	1:100	P-	General Landscape
L202	Setout Plan Sheet 3 of 5	1:100	P-	General Landscape
L203	Setout Plan Sheet 4 of 5	1:100	P-	General Landscape
L204	Setout Plan Sheet 5 of 5	1:100	P-	General Landscape
L300	Surfaces Plan Sheet 1 of 5	1:100	P1	General Landscape
L301	Surfaces Plan Sheet 2 of 5	1:100	P1	General Landscape
L302	Surfaces Plan Sheet 3 of 5	1:100	P1	General Landscape
L303	Surfaces Plan Sheet 4 of 5	1:100	P1	General Landscape
L304	Surfaces Plan Sheet 5 of 5	1:100	P1	General Landscape
L400	Grading Plan Sheet 1 of 5	1:100	P1	General Landscape
L401	Grading Plan Sheet 2 of 5	1:100	P1	General Landscape
L402	Grading Plan Sheet 3 of 5	1:100	P1	General Landscape
L403	Grading Plan Sheet 4 of 5	1:100	P1	General Landscape
L404	Grading Plan Sheet 5 of 5	1:100	P1	General Landscape
L500	Planting Plan Sheet 1 of 5	1:100	P1	General Landscape
L501	Planting Plan Sheet 2 of 5	1:100	P1	General Landscape
L502	Planting Plan Sheet 3 of 5	1:100	P1	General Landscape
L503	Planting Plan Sheet 4 of 5	1:100	P1	General Landscape
L504	Planting Plan Sheet 5 of 5	1:100	P1	General Landscape
L505	Planting Schedules	N/A	P1	General Landscape
L600	Industrial Play Sections	As Shown	P1	General Landscape
L601	Industrial Play Sections	As Shown	P1	General Landscape
L602	Water Play Sections	As Shown	P1	General Landscape
L603	Water Play Sections	As Shown	P1	General Landscape
L604	Junior Play Sections	As Shown	P1	General Landscape
L605	Awabakal & Worimi Sections	As Shown	P1	General Landscape
L606	General Sections	As Shown	P1	General Landscape
L607	Flying Fox Sections	As Shown	P1	General Landscape
L608	Undercover Walkway Sections	As Shown	P1	General Landscape
L609	Undercover Walkway Sections	As Shown	P1	General Landscape
L610	Musical Alcove	As Shown	P1	General Landscape
L611	Pump Room Façade	As Shown	P1	General Landscape
L612	Picnic & Quiet Spaces	As Shown	P1	General Landscape
L630	Softfall Interfaces	As Shown	P1	General Landscape
L631	Softscape Interfaces	As Shown	P1	General Landscape
L632	Paving Interfaces	As Shown	P1	General Landscape
L700	General Paving Details	As Shown	P1	General Landscape
L701	General Paving Details	As Shown	P1	General Landscape
L702	Pit Lid Details	As Shown	P1	General Landscape
L705	Soft Landscape Details	As Shown	P1	General Landscape
L706	Landscape Planting Details	As Shown	P1	General Landscape
L707	Edges and Wall Details	As Shown	P1	General Landscape
L708	Seat Edge Details Sheet 1 of 3	As Shown	P1	General Landscape
L709	Seat Edge Details Sheet 2 of 3	As Shown	P1	General Landscape
L710	Seat Edge Details Sheet 3 of 3	As Shown	P1	General Landscape
L712	Musical Alcove Details	As Shown	P1	General Landscape
L713	Musical Alcove Details	As Shown	P1	General Landscape
L715	Fencing Details	As Shown	P1	General Landscape
L716	Balustrade Details	As Shown	P1	General Landscape
L717	Shade Structure Details	As Shown	P1	General Landscape
L718	Stairs & Fixtures Details	As Shown	P-	General Landscape
L720	Junior Play Elements Details	As Shown	P1	General Landscape
L721	Junior Play Elements Details	As Shown	P1	General Landscape
L722	Junior Play Elements Details	As Shown	P1	General Landscape
L723	Junior Play Elements Details	As Shown	P1	General Landscape
L724	Junior Play Elements Details	As Shown	P1	General Landscape
L726	Junior Play Render 1	N/A	P1	General Landscape
L727	Junior Play Render 2	N/A	P1	General Landscape
L730	Industrial Play Softfall Patterning	1:100	P1	General Landscape
L731	Whale Swing Softfall Patterning	1:100	P1	General Landscape
L732	Junior Play Softfall Patterning	1:100	P1	General Landscape
L740	PV04 Tessellated Edge Plan	As Shown	P1	General Landscape
L742	Tessellated Edge Details	As Shown	P1	General Landscape
L745	Picnic Space Details	As Shown	P1	General Landscape

