Upgrade Works to Brick Pit Reserve, Frenchs Forest

(Part of the Frenchs Forest Town Centre Park Upgrades Project)

Review of Environmental Factors

Part 5 of the

Environmental Planning & Assessment Act, 1979

August 2023

ARPS

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Frenchs Forest is an urban forest, with green streets and new open space, making a feature of the forest that has always shaped the site's story.

Frenchs Forest will provide character and great places; it will foster healthy and connected communities, attract families and encourage new business. It will set the benchmark for health and wellness, liveability and prosperity in a new urban centre.

Source: Vision Statement from Frenchs Forest 2041 Place Strategy (DPIE 2021)

Document Review

Version	Date	Revision Description
1.0	11/08/2023	Draft Issued for Information & Review
2.0	24/08/2023	Issued for Approval
3.0		

1 Executive Summary

The proposal

The Frenchs Forest Town Centre Park Upgrades project will deliver upgrades to three (3) public reserves in Frenchs Forest as part of the planned infrastructure for the new Frenchs Forest Town Centre. Under the project, Northern Beaches Council is proposing upgrade works to Brick Pit Reserve, Akura Reserve and Rabbett Reserve. The upgrades will embellish these existing reserves and create inviting places for the community now and into the future. Council's overall open space planning for the precinct focuses on the embellishment of existing open space with an emphasis on multi-use and enhanced linkages, as well as improving functionality and capacity to deliver passive and active recreational outcomes, together with restoring natural areas that provide a respite from increased urbanisation.

Brick Pit Reserve in Frenchs Forest is a large parcel of public open space bounded by Warringah Road to the north, Bantry Bay Road to the west, Fitzpatrick Avenue East to the south and the Wakehurst Parkway to the east. The south-western corner of the site adjoins low density residential properties and there are low density residential properties opposite the western side of the Reserve along Bantry Bay Road. The Reserve forms an important recreational resource for the local and wider community and comprises two (2) allotments (Lot 103, DP 1214166 & Lot 1B, DP 417447) under Council ownership. The Reserve is heavily treed and there is a vegetated waterbody/wetland at the centre of the site and informal walking/bike tracks meander through the Reserve.

The upgrade of Brick Pit Reserve will create a landmark public reserve for Frenchs Forest. The design intention is to create an open space for local residents, future hospital staff and patients and the broader Northern Beaches community. To rehabilitate and enhance indigenous vegetation, to assist the regeneration of local flora and flora, and to provide landscape features that celebrate and interpret the Frenchs Forest area site history.

The design for the proposed upgrade works has been prepared based on the specific site conditions and the existing qualities of the reserve.

The scope of the proposed works at Brick Pit Reserve, but is not necessarily limited to, the following:

- Demolition of four (4) existing picnic settings and concrete slabs and timber (coppers log) barriers around an existing street tree in Bantry Bay Road;

- Removal of twenty two (22) trees including eight (8) trees impacted by the proposed works, with a further fourteen (14) weed, dead or collapsed specimens recommended for removal independent to the proposed development and the retention and protection of one hundred and forty eight (148) trees;

- Construction of an acoustic barrier wall along Warringah Road (to match existing);

- Construction of a nature play area with embankment rope and slide play in the north-western corner of the Reserve;

- Installation of a series of stone steps adjacent to the nature play area down an embankment from the northern access from Bantry Bay Road;
- Construction of a new amenities block;
- Provision of an open lawn passive recreation area across the western side of the Reserve;
- Planting of new native canopy trees and installation of WSUD stormwater garden strips along part of the western edge of the Reserve;
- Construction of a 2.5m wide shared path with brick paving bands along the western edge of the Reserve;
- Construction/installation of a 1.8m wide accessible FRP pathway around the perimeter of the central waterbody, including two (2) viewing decks and a stabilised decomposed granite resting/picnic area, and linking the other access pathways to Bantry Bay Road and Fitzpatrick Avenue East;
- Construction/installation of level open lawn areas with brick retaining walls and seats near the south-eastern corner of the Reserve;
- Construction of two (2) new kerb islands with trees and new kerb build out around the existing street tree and linemarking to upgrade the existing 90 degree parking in Bantry Bay Road, to provide thirteen (13) parking spaces including two (2) accessible parking spaces with kerb ramp at the southern end and new linemarking to create seven (7) parallel parking spaces at the northern end of the Bantry Bay frontage;
- Installation of bins, seating and public art at various locations throughout the Reserve;
- Upgrade of an existing stormwater pipe and headwall adjacent to the new amenities block; and
- Additional plantings/landscape embellishment works across the Reserve, including bioswale planting along the Bantry Road edge of the Reserve.

Need for the proposal

Frenchs Forest was declared a Planned Precinct by the (then) NSW Department of Planning, Industry and Environment (DPIE) on 1 June 2017. The Planned Precinct implements Phase 1 of Northern Beaches Council's adopted Hospital Precinct Structure Plan.

To provide for the future space needs of this precinct, Council intends to embellish existing open space areas ensuring recreational opportunities are provided to meet community need resulting from the increased population, with a focus on multiple use and enhanced linkages.

Council has received grant funding from the NSW Government Department of Planning and Environment (DPE) to upgrade three parks as part of the development of the new Frenchs Forest Town Centre, as envisaged under Frenchs Forest 2041.

Statutory and planning framework

The *Environmental Planning & Assessment Act, 1979* (EP&A Act) provides the statutory framework for planning and environmental assessment in NSW. Development consent is required to carry out development and/or works unless they fall within Section 4.1 of the EP&A Act.

Section 4.1 of the EP&A Act states that if an environmental planning instrument provides that specified development may be carried out without the need for development consent, then a person may carry the development out, in accordance with the instrument, on land to which the provisions apply. Environmental assessment of the development may nevertheless be required under Part 5 of the EP&A Act.

As Brick Pit Reserve is a public reserve under the control of Council, sections 2.20, 2.73, 2.74 and 2.113 of *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&I SEPP) apply to the proposed works at Brick Pit Reserve. Northern Beaches Council, as a public authority, is permitted to undertake the works without the need to obtain development consent.

Notwithstanding, the proposed works are an "activity" within the meaning of Section 5.1 of the EP&A Act on the basis that subsection 5.1(1)(d) of the Act defines the *carrying out of a work* as an "activity". Section 5.5 of the EP&A Act states 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.

As such, the proposed upgrade works are being assessed under Part 5 of the EP&A Act and a Review of Environmental Factors (REF) has been prepared to satisfy this requirement.

Community and stakeholder engagement

Community and stakeholder engagement for the Frenchs Forest Town Centre Park Upgrades is being undertaken in two stages.

In order to understand community sentiment about the project, Stage 1 of the community and stakeholder engagement was conducted between 24 March and 4 May 2022 and consisted of several activities that provided opportunities for the community and stakeholders to learn about the proposed upgrades to Brick Pit Reserve, Akora Reserve and Rabbett Reserve and provide feedback on the concept designs.

Engagement activities included the establishment of a project page on the Northern Beaches Council's 'Your Say' platform, promotion of the project and opportunities to provide feedback through electronic direct mail (EDM) including Council's regular email newsletters, a stakeholder email, social media posts (Facebook and LinkedIn), a letterbox drop to surrounding properties, print media at Council's Service Centres and Site Signs that provided a QR Code to access the 'Your Say' page.

Community and stakeholder feedback was captured through an online comment form embedded onto the 'Your Say' project page.

The form included a question that directly asked respondents for their level of support on the proposal. An open-field comments box provided community members a space to explain or elaborate on their support, not support or express neutral sentiment as well as any other feedback they wished to contribute. Email and written comments were also invited.

There was a total of 3,261 visits and 2,734 visitors to the 'Your Say' Frenchs Forest Town Centre Park Upgrades landing page. A total of 242 comments were received across the three Your Say pages created for each reserve, and eight via email. This included five emailed comments in support/against and three additional emailed comments in relation to general Frenchs Forest Town Centre and suburb upgrades, including roadways which are outside the scope of this engagement.

Specifically in relation to Brick Pit Reserve, there was a total of 1,237 visitors to the project page and 77 unique responses were received. Feedback themes include – great for the area; good balance of nature and infrastructure; dog friendly; mosquito control; keep the bike track. In response to the online sentiment question: What do you think of the concept plan for Brick Pit Reserve? – of the 100 responses received, 66% were in support, 24% would support with changes; 7% did not support; and 3% were neutral or undetermined.

The feedback from the community and stakeholder engagement has assisted in informing the detailed design of the proposed upgrade and improvement works to ensure that the proposed design meets the community requirements and expectations. Stage 2 of the community and stakeholder engagement will now be undertaken and will provide an opportunity for Council to obtain community sentiment and obtain feedback on the detailed designs for each reserve, as well as this Review of Environmental Factors and to ensure that the designs are acceptable to the community before proceeding to construction.

Environmental impacts

The main potential environmental impacts associated with the proposed upgrade works at Brick Pit Reserve in Frenchs Forest include:

- Tree removal and protection impacts;
- Flora and fauna impacts;
- Traffic and parking impacts;
- Noise and vibration impacts;
- Air quality impacts;
- Water and stormwater quality impacts;
- Visual amenity impacts;
- Waste management and minimisation impacts.

Justification and conclusion

The upgrade of Brick Pit Reserve will create a landmark public reserve for Frenchs Forest. The design intent is to create an open space for local residents, future hospital staff and patients and the broader Northern Beaches community. Further, the proposed upgrade of the Reserve will rehabilitate and enhance indigenous vegetation, assist the regeneration of local flora and fauna and provides landscape features that celebrate and interpret the Frenchs Forest area site history.

The proposed works at Brick Pit Reserve have the potential to result in some minor environmental impacts with respect to tree removal and protection, flora and fauna, traffic and parking, noise and air quality, water and stormwater quality, visual impacts and waste storage and disposal.

Notwithstanding, the safeguards and management measures that are detailed in this Review of Environmental Factors will ameliorate or minimise these expected impacts. The proposal will also realise a number of positive impacts, including the provision of an inclusive and accessible children's playground, walking/bike tracks, picnic areas, viewing platforms and seating and associated landscaping and upgrade works that will improve the recreational facilities for the local and wider community, as well as improving the aesthetic quality, public domain amenity and legibility of Brick Pit Reserve.

On balance the proposal is considered justified.

The environmental impacts of the proposal are not likely to be significant and therefore it is not necessary for approval to be sought for the proposal under Part 4 of the EP&A Act. There will be no significant impact on any threatened species, ecological communities or their habitats such that a Species Impact Statement (SIS) would be required or a need to apply the Biodiversity Offsets Scheme (BOS) under the *Biodiversity Conservation Act, 2016*. The proposal will not have a substantial impact on any matters of National environmental significance.