D&C PACKAGES (FOR REFERENCE)

DRAWING	Drawing Package Title			
L800 - L849	**INDUSTRIAL PLAY D&C PACKAGE**			
L850 - L899	**WATER PLAY D&C PACKAGE**			
L900 - L950	BESPOKE PICNIC PLAY AND SEATING AREA D&C PACKAGE Note: Bespoke Picnic, Play & Seating D&C Package is referred to as 'Awabakal & Worimi D&C Package' throughout this drawing package.			

CODES & ABBREVIATIONS LEGEND

Code	Description
CFW	Continuous Fillet Weld
CHS	Circular Hollow Section
CP##	Custom Play Element
CSK	Countersunk (Surface Finish)
Cts.	Centres
DC1	Dried Class 1
EA	Equal Angle
FE##	Fence Type
FN#	Proprietary Furniture Type #
FX#	Proprietary Fixture Type #
SE#	Steel Edge Type #
FSBW	Full Strength Butt Weld
FSL	Finished Surface Level
G	Gauge
GA##	Gate Type
GB#	Garden Bed Type #
PV#	Paving Arrangement Type #
HDG	Hot Dip Galvanised
HWD	Hardwood
MS	Mild Steel
Nom.	Nominal
PFC	Parallel Flange Channel
PP##	Proprietary Play Element
SD	Slot Drain
SF##	Soft Fall Surfaces
SHS	Square Hollow Section
SS	Stainless Steel
TD#	Timber Decking Type #
TP	Tangent Point
Typ	Typical
UA	Unequal Angle
WT#	Wall Type #
	ALL CODES AND ABBREVIATIONS ARE TO BE READ IN CONJUNCTION WITH THE SCHEDULES AND DRAWING SET.

Rev	Date	Revision Details	By	Chk	App
P1	16.08.24	100% DOCUMENTATION D&C ISSUE	GK	AO	DR
P-	15.03.24	75% DOCUMENTATION ISSUE	GK	AO	DR

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

T.C.L TAYLOR.CULLITY.LETHLEAN

File #: M2202

Designed by	Drawn by	Checked by	Approved by
TCL	GK	AO	DR

Status: 100% DOCUMENTATION

NOT FOR CONSTRUCTION

Drawing: TITLESHEET

Sheet: Sheet 1 of 1

Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22

Scale: N/A

Drawing No. L001

Rev. P1

M2202_LIVVI'S PLACE PLAYSPACE

INDUSTRIAL PLAY D&C PACKAGE LANDSCAPE WORKS

NEWCASTLE EAST, NSW, 2300

ISSUED: 04.06.2024 ISSUED FOR TENDER REV: T2

GENERAL NOTES

THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE PERFORMANCE SPECIFICATION AND THE LANDSCAPE DETAIL TYPE, FURNITURE & FIXTURES, AND PLAY ELEMENTS SCHEDULES PROVIDED AS PART OF THIS DRAWING SET. CONTRACTOR TO PROVIDE SIMILAR ALTERNATIVE ELEMENTS FOR LANDSCAPE ARCHITECT APPROVAL WHERE ORIGINAL PROPOSED ELEMENTS CANNOT BE PROCURED.

D&C CONTRACTOR TO COORDINATE ALL HOLD POINTS, ADJACENT INTERFACES AND SUB-STRUCTURE ELEMENTS WITH HEAD CONTRACTOR.

D&C CONTRACTOR TO ADHERE TO AUSTRALIAN STANDARDS INCLUDING AS DDA COMPLIANCE AS 1428.1 AND PLAYGROUND STANDARDS AS 4865.

THE CONTRACTOR AND SUB-CONTRACTORS SHALL VERIFY ALL DIMENSIONS, LINES, LEVELS, AND EXISTING SERVICE LOCATIONS PRIOR TO COMMENCEMENT ON SITE, PREPARATION OF DETAIL/SHOP DRAWINGS, AND FABRICATION OF CONSTRUCTION/BUILDING COMPONENTS.