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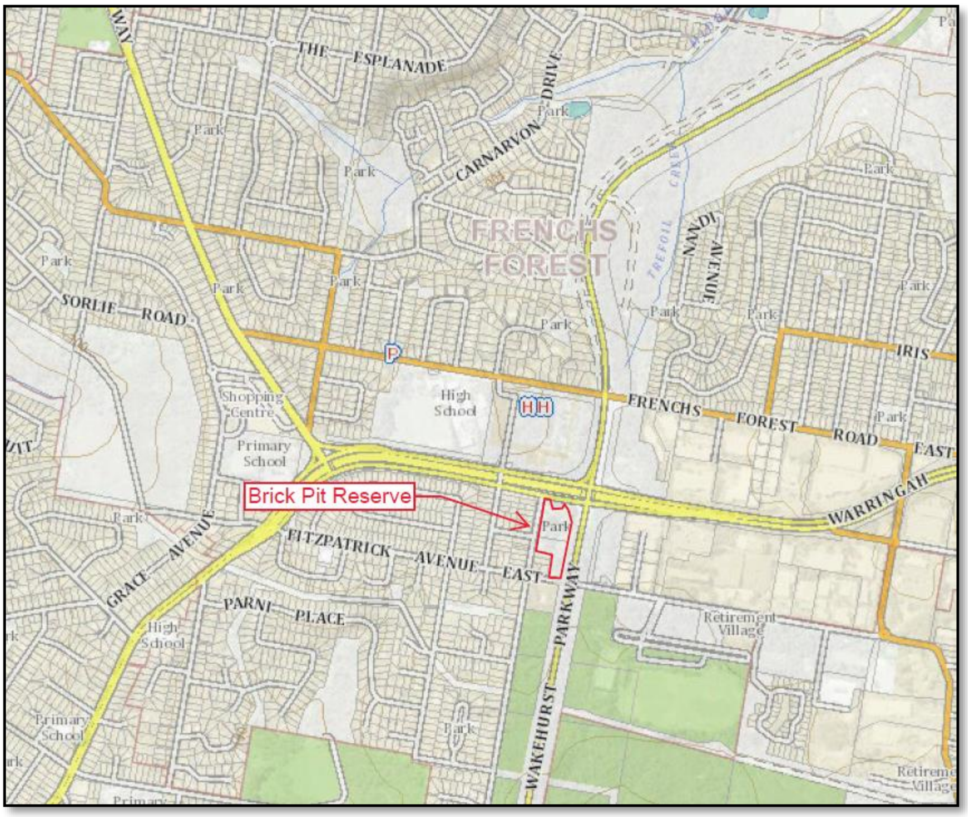
1 Introduction

1.1 Site and proposal identification

The Frenchs Forest Town Centre Park Upgrades project will deliver upgrades to three (3) public reserves in Frenchs Forest as part of the planned infrastructure for the new Frenchs Forest Town Centre. Under the project, Northern Beaches Council is proposing upgrade works to Brick Pit Reserve, Akura Reserve and Rabbett Reserve that are all within walking distance of the Frenchs Forest Precinct. The upgrades will embellish these existing reserves and create inviting places for the community now and into the future. Council's overall open space planning for the precinct focuses on the embellishment of existing open space with an emphasis on multi-use and enhanced linkages, as well as improving functionality and capacity to deliver passive and active recreational outcomes, together with restoring natural areas that provide a respite from increased urbanisation.

Brick Pit Reserve in Frenchs Forest is a large parcel of public open space bounded by Warringah Road to the north, Bantry Bay Road to the west, Fitzpatrick Avenue East to the south and the Wakehurst Parkway to the east. The south-western corner of the site adjoins low density residential properties and there are low density residential properties opposite the western side of the Reserve along Bantry Bay Road. The Reserve forms an important recreational resource for the local and wider community and comprises two (2) allotments (Lot 103, DP 1214166 & Lot 1B, DP 417447) under Council ownership. The Reserve is heavily treed and there is a vegetated waterbody/wetland (a remnant of former quarrying works) at the centre of the site and informal walking/bike tracks meander through the Reserve. The location of Brick Pit Reserve is shown in ***Figure 1.1*** below:

Figure 1.1 *– Brick Pit Reserve Location*



Source: www.maps.six.nsw.gov.au

The upgrade of Brick Pit Reserve will create a landmark public reserve for Frenchs Forest. The design intention is to create an open space for local residents, future hospital staff and patients and the broader Northern Beaches community. To rehabilitate and enhance indigenous vegetation, to assist the regeneration of local flora and flora, and to provide landscape features that celebrate and interpret the Frenchs Forest area site history.

The design for the proposed upgrade works has been prepared based on the specific site conditions and the existing qualities of the reserve.

An aerial view of Brick Pit Reserve is provided in ***Figure 1.2*** below:

Figure 1.2 *– Aerial view of Brick Pit Reserve at Frenchs Forest*

Source: www.maps.six.nsw.gov.au

Brick Pit Reserve is a 'public park' and the scope of works associated with the upgrades and associated landscaping works can be considered under Division 12 Parks and other public reserves of Chapter 2 of *State Environmental Planning Policy (Transport & Infrastructure) 2021* and are therefore subject to environmental assessment under Part 5 of the *Environmental Planning & Assessment Act, 1979.* Accordingly, this Review of Environmental Factors has been prepared to satisfy this requirement.

1.2 Purpose of the report

This Review of Environmental Factors has been prepared by Andrew Robinson Planning Services Pty Ltd (ARPS) on behalf of Northern Beaches Council. For the purposes of the proposed works, Northern Beaches Council is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act, 1979*.

The purpose of the Review of Environmental Factors is to describe the proposed upgrade works, to document the likely impacts of the proposed works on the environment, and to detail any necessary environmental safeguards and management measures to be implemented in order to reduce or avoid potential environmental impacts as a result of the proposed upgrade works.

The description of the proposed 'activity' to be undertaken at Brick Pit Reserve and the associated environmental impacts has been undertaken in context of the *Environmental Planning & Assessment Act, 1979* (EP&A Act), Clause 171 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regs), applicable environmental planning instruments and other relevant environmental legislation including the Commonwealth's *Environment Protection and Biodiversity Conservation Act, 1999* (EP&BC Act) In doing so, the Review of Environmental Factors helps to fulfil the requirements of Section 5.5 of the EP&A Act, namely that Northern Beaches Council *'examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity'*.

1.3 Structure of the Review of Environmental Factors

The Review of Environmental Factors is divided into the following sections:

- Introduction (Section 1) – introduces the proposal and purpose of the report;
- Need for the proposal (Section 2) – provides a description of the need for the project;
- Description of the proposal (Section 3) – provides a detailed description of the proposed upgrade works;
- Statutory and planning framework (Section 4) – provides information on the statutory and policy requirements for the proposed works;
- Community and stakeholder engagement (Section 5) – provides information on the stakeholder / community engagement that has been / will be undertaken;
- Environmental assessment (Section 6) – describes the existing environment and potential environmental impacts, and identifies the corresponding impact safeguards and environmental management/mitigation measures;
- Environmental management (Section 7) – summarises the proposed safeguards and environmental management/mitigation measures to be implemented in association with the proposed works;
- Conclusion (Section 8) – provides justification for the proposed works and concluding remarks as to whether the adverse environmental impacts are balanced or outweighed by the beneficial effects of the proposal;

- Certification (Section 9) – certifies that the Review of Environmental Factors provides a true and fair review of the proposal in relation to its potential effects on the environment and provides the required Determining Authority Certification and Determination Statement;

- References (Section 10) – contains a list of the resources used in the preparation of the Review of Environmental Factors; and

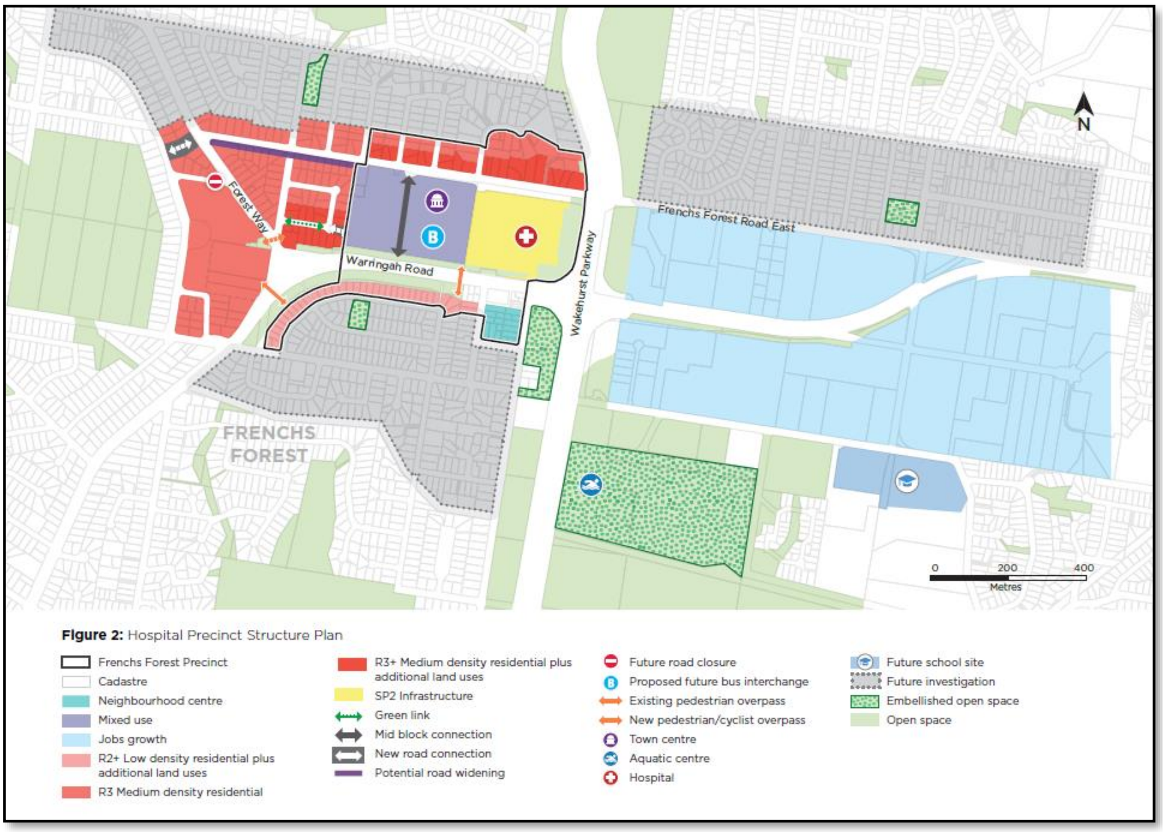
- Appendices – contains copies of the design drawings and technical/specialist reports that have informed this Review of Environmental Factors.

2 Need for the proposal

2.1 Strategic need for the proposal

Frenchs Forest was declared a Planned Precinct by the (then) NSW Department of Planning, Industry and Environment (DPIE) on 1 June 2017. The Planned Precinct implements Phase 1 of Northern Beaches Council's adopted Hospital Precinct Structure Plan, shown in ***Figure 2.1*** below.

Figure 2.1 *– Hospital Precinct Structure Plan extract from Frenchs Forest 2041*



Source: Frenchs Forest 2041 Place Strategy (DPIE 2021)

In December 2021, DPIE released the *Frenchs Forest 2041 Place Strategy*. Prepared in collaboration with Northern Beaches Council, *Frenchs Forest 2041* is a 20 year plan that establishes a vision for the revitalisation of Frenchs Forest as a thriving centre with potential for sustainable, well managed growth. The establishment of a new town centre that will expand retail, employment and social opportunities is key to the strategy.

Frenchs Forest 2041 is informed by the Greater Sydney Region Plan, North District Plan and Towards 2040, Northern Beaches Council's local strategic planning statement. It is also guided by Council's Hospital Precinct Structure Plan and represents the culmination of 6 years of planning and rich consultation with the community.

These documents recognise Frenchs Forest as one of 34 strategic centres in Greater Sydney – the major centres that can provide jobs, goods and services for a broader catchment of people – and as a health and education precinct where health and education facilities and services are co-located.

Frenchs Forest 2041 covers Phase 1 area of Council's Structure Plan – this is prioritised alongside the first road access upgrades. It incorporates the Structure Plan's planning framework and focuses on the new town centre and transition areas to the north and south of the town centre.