ALL DIMENSIONS ARE NOMINAL ONLY AND SHOWN FOR DESIGN INTENT UNLESS OTHERWISE SPECIFIED. CONTRACTOR TO PROVIDE STRUCTURAL CERTIFICATION FOR ALL STRUCTURAL ELEMENTS.

FIXING METHODS ARE INDICATIVE FOR DESIGN INTENT. CONTRACTOR TO PROVIDE ALTERNATIVE FIXING METHODS WHERE APPLICABLE FOR LANDSCAPE ARCHITECT AND STRUCTURAL ENGINEER APPROVAL. CONTRACTOR TO ENSURE ALL ELEMENTS ARE STRUCTURALLY CERTIFIED. NO VISIBLE FIXINGS.

CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS PRIOR TO FABRICATION AND INSTALLATION. IF ANY ANOMALIES ARISE THE CONTRACTOR IS TO ADVISE THE ENGINEER AND LANDSCAPE ARCHITECT IMMEDIATELY.
ALL DIMENSIONS ARE IN MM. DO NOT SCALE OFF DRAWINGS.

CONTRACTOR IS TO PROVIDE SHOP DRAWINGS (CAD DRAFTED TO SCALE WITH ADEQUATE NOTES AND DIMENSIONS FOR REVIEW AND FABRICATION) TO THE LANDSCAPE ARCHITECT, STRUCTURAL ENGINEER AND CITY OF NEWCASTLE ASSETS TEAM FOR APPROVAL PRIOR TO FABRICATION AND INSTALLATION. FIXING COMPONENTS AND DETAILS TO BE CONFIRMED THROUGH THE SHOP DRAWING PROCESS.

LANDSCAPE ARCHITECT TO NOMINATE PREFERRED COLOURS FOR ELEMENTS FOR CONTRACTOR. WHERE COLOURS ARE UNABLE TO BE SOURCED, CONTRACTOR TO PROVIDE SIMILAR ALTERNATIVES FOR LANDSCAPE ARCHITECT APPROVAL. ANY CHANGES TO ORIGINAL COLOUR SCHEME MUST BE REVIEWED AND APPROVED BY LANDSCAPE ARCHITECT.

ALL WELDS TO BE 4MM CFW ELECTRODE TO AS/NZ 1554, PART 1 AND 2 AS APPROPRIATE. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS/NZ 4100 STEEL STRUCTURES. SHOP WELD WITH CFW ALL JOINS. ALL BUTT WELDS SHALL BE FULL PENETRATION. UNLESS SPECIFIED OTHERWISE ALL FABRICATION TOLERANCES SHALL BE WITHIN +/- 1.0MM AND ALL.

ANGULAR TOLERANCES SHALL BE +/- 1.0MM. GRIND SMOOTH ALL EDGES TO MAKE NEAT JOINS. REMOVE GLOBULES OF WELD METAL, WELD SLAG AND ALL FOREIGN MATTER.

FINISH VISIBLE JOINTS MADE BY WELDING USING METHODS, APPROPRIATE TO THE CLASS OF WORK, INCLUDING GRINDING OR BUFFING BEFORE FURTHER TREATMENT.

CONTRACTOR SHALL SUPPLY AND INSTALL ALL STEEL SCREWS, BOLTS, NUTS , WASHERS, HINGES, LOCKS, RIVETS AND FIXINGS.

WHERE FIXING TYPES OR STRUCTURAL SPACINGS HAVE NOT BEEN NOMINATED, CONTRACTOR TO ENSURE THAT ENGINEER HAS APPROVED ANY SIZINGS AND SPACINGS INSTALLED.

ALL PRECAST CONCRETE SURFACES TO BE A MINIMUM 'CLASS 1' FINISH. REFER TO ENGINEER'S DRAWINGS FOR CONCRETE STRENGTH AND REINFORCING.

PRECAST CONCRETE UNITS WILL REQUIRE STEEL REINFORCEMENT - DESIGN TO BE PROVIDED BY THE FABRICATOR FOR THE ENGINEER'S APPROVAL. CONTRACTOR TO ALLOW FOR DH10 REINFORCEMENT AT 150C/C ON EACH FACE.

CONTRACTOR TO ENSURE ALL EXPOSED STEEL ELEMENTS AND FIXINGS ARE TO WITHSTAND MARINE ENVIRONMENTS.

HUNTER WATER APPROVALS IN RELATION TO SEWER BELOW.