To provide for the future space needs of this precinct, Council intends to embellish existing open space areas ensuring recreational opportunities are provided to meet community need resulting from the increased population, with a focus on multiple use and enhanced linkages.

Council has received grant funding from the NSW Government Department of Planning and Environment (DPE) under the Precinct Support Scheme to upgrade Brick Pit Reserve, Akora Reserve and Rabbett Reserve as part of the development of the new Frenchs Forest Town Centre, as envisaged under Frenchs Forest 2041. The location of these Reserves in relation to the Hospital Precinct and new Town Centre can be seen in ***Figure 2.1*** above.

2.2 Proposal objective

The primary objective for the proposed upgrade and improvement works at Brick Pit Reserve is to create a landmark public reserve for Frenchs Forest through the delivery of a high quality community recreation area that effectively responds to community expectations and use, in an attractive and sustainable landscape environment. The following photographs illustrate the context and existing condition of Brick Pit Reserve:

Photograph 1: View looking north along Bantry Bay Road towards The Northern Beaches Hospital, with Brick Pit Reserve to the right.

Photograph 2: View looking south-east towards Brick Pit Reserve from the intersection of Warringah Road and Bantry Bay Road.

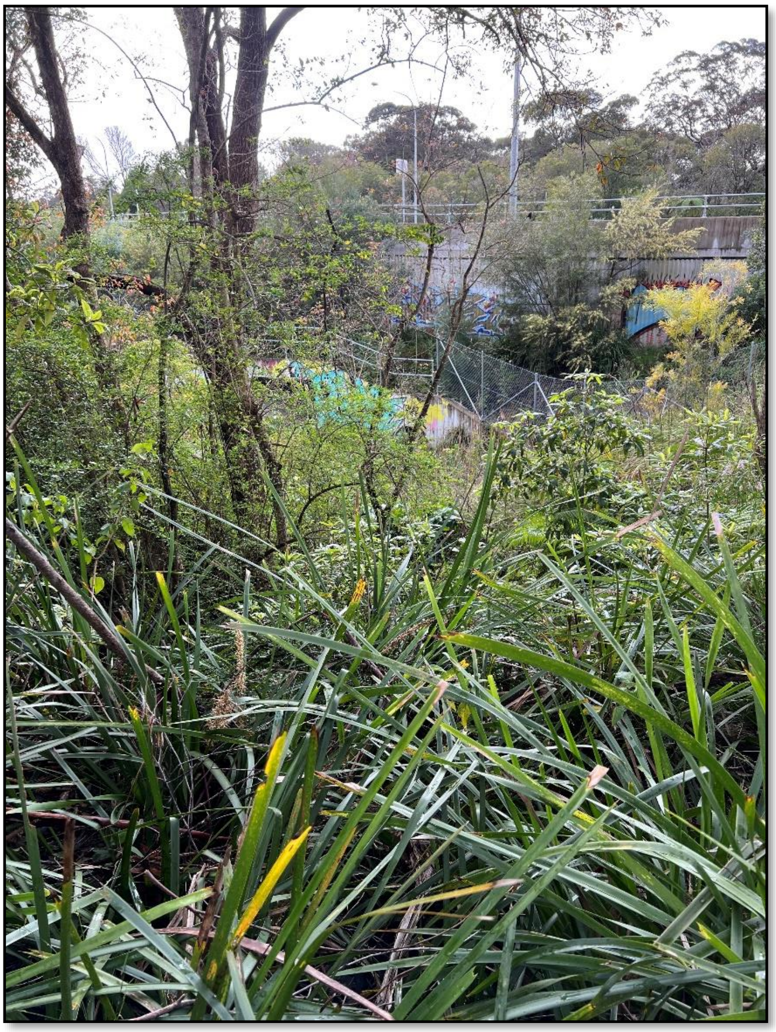
Photograph 3: View looking south-west towards Brick Pit Reserve across the Wakehurst Parkway.

Photograph 4: View looking north-east across Brick Pit Reserve from Bantry Bay Road.

Photograph 5: View of the southern end of Brick Pit Reserve looking north-east from Fitzpatrick Avenue East.

Photograph 6: View from Bantry Bay Road of the south-western corner of Brick Pit Reserve where it adjoins residential properties.

Photograph 7: View of some of the existing vegetation within the southern end of Brick Pit Reserve.



Photograph 8: View from within Brick Pit Reserve looking north-east towards The Wakehurst Parkway.

3 Description of the proposal

3.1 The proposal

As part of the Frenchs Forest Town Centre Park Upgrades project, Northern Beaches Council is proposing upgrade works to Brick Pit Reserve to create a landmark public reserve for local residents, future hospital staff and patients and the broader Northern Beaches community. In addition to improving the scenic and recreational value of the Reserve, it is anticipated that the upgrade works will also rehabilitate and enhance indigenous vegetation, assist the regeneration of local flora and flora, and provide landscape features that celebrate and interpret the Frenchs Forest area site history.

This Review of Environmental Factors is based on the 70% Detailed Design – General Arrangement Plans prepared by COMPLETE Urban dated 4 July 2023.

The scope of the proposed works at Brick Pit Reserve, but is not necessarily limited to, the following:

- Demolition of four (4) existing picnic settings and concrete slabs and timber (coppers log) barriers around an existing street tree in Bantry Bay Road;
- Removal of twenty two (22) trees, including eight (8) trees impacted by the proposed works, with a further fourteen (14) weed, dead or collapsed specimens recommended for removal independent to the proposed development and the retention and protection of one hundred and forty eight (148) trees;
- Construction of an acoustic barrier wall along Warringah Road (to match existing);
- Construction of a nature play area with embankment rope and slide play in the north-western corner of the Reserve;
- Installation of a series of stone steps adjacent to the nature play area down an embankment from the northern access from Bantry Bay Road;
- Construction of a new amenities block;
- Provision of an open lawn passive recreation area across the western side of the Reserve;
- Planting of new native canopy trees and installation of WSUD stormwater garden strips along part of the western edge of the Reserve;
- Construction of a 2.5m wide shared path with brick paving bands along the western edge of the Reserve;
- Construction/installation of a 1.8m wide accessible FRP pathway around the perimeter of the central waterbody, including two (2) viewing decks and a stabilised decomposed granite resting/picnic area, and linking the other access pathways to Bantry Bay Road and Fitzpatrick Avenue East;
- Construction/installation of level open lawn areas with brick retaining walls and seats near the south-eastern corner of the Reserve;

- Construction of two (2) new kerb islands with trees and new kerb build out around the existing street tree and linemarking to upgrade the existing 90-degree parking in Bantry Bay Road, to provide thirteen (13) parking spaces including two (2) accessible parking spaces with kerb ramp at the southern end and new linemarking to create seven (7) parallel parking spaces at the northern end of the Bantry Bay frontage;

- Installation of bins, seating and public art at various locations throughout the Reserve;

- Upgrade of an existing stormwater pipe and headwall adjacent to the new amenities block; and

- Additional plantings/landscape embellishment works across the Reserve, including bioswale planting along the Bantry Road edge of the Reserve.

Details of the proposed works are provided in the Brick Pit Reserve General Arrangement Plans prepared by COMPLETE Urban on behalf of Northern Beaches Council, provided at ***Appendix B*** of this Review of Environmental Factors.

3.2 Construction Activities

3.2.1 Work methodology

Prior to the commencement of any work, 'construction zones' will need to be established around the perimeters of the work sites within Brick Pit Reserve. In addition, the tree protection measures as recommended in this REF will need to be put in place prior to the commencement of works and maintained for the duration of the works period. The final details of the construction methodology are still under consideration and therefore were not available at the time of preparation of this Review of Environmental Factors. However, prior to any works commencing, the pedestrian and traffic management controls and other environmental controls recommended in this Review of Environmental Factors will need to be implemented.

Notwithstanding, given the 'contained' nature of the Reserve, the construction zones are unlikely to have a significant impact on traffic and pedestrian movements outside the Reserve.

Construction activities will vary throughout the works period, however, are anticipated to include (but not be limited to):

- Minor demolition works;

- Tree removal and protection of trees to be retained;

- Formwork and concreting and construction of pathways, ramps and edges, retaining walls, new kerb and guttering etc;

- Construction of the amenities building; acoustic barrier wall; pathways and viewing platforms;

- Construction/installation of the new nature play area equipment;

- Installation of the stone steps; public art; signage; car parking linemarking etc;

- Installation of furniture, including seating, benches, waste bins etc;
- Installation of new stormwater management infrastructure and WSUD stormwater gardens;
- Landscaping, including new plantings and mulching, paving, turfing etc.

3.2.2 Plant and equipment

The plant and equipment that will be required for the works will vary throughout the ongoing stages of the work activities. Typical equipment and plant will generally include (but not be limited to) the following:

- Construction and/or earthmoving equipment including bobcats, rollers, crane etc;
- Various trucks and trade vehicles;
- Various powered and unpowered hand tools.

During the course of the works various forms of environmental control equipment such as silt fences / socks, rubbish skips etc will be required.

3.2.3 Waste management

All waste material will need to be either removed from the site immediately, or stored on site in skip bins (or similar), sorted as per waste classification guidelines and either recycled or disposed of at a licensed waste management facility. As a principle, reuse and/or recycling should be maximised in order to minimise the need for disposal.

3.2.4 Source of materials

Wherever possible, materials of construction should be sourced locally.

3.2.5 Traffic management and access

Where and when necessary, traffic and pedestrian management measures will need to be put into place prior to the commencement of works in order to provide a safe environment for road users, cyclists and pedestrians, and to manage access to the work site/s. Notwithstanding, it is anticipated that temporary traffic management arrangements on Bantry Bay Road, and potentially Fitzpatrick Avenue East will only be necessary to assist with the arrival and/or departure of large vehicles to the site.

All changes to the existing traffic, cyclist and pedestrian conditions in the vicinity of the works area/s will need to be accompanied by appropriate signage etc to notify users of the temporary arrangements.

3.3 Public utility adjustment

All utilities, including water, sewer, electricity and communications infrastructure are currently available to the site. The proposed works are unlikely to require any adjustment to existing water, or sewer infrastructure beyond the site.

4 Statutory and planning framework

4.1 Commonwealth legislation

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EP&BC Act) a referral is required to the Australian Government for proposed *'actions that have the potential to significantly impact on matters of National environmental significance or the environment of Commonwealth land'*.

The EP&BC Act nominates any impact on listed threatened species or communities as a matter of National environmental significance (NES).

Narla Environmental have prepared a Flora and Fauna Assessment (refer to ***Appendix C***) in association with the proposed upgrade works and this assessment confirms that there are no EP&BC Act Endangered Ecological Communities (EECs) occurring within the site.

Although the likelihood of occurrence on the site was low, due to the presence of potential breeding habitat an EP&BC Assessment of Significance was undertaken by Narla Environmental for *Heleioporus australiacus* (Giant Burrowing Frog) and *Isoodon obesulus obesulus* (Southern Brown Bandicoot), both of which are listed as vulnerable species under the EP&BC Act. This concluded that the proposed works will not have a significant impact on either of these species.

Accordingly, referral to the Department of Climate Change, Energy, the Environment and Water is not required.

4.1.2 Disability Discrimination Act 1992

The *Disability Discrimination Act, 1992* (DDA) makes it unlawful to discriminate against a person, in many areas of public life, including (but not limited to) employment, education, getting or using services and accessing public places, because of their disability. Therefore, areas such as Brick Pit Reserve, including the Playground and other facilities that are open to the public should be open and available to people with a disability.

The new shared paths through the Reserve, as well as the nature play area and pathway that provide access to and within the new playground have been designed to ensure equitable access for all users.

It is also noted that two (2) new accessible parking spaces with a kerb ramp accessed off the shared space are proposed in Bantry Bay Road adjacent to the Reserve.

4.1.1 Native Title Act, 1993

The Commonwealth Government enacted the *Native Title Act, 1993* in order to formally recognise and protect Native Title rights in Australia, following the decision of the High Court of Australia in *Mabo & Ors v Queensland (No. 2) (1992) 175 CLR 1 ("Mabo")*. This Act is the legal recognition of Indigenous Australians' rights and interests in land and waters, according to their own traditional laws and customs.

Although there is a presumption of Native Title in any area where an Aboriginal community or group can establish a traditional or customary connection with that area, there are a number of ways that Native Title is taken to have been extinguished. For example, land that was designated as having freehold title prior to 1 January 1994 extinguishes Native Title, as does any commercial, agricultural, pastoral or residential lease. Further, land that has been utilised for the construction or establishment of public works also extinguishes any Native Title rights and interests for as long as they are used for that purpose.

A search of the Register of Native Title Claims on the National Native Title Tribunal website indicates that there have been no claims made in relation to the land on which Brick Pit Reserve is located. Further, an AHIMS search carried out on 30 July 2023 confirmed that there are no recorded AHIMS sites within the Reserve, or a 200m buffer around the Reserve, such that the continued use of the Reserve for public recreation is unlikely to conflict with any of the provisions of the *Native Title Act, 1993*.

4.2 State legislation

4.2.1 Environmental Planning & Assessment Act 1979

The *Environmental Planning & Assessment Act, 1979* (EP&A Act) provides the statutory framework for planning and environmental assessment in NSW. It contains two parts that impose requirements for planning approval:

- Part 4 generally provides for the control of local 'development' that requires development consent from local council.
- Part 5 provides for the control of 'activities' that do not require development consent and are undertaken or approved by a determining authority.

The applicable approval process under the EP&A Act is generally determined by reference to the relevant environmental planning instruments and other statutory planning instruments and controls. These include the *Environment Protection and Biodiversity Conservation Act 1999 (EP&BC Act)*, *State Environmental Planning Policy (Transport & Infrastructure) 2021* (T&I SEPP), other relevant State Environmental Planning Policies (SEPPs) and local environmental plans (LEPs).

Development consent is required to carry out development and/or works unless they fall within Section 4.1 of the EP&A Act.

Section 4.1 of the EP&A Act states that if an environmental planning instrument provides that specified development may be carried out without the need for development consent, then a person may carry the development out, in accordance with the instrument, on land to which the provisions apply. Environmental assessment of the development may nevertheless be required under Part 5 of the Act.

Further, where an environmental planning instrument specifies that certain development may be carried out as *exempt development,* it may be carried out without the need for development consent under Part 4 of the EP&A Act or for assessment under Part 5 of the Act.

State Environmental Planning Policy (Transport & Infrastructure) 2021 (T&I SEPP) is the environmental planning instrument under which the proposed works at Brick Pit Reserve may be carried out either as *exempt development*, or *development without consent*. Further discussion on the provisions of the T&I SEPP is provided at 4.3.1 below.

Notwithstanding, those works that do not require development consent are considered to be an "activity" within the meaning of Section 5.1 of the EP&A Act on the basis that subclause 5.1(1)(d) of the Act defines the *carrying out of a work* as an "activity".

Section 5.1(1) of the EP&A Act defines an "activity" as being:

(a) the use of land, and
(b) the subdivision of land, and
(c) the erection of a building, and
(d) the carrying out of a works, and
(e) the demolition of a building or work, and
(f) any other act, matter or thing referred to in Section 26 that is prescribed by the regulations for the purposes of this definition,

but does not include:

(g) any act, matter or thing for which development consent under Part 4 is required or has been obtained, or
(h) any act matter or thing that is prohibited under an environmental planning instrument, or
(i) exempt development, or
(j) development carried out in compliance with an order under Division 2A of Part 6, or
(k) any development of a class or description that is prescribed by the regulations for the purposes of this definition.

The proposal involves the use of land and the carrying out of works and is therefore an "activity" for the purposes of Part 5 of the Act.

A determining authority is defined in Section 5.1 of the Act as "a Minister or public authority and, in relation to any activity, means the Minister or public authority by or on whose behalf the activity is or is to be carried out or any Minister or public authority whose approval is required in order to enable the activity to be carried out".

The term 'public authority' is defined in Section 1.4 of the EP&A Act as follows:

(a) a public or local authority constituted by or under an Act, or

(b) a Public Service Agency, or

(c) a statutory body representing the Crown, or

(d) a Public Service senior executive within the meaning of the Government Sector Employment Act 2013; or

(e) a statutory State owned corporation (and its subsidiaries) within the meaning of the State Owned Corporations Act 1989; or

(f) a chief executive officer of a corporation or subsidiary referred to in paragraph (e), or

(g) a person prescribed by the regulations for the purposes of this definition.

Northern Beaches Council is a public authority constituted under the *Local Government Act 1993* (LG Act). Accordingly, as the works will be undertaken either by or on behalf of the public authority, Northern Beaches Council is deemed to be the determining authority for the proposed upgrade works at Brick Pit Reserve in accordance with Part 5 of the Act.

Section 5.5 of the EP&A Act states 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.

In addition, the determining authority must also take into account the matters outlined in Clause 171 of the EP&A Regs, which provides as follows:

(1) When considering the likely impact of an activity on the environment, the determining authority must take into account the environmental factors specified in the environmental factors guidelines that apply to the activity.

(2) If there are no environmental factors guidelines in force, the determining authority must take into account the following environmental factors:

(a) the environmental impact on the community,
(b) the transformation of the locality,
(c) the environmental impact on the ecosystems of the locality,
(d) reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality,
(e) the effects on any locality, place or building that has –
(i) aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance, or
(ii) other special value for present or future generations,
(f) the impact on the habitat of protected animals (within the meaning of the Biodiversity Conservation Act 2016),
(g) the endangering of a species of animal, plant or other form of life, whether living on land, in water or in the air,
(h) long-term effects on the environment,
(i) degradation of the quality of the environment,
(j) risk to the safety of the environment,
(k) reduction in the range of beneficial uses of the environment,
(l) pollution of the environment,
(m) environmental problems associated with the disposal of waste,
(n) increased demands on natural or other resources that are, or are likely to become, in short supply,
(o) the cumulative environmental effect with other existing or likely future activities,
(p) the impact on coastal processes and coastal hazards, including those under projected climate change conditions,
(q) applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1,
(r) other relevant environmental factors.

(3) A determining authority must prepare a review of environmental factors that demonstrates how the environmental factors specified in the environmental factors guidelines, or the environmental factors specified in subsection (2) if no guidelines are in force, were taken into account when considering the likely impact of an activity.

(4) The review of environmental factors must be published on the determining authority's website or the NSW planning portal if—

(a) the activity has a capital investment value of more than $5 million, or
(b) the activity requires an approval or permit as referred to in any of the following provisions before it may be carried out—
(i) Fisheries Management Act 1994, sections 144, 200, 205 or 219,
(ii) Heritage Act 1977, section 57,
(iii) National Parks and Wildlife Act 1974, section 90,
(iv) Protection of the Environment Operations Act 1997, sections 47–49 or 122, or

(c) the determining authority considers that it is in the public interest to publish the review.

(5) The review must be published under subsection (4)—

(a) before the activity commences, or
(b) if publishing the review before the activity commences is not practicable—as soon as practicable, and no later than 1 month, after the activity commences.

(6) Subsection (4) does not apply in relation to a review of an activity—

(a) that belongs to a class specified by the Planning Secretary in a notice published on the Department's website for the purposes of this section, or
(b) to which an approved code under Division 6 applies.

(7) If a provision of an approved code under Division 6 applies to a determining authority's exercise of functions under the Act, section 5.5, the provision of the approved code prevails to the extent of an inconsistency with a provision of this section.

(8) Subsection (4) applies on and from 1 July 2022.

These matters set out in subclause 171(2) are discussed in ***Appendix A*** of this Review of Environmental Factors.

"Guidelines for Division 5.1 Assessments" was released by the (then) Department of Planning, Infrastructure and Environment (DPIE) in June 2022 and explains what proponents and determining authorities need to do to undertake a Division 5.1 assessment under the *Environmental Planning & Assessment Act, 1979*.

This Review of Environmental Factors has been prepared in accordance with these guidelines to enable Northern Beaches Council to assess the environmental impacts of the proposed works associated with the upgrade works at Brick Pit Reserve and to determine whether these activities are likely to have a significant impact on the environment.

As described previously, Section 5.5 of Part 5 of the EP&A Act relates to the duty to consider environmental impact and subclause (1) states:

(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.

4.2.2 Local Government Act 1993

The *Local Government Act 1993* (LG Act) requires that 'community land' be categorised consistent with its intended use/s. It must be managed in accordance with a Plan of Management which is required to identify:

- the category for the land
- objectives and performance targets for the management of the land
- the means by which Council proposes to achieve the objectives and performance targets
- measures by which Council proposes to assess its performance.

Northern Beaches Council Land Register indicates that Brick Pit is categorised as 'community land'. However, there is not a Plan of Management for the land.

The proposed upgrade works to Brick Pit Reserve are compatible with the purposes of a variety of public recreation pursuits.

4.2.3 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) is the principal NSW legislation that identifies and protects threatened species populations and ecological communities. The purpose of the Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.

Biodiversity conservation has three main objectives:

- To preserve the diversity of species.
- Sustainable utilization of species and ecosystem.
- To maintain life-supporting systems and essential ecological processes.

The BC Act also establishes a framework for assessing and offsetting unavoidable biodiversity impacts from proposed development with biodiversity gains through land stewardship agreements.

As discussed earlier, Narla Environmental have prepared a Flora and Fauna Assessment (refer to ***Appendix C***) in association with the proposed upgrade works and this assessment confirms that there are no BC Act Endangered Ecological Communities (EECs) occurring within the site.

Although the likelihood of occurrence on the site was low, due to the presence of potential breeding habitat a BC Act 5-Part Test of Significance was undertaken by Narla Environmental for *Heleioporus australiacus* (Giant Burrowing Frog), *Pseudophryne australis* (Red-crowned Toadlet) and *Isoodon obesulus obesulus* (Southern Brown Bandicoot), both of which are listed as vulnerable species under the EP&BC Act. The 5-Part Test concluded that the proposed works will not have a significant impact on any of these species, such that a local viable population would be placed at risk of extinction. Further, although the proposed works would see a temporary increase in the impact on clearing native vegetation - a Key Threatening Process (KTP) listed under Schedule 4 of the BC Act – this will not have an unacceptable impact on potential breeding habitat. Further, as the works include rehabilitation of the waterbody/wetland area and additional plantings, potential habitat is expected to be retained and enhanced across the broader project area.

As noted earlier, twenty two (22) trees are proposed to be removed. However, as described in the Flora and Fauna Assessment prepared by Narla Environmental, none are a representative species of a 'Critically Endangered Ecological Community' listed under the BC Act.

Further, Brick Pit Reserve is not mapped as 'Biodiversity' on the Natural Resources – Biodiversity Map that accompanies *Warringah Local Environmental Plan 2011*, and there are no areas in the vicinity of the Reserve that are mapped as having biodiversity value or terrestrial biodiversity.