DRAWING LIST

DRAWING	Drawing Title	Scale	Rev
L800	Industrial Play - Title Sheet	N/A	T2
L801	Schedules	N/A	T-
L802	Scope	1:400	T1
L805	Industrial Play - Render	N/A	T1
L806	Industrial Play - Render	N/A	T1
L807	Industrial Play - Render	N/A	T1
L810	Industrial Play - Context Plan	1:100	T1
L811	Industrial Play - Detail Plan	1:50	T2
L813	Industrial Play - Section	1:50	T2
L814	Industrial Play - Details	As Shown	T-
L815	Industrial Play - Details	As Shown	T-
L816	Industrial Play - Cog Frames	N/A	T1
L817	Industrial Play - Cog Frames	As Shown	T2
L818	Industrial Play - Cog Frames	As Shown	T2
L819	Industrial Play - Cog Frames	As Shown	T2
L820	Industrial Play - Cog Frames	As Shown	T2
L821	Industrial Play - Details	As Shown	T2
L822	Industrial Play - Details	As Shown	T2
L823	Industrial Play - Details	As Shown	T2
L824	Industrial Pay - Details	As Shown	T2
L825	Industrial Pay - Details	As Shown	T2
L826	Industrial Pay - Details	As Shown	T2
L827	Industrial Pay - Framing Details	As Shown	T1
L828	Industrial Pay - Details	As Shown	T1
L829	Industrial Pay - Flange Details	As Shown	T1
L830	Tree Top Walk - Detail Plan	1:50	T1
L831	Tree Top Walk - Ramp Details	As Shown	T2
L832	Tree Top Walk - Ramp Details	As Shown	T2
L833	Tree Top Walk - Sections	As Shown	T1
L834	Tree Top Walk - Sections	As Shown	T1
L835	Undercover Walkway - Sections	As Shown	T2
L836	Undercover Walkway - Details	As Shown	T1
L840	Industrial Play - Details	As Shown	T1
L841	Industrial Play - Details	As Shown	T1
L842	Industrial Play - Details	As Shown	T1
L843	Industrial Play - Panel Details	As Shown	T1
L844	Industrial Play - Gate Details	As Shown	T1

T2

CODES & ABBREVIATIONS LEGEND

Code	Description
CFW	Continuous Fillet Weld
CHS	Circular Hollow Section
CP##	Custom Play Element
CSK	Countersunk (Surface Finish)
Cts.	Centres
DC1	Dried Class 1
EA	Equal Angle
FE##	Fence Type
FN#	Proprietary Furniture Type #
FX#	Proprietary Fixture Type #
SE#	Steel Edge Type #
FSBW	Full Strength Butt Weld
FSL	Finished Surface Level
G	Gauge
GA##	Gate Type
GB#	Garden Bed Type #
PV#	Paving Arrangement Type #
HDG	Hot Dip Galvanised
HWD	Hardwood
MS	Mild Steel
Nom.	Nominal
PFC	Parallel Flange Channel
PP##	Proprietary Play Element
SD	Slot Drain
SF##	Soft Fall Surfaces
SHS	Square Hollow Section
SS	Stainless Steel
TD#	Timber Decking Type #
TP	Tangent Point
Typ	Typical
UA	Unequal Angle
WT#	Wall Type #
	ALL CODES AND ABBREVIATIONS ARE TO BE READ IN CONJUNCTION WITH THE SCHEDULES AND DRAWING SET.

Rev	Date	Revision Details	By	Chk	App
T2	04.06.24	DESIGN & CONSTRUCT ISSUE	GK	AO	DR
T1	05.04.24	DESIGN & CONSTRUCT ISSUE	GK	AO	DR
T-	23.02.24	DESIGN & CONSTRUCT DRAFT ISSUE	GK	AO	DR

LIVVI'S PLACE PLAYSPACE

NEWCASTLE EAST, NSW, 2300

File #: M2202

T.C.L TAYLOR.CULLITY.LETHLEAN

Designed by	Drawn by	Checked by	Approved by
TCL	GK	AO	DR

Status: DESIGN & CONSTRUCT
ISSUED FOR TENDER
NOT FOR CONSTRUCTION

Drawing: TITLE SHEET
Sheet: Sheet 1 of 15
Purpose: LANDSCAPE ARCHITECTURE

Date: 25.11.22
Scale: N/A
Drawing No. L800
Rev. T2