Accordingly, there will be no net loss of biodiversity value at the site as a result of the proposed works.

As the proposed works are not likely to significantly affect threatened species, populations, ecological communities, or critical habitat, a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) are not required under the *Biodiversity Conservation Act 2016*.

4.2.4 National Parks and Wildlife Act, 1974

The intent of the *National Parks and Wildlife Act, 1974* (NP&W Act) is to conserve the natural and cultural heritage of the state of New South Wales; fostering public appreciation, understanding and enjoyment of its natural and cultural heritage; and managing any lands reserved for the purposes of conserving and fostering public appreciation and enjoyment of its natural and/or cultural heritage. The NP&W Act is also the primary legislation in NSW to ensure the effective management and protection of the state's Aboriginal cultural heritage.

A NSW AHIMS web service (Aboriginal Heritage Information Management System) search undertaken on 30 July 2023 by the author of this REF indicates that there are no recorded Aboriginal sites or Aboriginal places declared in or within a 200m radius of the site.

As such, the site is unlikely to hold particular significance to Aboriginal people and the proposed works are unlikely to have any adverse impact on Aboriginal cultural heritage.

4.2.5 Roads Act 1993

Section 138 (Works and Structures) of the *Roads Act 1993* requires the consent of the roads authority to be obtained prior to any works occurring within a road reserve. Although Northern Beaches Council is the local roads authority, the provisions of Section 138 apply to any employee of the roads authority as it applies to any other person.

Section 138 is reproduced below:

> *(1) A person must not--*
>
> > *(a) erect a structure or carry out a work in, on or over a public road, or*
> > *(b) dig up or disturb the surface of a public road, or*
> > *(c) remove or interfere with a structure, work or tree on a public road, or*
> > *(d) pump water into a public road from any land adjoining the road, or*
> > *(e) connect a road (whether public or private) to a classified road,*
> >
> > *otherwise than with the consent of the appropriate roads authority.*

It is proposed to construct sections of new kerb and guttering and line mark parking spaces in the Bantry Bay Road reserve adjacent to the western edge of part of the Reserve. As such, the approval of the roads authority will need to be obtained prior to works commencing.

4.3 State Environmental Planning Policies

4.3.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (T&I SEPP) commenced on 1 March 2022 and transfers the provisions of (3) former State Environmental Planning Policies together under a single policy, including the now repealed *State Environmental Planning Policy (Infrastructure) 2007.*

Chapter 2 of the T&I SEPP relates to infrastructure and aims to facilitate the effective delivery of infrastructure across the State and in particular, by identifying the environmental assessment category into which different types of infrastructure and services development fall. The provisions of the T&I SEPP prevail over any provisions within a local environmental plan that relate to the development of infrastructure facilities identified in the ISEPP.

Division 12 in Part 2.2 of the T&I SEPP relates to parks and other public reserves and allows the Northern Beaches Council, as a public authority, to undertake certain works associated with the upgrade and associated landscaping works at Brick Pit Reserve without the need to obtain development consent under Part 4 of the EP&A Act.

Division 17 in Part 2.3 of Chapter 2 of the T&I SEPP relates to Roads and traffic and Subdivision 1 of Division 17 (sections 2.108 to 2.115) deals with roads and road infrastructure facilities and allows the Northern Beaches Council, as a public authority, to undertake certain works in the Bantry Bay Road reserve associated with the upgrade works at Brick Pit Reserve without the need to obtain development consent under Part 4 of the EP&A Act.

In addition, other proposed works are considered to constitute 'exempt development' under section 2.20 and 2.113 of the T&I SEPP, such that they don't require either development consent, or environmental impact assessment under the provisions of Section 4.1 of the EP&A Act.

A discussion on the relevant provisions of the T&I SEPP is provided below:

<u>Division 12 Parks and other public Parks</u>

Under subsection 2.73(3) of Division 12 - Parks and other public reserves, of Chapter 2 of the T&I SEPP, the following works are able to be undertaken by or on behalf of a council without consent on a public reserve under the control of or vested in the council:

(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)* ***recreational areas*** *and recreational 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 schemes,*

(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).

Section 2.72 of the T&I SEPP provides the following definition of a public reserve:

> ***public reserve*** *has the same meaning as it has in the Local Government Act, 1993, but does not include a Crown reserve that is dedicated or reserved for a public cemetery.*

The *Local Government Act, 1993* defines a public reserve as follows:

public reserve *means:*

(a) a public park, or

(b) any land conveyed or transferred to the council under section 340A of the Local Government Act, 1919, or

(c) any land dedicated or taken to be dedicated as a public reserve under section 340C or 340D of the Local Government Act, 1919, or

(d) any land dedicated or taken to be dedicated under section 49 or 50, or

(e) any land vested in the council, and declared to be a public reserve, under section 37AAA of the Crown Lands Consolidation Act, 1913, or

(f) any land vested in the council, and declared to be a public reserve, under section 76 of the Crown Lands Act, 1989, or

(g) a Crown reserve that is dedicated or reserved:

(i) for public recreation or for a public cemetery, or

(ii) for a purpose that is declared to be a purpose that falls within the scope of this definition by means of an order published in the Gazette by the Minister administering the Crown Lands Act, 1989, being a Crown reserve in respect of which a council has been appointed as manager of a reserve trust for the reserve or for which no reserve trust has been established, or

(h) land declared to be a public reserve and placed under the control of a council under section 52 of the State Roads Act, 1986, or

(i) land dedicated as a public reserve and placed under the control of a council under section 159 of the Roads Act, 1993, and includes a public reserve of which a council has the control under section 344 of the Local Government Act, 1919 (repealed) or section 48, but does not include a common.

Warringah Local Environmental Plan 2011 defines a recreation area as follows:

> ***Recreation area*** *means a place used for outdoor recreation that is normally open to the public, and includes—*
>
> *(a) a children's playground, or*
> *(b) an area used for community sporting activities, or*
> *(c) a public park, reserve or garden or the like,*
>
> *and any ancillary buildings, but does not include a recreation facility (indoor), recreation facility (major) or recreation facility (outdoor).*

The land on which Brick Pit Reserve is located is owned by Northern Beaches Council and has been dedicated as a public park. Therefore, having regard to item (a) in the above definition, Brick Pit Reserve is classified as a public reserve for the purposes of the LG Act and accordingly, the components of the works associated with the construction of the amenities block, pathways, landscaping and signage at Brick Pit Reserve described above will fall within the criteria under subsection 2.73(3) of the T&I SEPP and may be carried out without development consent.

Section 2.74 of the T&I SEPP sets out what development for the purpose of parks and other public Parks is ***exempt development*** and states:

> *(1) Development for any of the following purposes that is carried out in the prescribed circumstances is exempt development:*
>
> *(a) construction or maintenance of:*
>
> *(i) walking tracks, raised walking paths (including boardwalks),* ***ramps, stairways*** *or gates,*
>
> *(ii) bicycle-related storage facilities, including bicycle racks and other bicycle parking facilities (except for bicycle paths), or*
>
> *(iii) handrail barriers or vehicle barriers, or*
>
> *(iv) ticketing machines or park entry booths, or*
>
> *(v)* ***viewing platforms*** *with an area not exceeding 100m^2, or*
>
> *(vi) sporting facilities, including goal posts, sight screens and fences, if the visual impact of the development on surrounding land uses is minimal, or*
>
> *(vii)* ***play equipment*** *if adequate safety measures (including soft landing surfaces) are provided, and in the case of the construction of such equipment, so long as the equipment is situated at least 1.2m away from any fence, or*
>
> *(viii)* ***seats,*** *picnic tables, barbeques,* ***bins*** *(including frames and screening), shelters or shade structures, or*
>
> *(ix) portable lifeguard towers if the footprint of the tower covers an area no greater than 20 square metres.*

(b) routine maintenance of playing fields and other infrastructure, including landscaping.

(c) routine maintenance of roads that provide access to or within those playing fields, including landscaping.

Therefore, the new nature play area, viewing platforms, seating and bins would fall into categories 2.74(1)(a) above.

Subsection 2.74(2)(a) states:

(2) Development is carried out in the prescribed circumstances if the development is carried out:

(a) on land referred to in section 2.73(1), by or on behalf of a public authority.

Subsection 2.74(3) states:

(3) Development is exempt development under this section only if the development:

(a) complies with section 2.20, and

(b) involves no greater disturbance of native vegetation than necessary, and

(c) does not result in an increase in stormwater run-off or erosion, and

In relation to (a), the requirements of section 2.20 are discussed below:

To *be exempt development, the development:*

(a) must meet the relevant deemed-to-satisfy provisions of the Building Code of Australia, or if there are no such relevant provisions, must be structurally adequate, and

Comment: The proposed works will need to be constructed in accordance with the applicable requirements of the BCA and it will be the responsibility of the selected contractor/s to ensure compliance.

(b) must not, if it relates to an existing building:

(i) cause the building to contravene the Building Code of Australia, or

(ii) compromise the fire safety of the building or affect access to any fire exit, and

Comment: The works do not relate to an existing building.

(c) must be carried out in accordance with all relevant requirements of the Blue Book, and

Comment: It will be the responsibility of the contractor/s to ensure that all requirements (as necessary) of the Blue Book are followed.

(d) must not be designated development, and

Note. Designated development is defined in section 4.10 of the Act as development that is declared to be designated development by an environmental planning instrument or the regulations.

Comment: The proposed works do not constitute designated development.

(e) if it is likely to affect a State or local heritage item or a heritage conservation area, must involve no more than minimal impact on the heritage significance of the item or area, and

Comment: Brick Pit Reserve is not a heritage item or within a heritage conservation area. As such, the proposed works associated with the upgrade of Brick Pit Reserve will not have any heritage impact.

(f) must not involve the demolition of a building or work that is, or is part of, a State or local heritage item, and

Comment: Brick Pit Reserve is not a heritage item or within a heritage conservation area.

(g) if it involves the demolition of a building, must be carried out in accordance with Australian Standard AS 2601-2001, The demolition of structures, and

Comment: No buildings are to be demolished.

(h) must be installed in accordance with the manufacturer's specifications, if applicable, and

Comment: It will be the responsibility of the contractor/installer to ensure that each component of the proposed works will be installed in accordance with the manufacturer's specifications.

(i) must not involve the removal or pruning of a tree or other vegetation that requires a permit or development consent for removal or pruning, unless that removal or pruning is undertaken in accordance with a permit or development consent.

Comment: Twenty two (22) trees are to be removed across the site. However, compensatory planting of new trees, and mass planting of groundcovers at selected locations is proposed in order to replace the canopy and provide improved shade and amenity. It is anticipated that the selected new tree plantings will achieve a similar canopy cover and improved shade value at maturity.

State Environmental Planning Policy (Biodiversity and Conservation) 2021 prescribes that consent or permit requirements for tree removal or pruning is to be regulated under the applicable development control plan. Trees on land under Council management are exempt from are exempt from permit or development consent.

(j) must not involve the removal of asbestos, unless that removal is undertaken in accordance with Working with Asbestos: Guide 2008 (ISBN 0 7310 5159 9) published by the WorkCover Authority.

Comment: The proposed works will not require the removal of asbestos.

In relation to (b) and (c), the proposed upgrade works associated will not cause any greater disturbance to native vegetation than necessary and will not cause an increase to stormwater run-off or erosion.

Sections 2.10 to 2.17 of Division 1 Consultation in Part 2.2 General of the T&I SEPP contain provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Table 4-1 below outlines the issues to be considered when determining whether consultation is required, and their applicability to this proposal.

Table 4-1: Requirements for consultation under the Transport & Infrastructure SEPP

Issue		Consultation Required?
Section 2.10 - Consultation with Councils – impacts on Council related infrastructure or services		
1(a)	Will the development have a substantial impact on Council stormwater services?	No. While new stormwater management infrastructure is proposed as part of the proposed works, this will improve on the existing situation. Notwithstanding, as Council is the proponent for the works, there is no need for consultation.
1(b)	Is the development likely to generate traffic to an extent that will constrain the capacity of the road system?	No.
1(c)	Does the development involve connection to, and a substantial impact on a sewerage system owned by a Council?	No.
1(d)	Does the development involve connection to, and use of a substantial volume of water from a Council-owned water supply system?	No.
1(e)	Does the development involve the installation of a temporary structure on, or the enclosing of, a Council-managed / controlled public place that is likely to cause disruption to pedestrian or vehicular traffic that is not minor or inconsequential?	No. There will be temporary (minor) disruption to public access to the Reserve during the works period. However, as Council is the proponent for the works, there is no need for consultation.
1(f)	Does the development involve excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which Council is the roads authority?	No.
Section 2.11 - Consultation with Councils – impacts on local heritage		
1(a)	Is the development likely to have an impact that is not minor or inconsequential on a local heritage item or a heritage conservation area?	No. Brick Pit Reserve is not listed as a heritage item under Schedule 5 of Warringah LEP 2011.
Section 2.12 - Consultation with Councils – impacts on flood liable land		
2	Is the development on flood liable land and will it change flood patterns other than to a minor extent?	No.
Section 2.13 - Consultation with State Emergency Service – impacts on flood liable land		
1	Is the development on flood liable land such	No.

	that written notice must be given to the State Emergency Service prior to any work being carried out?	
Section 2.14 - Consultation with Councils – impacts on certain lands within the coastal zone		
1	Is the work to be undertaken in a coastal vulnerability area and is inconsistent with a certified coastal management program applying to the land?	No.
Section 2.15 - Consultation with public authorities other than Councils		
2(a)	Is the development adjacent to land reserved under the *National Parks and Wildlife Act 1974*?	No.
2(b)	Is the development on land zoned E1 National Parks and Nature Reserves?	No.
2(c)	Does the development comprise a fixed or floating structure in or over navigable waters?	No.
2(d)	Is the development on land mapped as dark sky region and likely to increase artificial light in the night sky?	No.
2(e)	Is the development on defence communications buffer land?	No.
2(f)	Is the development on land in a mine subsidence district?	No.
Section 2.16 – Consideration of Planning for Bushfire Protection		
	Is the development for the purposes of health services facilities, correctional centres or residential accommodation, in an area that is bush fire prone land?	No. Although the Reserve is mapped as Bush Fire Prone Land, the recreational use is not a 'Special Fire Protection Purpose'.

Having regard to the table above, there is no requirement for consultation with other public authorities under the T&I SEPP.

<u>Division 17 -Roads and traffic</u>

Under subsection 2.113(1)(a) of Division 17 - Roads and traffic, of Chapter 2 of the T&I SEPP, development for the following purposes is 'exempt development' if it is carried out by or on behalf of a public authority in connection with a road or road infrastructure facilities and complies with section 2.20:

(a) erection, installation, maintenance, reconstruction or replacement of any of the following, and any associated landscaping works—

(i) security fencing with a height above ground level (existing) of not more than 3.2m,

(ii) safety barriers or systems, including Jersey barriers,

(iii) directional, safety or other advisory signs relating to road works or the use of existing road infrastructure facilities,

(iv) pedestrian and cyclist facilities (such as footpaths, street lighting, ***kerb adjustments*** *and ramps, pedestrian fences, refuges, holding rails, and bollards),*

(v) slope stability works that are required for safety reasons and minor road safety improvements,

(vi) minor road pavement or shoulder work (such as patching, grading, re-sheeting, sealing and re-sealing),

(vii) street furniture (such as seats, bins and directional signs) and any associated kerb construction, ***access paths and ramps****, lighting and* ***signage that complies with AS:1428.2 and the Disability Standards****,*

(viii) removal from or addition to existing traffic lights of items such as signal displays, loops or buttons,

(ix) roadside facilities and rest areas, if the development does not involve the installation of toilets and involves no greater disturbance to the ground or vegetation than necessary,

(x) street lighting, if any replacement involves the replacement of existing materials with similar materials only and if the lighting minimises light spill and artificial sky glow in accordance with the Lighting for Roads and Public Spaces Standard,

(xi) ***pavement and road surface markings*** *(such as bus lane markings), lane delineators, electric pavement lights, detection loops and traffic counters,*

(xii) ***kerb and guttering****,*

(xiii) culverts, drains and other works to improve the quality or control of stormwater runoff,

(xiv) public transport information display and ticketing systems,

Accordingly, the works within the Bantry Bay Road reserve associated with the kerb and gutter replacement, kerb islands and planting, parking space linemarking, kerb ramp and markings and signage for the two (2) accessible parking spaces is 'exempt development' under the T&I SEPP provided it complies with section 2.20.

Under section 2.20, to be exempt development, the development:

(a) must meet the relevant deemed-to-satisfy provisions of the Building Code of Australia, or if there are no such relevant provisions, must be structurally adequate, and

Comment: The proposed works will need to be constructed in accordance with the applicable requirements of the BCA and it will be the responsibility of the selected contractor/s to ensure compliance.

(b) must not, if it relates to an existing building:

(i) cause the building to contravene the Building Code of Australia, or

(ii) compromise the fire safety of the building or affect access to any fire exit, and

Comment: The works do not relate to an existing building.

(c) must be carried out in accordance with all relevant requirements of the Blue Book, and

Comment: It will be the responsibility of the contractor/s to ensure that all requirements (as necessary) of the Blue Book are followed.

(d) must not be designated development, and

Note. *Designated development is defined in section 4.10 of the Act as development that is declared to be designated development by an environmental planning instrument or the regulations.*

Comment: The proposed works do not constitute designated development.

(e) if it is likely to affect a State or local heritage item or a heritage conservation area, must involve no more than minimal impact on the heritage significance of the item or area, and

Comment: Neither Bantry Bay Road or the adjoining Brick Pit Reserve is a heritage item or within a heritage conservation area. As such, the proposed works associated with the upgrade of Brick Pit Reserve, including the works in Bantry Bay Road, will not have any heritage impact.

(f) must not involve the demolition of a building or work that is, or is part of, a State or local heritage item, and

Comment: Brick Pit Reserve is not a heritage item or within a heritage conservation area.

(g) if it involves the demolition of a building, must be carried out in accordance with Australian Standard AS 2601-2001, The demolition of structures, and

Comment: No buildings are to be demolished.

(h) must be installed in accordance with the manufacturer's specifications, if applicable, and

Comment: It will be the responsibility of the contractor/installer to ensure that each component of the proposed works will be installed in accordance with the manufacturer's specifications.

(i) must not involve the removal or pruning of a tree or other vegetation that requires a permit or development consent for removal or pruning, unless that removal or pruning is undertaken in accordance with a permit or development consent.

Comment: No trees within the road reserve are to be removed.

4.3.2 State Environmental Planning Policy (Resilience and Hazards) 2021

State Environmental Planning Policy (Resilience and Hazards) 2021 (R&H SEPP) commenced on 1 March 2022 and transfers the provisions of (3) former State Environmental Planning Policies together under a single policy, including the now repealed *State Environmental Planning Policy No. 55 – Remediation of Land*.

Chapter 4 of the R&H SEPP relates to the remediation of land and provides for a consistent State-wide planning approach to the remediation of contaminated land.

In particular, Chapter 4 of the R&H SEPP aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment:

(a) by specifying when consent is required, and when it is not required, for a remediation work, and

(b) by specifying certain considerations that are relevant in rezoning land and in determining development applications in general and development applications for consent to carry out a remediation work in particular, and

(c) by requiring that a remediation work meet certain standards and notification requirements.

Clause 4.6 of the R&H SEPP states that:

A consent authority must not consent to the carrying out of any development on land unless:

(a) it has considered whether the land is contaminated, and

(b) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and

(c) if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

Although the proposed upgrade works at Brick Pit Reserve do not require consent under Part 4 of the EP&A Act, the issue of contamination is a relevant consideration in order to ensure that any works requiring disturbance to the surface of the public domain are undertaken in a manner that protects the health of workers and members of the public.

The site has historically been used for quarrying/extractive activities, primarily for clay mining associated with a brickworks prior to 1930, prior to its current use as a public reserve.

JK Environments were engaged to carry out a preliminary site investigation in order to identify any past or present potentially contaminating activities and make a preliminary assessment of the potential for contamination at the site.

As detailed in the Preliminary (Stage 1) Site Investigation (PSI) report dated 9 November 2022, the preliminary site investigation included a review of historical information and sampling/testing from six boreholes. The site history information and site walkover inspection identified the following areas of concern (AEC): fill material; historical quarrying/extractive activities; use of pesticides; and hazardous building materials. Therefore, based on the potential contamination sources/AEC identified, and the soil sample test results, JK Environments recommended that a Detailed Site Investigation (DSI) should be prepared.

JK Environments have subsequently prepared a Detailed Site Investigation (DSI) report dated 18 July 2023.

The DSI included a review of a previous Preliminary Site Investigation (PSI), soil sampling from 27 boreholes/test pits across the site and five selected soil mounds in the north-east section, sediment sampling from four locations, groundwater sampling from three monitoring wells and surface water sampling from four locations.

As described in the DSI report, no asbestos was encountered at the site, however, demolition material was encountered across the site and there is a potential for asbestos to be identified during future earthworks. As such, inclusion of an 'Unexpected Finds Protocol' in the mitigation measures is recommended to address this potential risk.

Although the testing revealed that there were concentrations of lead, nickel and/or zinc and total recoverable hydrocarbon (TRHs) that exceeded the guidelines, JK Environments advise that contaminant concentrations in soil, sediment, groundwater and surface water were generally low and were assessed not to pose an unacceptable risk in the context of the proposed development/land use scenario. Further, the DSI did not identify any triggers for remediation.

Therefore, based on the findings of the investigation, JK Environments is of the opinion that the site is suitable for the proposed development and ongoing public recreational use without the need for any form of remediation.

On this basis, it is considered that there is no risk to human health due to potential exposure to contaminants associated with the carrying out of the proposed upgrade works.

The DSI report is provided at ***Appendix E*** of this REF.

4.3.3 State Environmental Planning Policy (Biodiversity and Conservation) 2021

State Environmental Planning Policy (Biodiversity and Conservation) 2021 (B&C SEPP) commenced on 1 March 2022 and transfers the provisions of several former State Planning Policies together under a single policy, including the now repealed *State Environmental Planning Policy (Vegetation in Non-rural Areas) 2017.*

Chapter 2 of the B&C SEPP applies to vegetation in non-rural areas and aims to protect the biodiversity value of trees and other vegetation in non-rural areas and to preserve the amenity of non-rural areas through the preservation of trees and other vegetation. The clearing or removal of trees and vegetation that is ancillary to development requiring consent must be assessed as part of the development assessment process and may require further assessment and approval under the *Biodiversity Conservation Act 2016*. Similarly, while the proposed works may be carried out without the need for consent, the removal of vegetation must be given due consideration with respect to the potential impact on the biodiversity value or amenity of the locality.

The B&C SEPP prescribes that consent or permit requirements for tree removal or pruning is to be regulated under the applicable development control plan. Notwithstanding, trees on land under Council management are exempt from requiring a permit or development consent.

The Reserve contains many established trees that contribute to the landscape character and setting of the location.

An Arboricultural Impact Assessment and Tree Management Plan has been prepared by Redgum Horticultural in association with the proposed works. This report provides an assessment of one hundred and seventy (170) trees comprising one hundred and seven (107) within the site, one (1) tree on the property boundary, one (1) tree in the Bantry Bay Road reserve and sixty one (61) trees outside the boundaries of the Reserve. The assessment does not include all trees within and adjacent to the Reserve, but focuses on trees within 5m of where works are to occur and that may be impacted by the works.

Redgum Horticultural undertook a Visual Tree Assessment (VTA) in order to provide an overview of the quality and value of the trees, to determine Tree Protection Zones (TPZs) and Structural Root Zones (SRZs) and provide arboricultural advice to assist in the preparation of the concept design for the upgrade works. Each of the one hundred and seventy (170) trees were identified by Genus and species, as well as their common name and given a condition rating of Good (G), Fair (F), Poor (P), Dead (D) or Weed (W). In addition, a Retention Value was assigned using the IACA Significance of a Tree, Assessment Rating System (STARS) Retention Value Matrix adopted as the industry standard by the Institute of Australian Consulting Arboriculturalists.

In order to accommodate the proposed upgrade works it has been determined that twenty two (22) existing trees require removal. The Arboricultural Impact Assessment recommends removal of twenty three (23) trees. This includes nine (9) trees that have been assessed as being either not worthy of retention, or located in a position where they cannot be retained due to the proposed works, where encroachment will have an adverse impact on the trees roots and crown for viability and stability. A further fifteen (15) trees are either dead or weed specimens that should be removed independent of the proposed works. However, minor adjustments to the design mean that one (1) of the trees recommended for removal will no longer be impacted by the works and can be retained.

It is proposed to retain and protect all of the remaining existing trees on the site, as well as the trees in the adjoining properties and road reserves and the design for the upgrade works has taken into consideration the Tree Preservation Zones (TPZs) and Structural Root Zones (SRZs) recommended in the Arboricultural Impact Assessment and Tree Management Plan to ensure that the design is sensitive to the protection requirements of each tree and that the trees will not be compromised by the proposed works.

The Tree Management Plan prepared by Redgum Horticultural sets out recommendations and specifications with respect to the retention and protection of the remaining trees that were assessed and are not to be removed. All works to be undertaken as part of the upgrade will need to be carried out in accordance with the Tree Management Plan provided at ***Appendix D*** of this REF.

In the context of the B&C SEPP, it is considered that there will not be an unacceptable impact on the biodiversity value or amenity of the locality as a result of the proposed works.

4.4 Local Environmental Plans

4.4.1 Warringah Local Environmental Plan 2011

The land on which Brick Pit Reserve is located is zoned RE1 Public Recreation under *Warringah Local Environmental Plan 2011* (LEP).

The stated objectives for the RE1 Public Recreation zone are as follows:

- *To enable land to be used for public open space or recreational purposes;*
- *To provide a range of recreational settings and activities and compatible land uses;*
- *To protect and enhance the natural environment for recreational purposes;*
- *To protect, manage and restore public land that is of ecological, scientific, cultural or*

aesthetic value;

- *To prevent development that could destroy, damage or otherwise have an adverse effect on those values.*

The continued use of the land at Brick Pit Reserve for public recreational purposes is commensurate with these objectives and the proposed upgrade works will provide for active (and to a lesser extent) passive recreational activities for the benefit of the local and wider community. The works within Brick Pit Reserve are consistent with these objectives and will enhance, restore and assist in the ongoing management of this public recreational resource by facilitating the delivery of high quality recreational facilities that will benefit the local and wider community.

The Land Use Table for the RE1 Public Recreation zone lists *recreation areas* as permissible only with development consent. Therefore, ordinarily development consent under Part 4 of the EP&A Act would be required prior to undertaking the proposed works.

Notwithstanding, as identified at Clause 1.9 of the LEP, the provisions of the T&I SEPP prevail over the provisions of *Warringah Local Environmental Plan 2011* and pursuant to Divisions 12 and 17, together with section 2.20 of the T&I SEPP, the works may be carried out as either *development without consent* or *exempt development*.

4.5 Confirmation of statutory position

All relevant statutory planning instruments have been examined with respect to the proposal.

The proposed works at Brick Pit Reserve Park as described in this REF have been assessed as being either ***exempt development*** or ***development without consent*** under the relevant environmental planning instrument (T&I SEPP). This position relies on the operation of the T&I SEPP to remove the otherwise applicable consent requirements under the LEP.

Accordingly, the proposed works do not require approval under Part 4 of the *Environmental Planning & Assessment Act, 1979.*

Notwithstanding, the proposed works fall within the definition of an 'activity' as defined under Section 5.1 of the EP&A Act on the basis that subclause 5.1(1)(d) of the EP&A Act defines the *carrying out of a work* as an "activity".

Section 5.5 of the EP&A Act states 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.

Therefore, as the works are being proposed by a public authority (Northern Beaches Council) and they do not require development consent, they are subject to an environmental impact assessment under Part 5 of the EP&A Act.

5 Community and stakeholder engagement

5.1 Consultation

Community and stakeholder engagement for the Frenchs Forest Town Centre Park Upgrades is being undertaken in two stages.

- Stage 1: to understand community sentiment and obtain feedback on the initial concept designs of each park; and

- Stage 2: to understand community sentiment and obtain feedback on the detailed designs for each park, review environment factors studies (where applicable) and to ensure the designs are acceptable to the community before proceeding to construction.

The objectives of the community and stakeholder engagement were:

- Objective 1: build community and stakeholder awareness of participation activities (inform)

- Objective 2: provide accessible information so community and stakeholders can participate in a meaningful way (inform)

- Objective 3: identify community and stakeholder concerns, local knowledge and values (consult)

Stage 1 of the community and stakeholder engagement was conducted between 24 March and 4 May 2022 and consisted of several activities that provided opportunities for the community and stakeholders to learn about the proposed upgrades to Brick Pit Reserve, Akora Reserve and Rabbett Reserve and provide feedback on the concept designs.

Engagement activities included the establishment of a project page on the Northern Beaches Council's 'Your Say' platform, promotion of the project and opportunities to provide feedback through electronic direct mail (EDM) including Council's regular email newsletters, a stakeholder email, social media posts (Facebook and LinkedIn), a letterbox drop to surrounding properties, print media at Council's Service Centres and Site Signs that provided a QR Code to access the 'Your Say' page.

Community and stakeholder feedback was captured through an online comment form embedded onto the 'Your Say' project page. The form included a question that directly asked respondents for their level of support on the proposal. An open-field comments box provided community members a space to explain or elaborate on their support, not support or neutral sentiment as well as any other feedback they wished to contribute. Email and written comments were also invited.

There was a total of 3,261 visits and 2,734 visitors to the 'Your Say' Frenchs Forest Town Centre Park Upgrades landing page. A total of 242 comments were received across the three Your Say pages created for each reserve, and eight via email. This included five emailed comments in support/against and three additional emailed comments in relation to general Frenchs Forest Town Centre and suburb upgrades, including roadways which are outside the scope of this engagement.

Specifically in relation to Brick Pit Reserve, there was a total of 1,237 visitors to the project page and 77 unique responses were received. Feedback themes include – great for the area; good balance of nature and infrastructure; dog friendly; mosquito control; keep the bike track. In response to the online sentiment question: What do you think of the concept plan for Brick Pit Reserve? – of the 100 responses received, 66% were in support, 24% would support with changes; 7% did not support; and 3% were neutral or undetermined.

The Community and Stakeholder Engagement Report for the Frenchs Forest Town Centre Park Upgrades project prepared by Northern Beaches Council provided (in tabular form) a summary of key themes and issues raised in relation to the proposed upgrade works at Brick Pit Reserve, together with Council's response. This table is reproduced below:

Theme	What We Heard	Council's Response
Preservation of natural environment	Concern that the upgrades will result in significant tree loss at the site.	The embellishment of Brick Pit Reserve will look to rehabilitate and enhance indigenous vegetation, and to assist the regeneration of local flora and fauna.
Parking	Support for additional parking	Additional parking is not proposed as part of the park upgrades.
Additional Amenity	Support for additional facilities, including: - Public toilets - Fitness station - Additional seating - Shelters - Basketball court - Skate park	playground is proposed as part of the park upgrade and can be identified by number 4 on the concept plan. By way of context, the draft open space and recreation strategy is currently on exhibition to the community and in such a strategy, playgrounds are typically categorised as regional, district, neighbourhood or local. The strategy includes an outline of the typical facilities, for each park classification. Additional amenity is based on these classifications which also considers access, inclusivity, and diversity of experiences. All feedback is being considered in the next stage of design development including the possibility of including a public toilet.
Wetland	Concern that wetland may attract mosquitos.	The concept proposes to embellish the existing functioning wetland within Brick Pit Reserve.

		The current wetland is overgrown with its banks. Vegetation and water quality management with a focus on mosquito control will form part of the design development.
Bike Track	Support for the retention of existing bike jumps and track and incorporation of bike racks.	An existing bike trail loop is located within the park, retention of these jumps and tracks will be investigated as part of the design process, taking into account the impacts on the natural environment and other park users. The incorporation of bike racks will be considered during development of the design and in response to community feedback.
Playground	Support for a larger playground that caters to a range of age groups.	A playground is proposed as part of the park upgrade and can be identified by number 4 on the concept plan. By way of context, the draft open space and recreation strategy is currently on exhibition to the community and in such a strategy, playgrounds are typically categorised as regional, district, neighbourhood or local. The strategy includes an outline of the typical facilities, for each park classification. Additional amenity is based on these classifications which also considers access, inclusivity, and diversity of experiences. All feedback is being considered in the next stage of design development.
Site History	Support for comprehensive interpretation of the history of the site.	The history of the site will be incorporated into the overall design of the park which will be further detailed during design

		development.
Impacts on Neighbouring Properties	Concern over privacy for residents in adjacent properties.	The concept designs were created during the Hospital Precinct Structure Plan development and were exhibited during this time. The concepts give the community an idea of what might be possible at the park with the design to be further detailed during design development in response to feedback received from the community. As we progress through the process, the community are kept up to date on how the designs.
Pathway Conflicts	Concern for conflicts between pedestrians and cyclists.	The network of paths will be further refined during design development and in response to community feedback.

The feedback from the community and stakeholder engagement has assisted in informing the detailed design of the proposed upgrade and improvement works to ensure that the proposed design meets the community requirements and expectations. Stage 2 of the community and stakeholder engagement will now be undertaken and will provide an opportunity for Council to obtain community sentiment and obtain feedback on the detailed designs for each reserve, as well as this Review of Environmental Factors and to ensure that the designs are acceptable to the community before proceeding to construction.

5.2 T&I SEPP consultation

As identified in Table 4-1 in the previous Chapter, consultation in accordance with the T&I SEPP is not required.

5.3 Government agency involvement

There is no requirement for involvement from other government agencies.

5.4 Ongoing or future consultation

There is no requirement for any ongoing or future consultation. Notwithstanding, Northern Beaches Council should notify nearby residents and any community user groups of Brick Pit Reserve prior to the commencement of any works.

Further, once works commence, the community should be provided with a contact name and number that they can contact should any complaints wish to be registered.

6 Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposed upgrade works and facilities at Brick Pit Reserve. All aspects of the environment potentially impacted upon by the proposal are considered. This includes consideration of the factors specified in *Guidelines for Division 5.1 Assessments* (DPIE 2022) as required under Clause 171(1) of the *Environmental Planning and Assessment Regulation 2021*. Site-specific safeguards and management measures are provided to ameliorate or minimise the identified potential environmental impacts.

The proposal has been assessed on both the construction phase and the project outcome / operational phase of the project (i.e. once the new and upgraded facilities are in use).

<u>Construction Phase</u>

6.1 Tree Removal and Protection

6.1.1 Existing environment

Brick Pit Reserve is heavily treed and there are other trees around the perimeter of the Park in adjoining properties and within the road reserves that contribute to the overall landscape character and setting of the Reserve.

In order to provide an overview of the quality and value of the trees at the Reserve, to determine Tree Protection Zones (TPZs) and Structural Root Zones (SRZs), and to provide Arboricultural advice to assist with the design process for the proposed works and recommendations for the protection of retained trees, Redgum Horticultural was commissioned to prepare an Arboricultural Impact Assessment and Tree Management Plan. This report provides an assessment of one hundred and seven (107) trees within the Park, together with a further sixty three (63) trees in the adjoining properties and road reserves that contribute to the overall landscape character and setting.

The Arboricultural Impact Assessment report indicates that the trees are a mix of locally indigenous, Australian native and exotic species.

6.1.2 Potential impacts

In order to accommodate the upgrade works, twenty two (22) trees are proposed to be removed. All of the remaining existing trees, both within the Reserve and the adjoining properties and road reserves are to be retained and protected. The one hundred and seventy (170) trees were identified by genus and species, were given a retention value and were assessed for the potential to be adversely impacted by the proposed works. A Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) for each tree was also calculated.

A copy of the Arboricultural Impact Assessment & Tree Management Plan is provided at ***Appendix D*** of this REF.

The proposed removal of twenty two (22) trees will have a minor impact on the existing tree canopy and landscape character of the Park. It is also noted that fourteen (14) of the trees to be removed are either dead or weed species. However, this tree loss is to be offset by the planting of several new trees and mass plantings of groundcovers across the Reserve. The species and proposed planting locations / spacing of new trees have been selected to ensure optimal tree growth and canopy spread.

A range of tree protection measures and sensitive construction methods to minimise adverse impacts during construction works have been recommended by the Arborist in the Tree Management Plan. In addition, further safeguards and management measures as set out below are recommended.

6.1.3 Safeguards and management measures

- Trees numbered 17, 26, 30, 31, 32, 33, 34, 35, 36, 54, 55, 56, 57, 58, 59, 70, 73, 81, 101, 113, 117 & 118 in the Arboricultural Impact Assessment prepared by Redgum Horticultural and dated 3 April 2023 may be removed.

- Trees numbered 1 to 16, 19 to 25, 27, 28, 29, 37 to 53, 60, 71, 72, 74 to 80, 82 to 100, 102 to 106, 109, 111, 112, 115, 116, 119, 121 to 123 & 161 in the Arboricultural Impact Assessment prepared by Redgum Horticultural and dated 3 April 2023 are to be retained and protected.

- All work is to be carried out in accordance with the recommendations and specifications set out in the Tree Management Plan prepared by Redgum Horticultural and dated 3 April 2023 (a copy of which is provided at ***Appendix D*** of this REF).

- All tree removal is to be undertaken under the direct supervision of an arborist with minimum AQF Level 5 qualifications, appointed by the Northern Beaches Council / Project Manager.

- All remaining trees that are not identified in the Arboricultural Impact Assessment prepared by Redgum Horticultural and dated 3 April 2023 are to be retained and protected in accordance with the requirements of *AS4970 Protection of Trees on Development Sites (2009).*

- Before the commencement of works, Tree Protection Zones (TPZs) must be established around all trees to be retained. Tree protection must be installed and maintained in accordance with *AS 4970 Protection of Trees on Development Sites* under the supervision of the Project Arborist.

- The following works must be excluded from within any TPZs:

    (i) Soil cut or fill including excavation and trenching;

    (ii) Soil cultivation, disturbance or compaction;

    (iii) Stockpiling, storage or mixing of materials;

    (iv) The parking, storing, washing and repairing of tools, equipment and machinery;

    (v) The disposal of liquids and refuelling;

    (vi) The disposal of building materials;

    (i) The siting of offices or sheds;

    (ii) Any action leading to the impact on tree health or structure.

- New trees should be grown in accordance with *AS 2303 Tree Stock for Landscape Use (2018)*.

6.2 Traffic and Parking

6.2.1 Existing environment

Construction access to the site will primarily be via Bantry Bay Road, which both carry relatively low volumes of daily vehicles and to a lesser extent, cyclists and pedestrians. Site access via Fitzpatrick Avenue East may also be necessary.

6.2.2 Potential impacts

Impacts during the works would primarily occur when traffic flows and/or pedestrian movements in the vicinity of the site may need to be temporarily disrupted to allow for construction vehicles and/or equipment to access or leave the work site/s. There may also be short term impacts associated with truck movements during the works, as well as an additional demand for on-street parking from worker's vehicles. Notwithstanding, these impacts would be minimised through the implementation of appropriate traffic / pedestrian control measures in the vicinity of the works.

6.2.3 Safeguards and management measures

- Where required, appropriate traffic management measures on Bantry Bay Road and Fitzpatrick Avenue East, such as temporary speed restrictions, precautionary signs, illuminated warning devices and manual and/or electronic traffic control to control access of construction vehicles etc to the park will need to be implemented (as guided by a Traffic and Pedestrian Management Plan) and maintained throughout the works period.

6.3 Noise and Vibration

6.3.1 Existing environment

The existing noise environment is typical of a public open space within an established urban area adjacent to low density residential uses and major road corridors to the north and east (Warringah Road and Wakehurst Parkway). Existing background noise levels mainly comprise traffic noise, with minimal noise expected to be generated by the adjoining residential uses.

6.3.2 Potential impacts

There will be some noise impacts associated with the demolition and construction activities. However, general construction noise associated with the works is not likely to cause a significant disturbance above existing noise levels associated with nearby major roads. All works will occur during the daytime period when background noise levels are higher and there is sufficient separation distance from nearby sensitive land uses to assist in minimising or ameliorating any significant noise impacts.

6.3.3 Safeguards and management measures

- Work is to be restricted to the following working hours and noisy work should be undertaken during less sensitive periods where possible:
  - Monday to Friday – 07:00 to 17:00; and
  - Saturday – 08:00 to 13:00.

  No work is to be undertaken on:
  - Sundays and Public Holidays.

- Noise from construction activities shall comply with the *Protection of the Environment Operations (Noise Control) Regulation 2017*.

- All plant, machinery and noise generating equipment should be maintained in good working order. Where practical / possible machinery should be fitted with exhaust silencers and / or noise reduction devices.

- Plant and machinery will need to be turned off when not in use.

- The construction noise levels shall not reach or exceed the exposure levels, including peak exposure (140dB[C]) and daily average (85dB[A]), as detailed in Clause 56 of the WH&S Regulation 2017. Work planning and preparation shall be considered to ensure noisy activities are minimised. The control measures developed shall meet the requirements of *AS2436 – 2010 – 'Guide to Noise and Vibration Control on Construction, Maintenance and Demolition Sites'* i.e. localised noise boxes or barriers. Appropriate tools and equipment shall be used to ensure noise levels are reduced and controlled.

6.4 Air Quality

6.4.1 Existing environment

The air quality at Brick Pit Reserve is typical of an established urban environment. The main sources of air pollution are air borne pollutants from vehicle exhausts, as well as dust and debris during periods of high winds.

6.4.2 Potential impacts

There is the potential for some adverse air quality impacts as a consequence of the proposed works such as air borne dust during the removal of the existing playground equipment, pavements / kerb and guttering etc and general construction / installation associated with the upgrade works. Some minor additional air quality impacts may result from the equipment and vehicles being used during works. However, the likely cumulative impact is considered to be negligible.

6.4.3 Safeguards and management measures

- The Contractor is required to monitor and manage dust / air quality during the works.

- All plant, machinery and noise generating equipment is to be maintained in good working order and is to be turned off when not in use for prolonged periods.

- Where possible, all construction plant and machinery should be fitted with emission control devices complying with Australian Design Standards.

- All vehicles leaving the site that are carrying waste or other materials are to have their loads covered.

- Any dust generating works should be stopped during periods of high wind.

- Plastic sheeting shall be available to cover excavation faces and stockpiles.

6.5 Water Quality

6.5.1 Existing Environment

The Reserve primarily relies on infiltration of stormwater into the ground surface during rain events.

However, there is also stormwater discharged into the Reserve from the street stormwater drainage system surrounding the Reserve.

6.5.2 Potential impacts

There is the potential for soil and other pollutants disturbed during the works, or through localised erosion to enter the stormwater drainage system in the surrounding roads, particularly if there is heavy rain during the course of works.

6.5.3 Safeguards and management measures

- Erosion and sedimentation controls such as silt fences / bags, sediment traps, diversion drains, berms, sumps etc will need to be installed across the works site and around any stockpiles before the commencement of works to prevent sediment-laden runoff entering the local stormwater system.

- A Construction Soil and Water Management Plan and/or Erosion and Sedimentation Control Plan is to be prepared in accordance with the Blue Book to detail processes, responsibilities and measures to manage potential impacts during construction. Any cleared areas are to be revegetated or stabilised as soon as practicable to prevent erosion of soil surfaces.

- All chemicals must be stored in appropriately bunded and secure areas and not be located within or directly adjacent to drainage pits.

- Spill kits are to be available to ensure any spills are appropriately managed.

- Regular inspection and maintenance of the erosion and sedimentation controls is to be undertaken. Sediment build up is to be cleared from behind barriers where required and all controls are to be maintained in working order sufficient for a 10 year Average Recurrence Interval (ARI) rainfall event.

- Building operations and stockpiles must not be located on the public footway or any other locations which could lead to the discharge of materials into the stormwater system.

6.6 Visual Amenity

6.6.1 Existing environment

The existing visual amenity is typical of an urban environment comprising a large area of public open space bounded on two sides by major trafficable streets and surrounded on the other two sides by a predominantly low density residential neighbourhood.

6.6.2 Potential impacts

The likely short terms visual impacts associated with the works include the presence of temporary safety fencing, plant and equipment, stockpiles etc at the site. However, this visual impact is likely to be minimal and will only exist for the duration of the works.

The long term changes to this visual environment will primarily be the improved appearance of the Reserve as a consequence of the upgrade works. This is not considered to be a negative visual impact. New plantings will improve visual amenity as the trees mature and the canopy develops.

Temporary perimeter fencing will be used to ensure members of the public cannot access the Reserve during construction works. This should incorporate shade cloth (or similar) with details of the proposed works to minimise visual impacts during construction works. Other than this requirement and that all parts of the construction site are kept in a clean and tidy manner, no additional safeguards are proposed with respect to visual amenity.

6.6.3 Safeguards and management measures

- All parts of the work areas are to be kept clean and tidy at all times.

- Shade cloth (or similar) incorporating project details should be used on temporary perimeter fencing to improve visual amenity during demolition and construction works.

6.7 Waste Management and Minimisation

6.7.1 Potential impacts

The construction activities associated with the upgrade works will generate a variety of waste material including, but not necessarily limited to demolition waste, waste soil and vegetation, packaging, surplus materials and general litter.

All waste will need to be collected, sorted and stored on site in appropriate skips / containers etc and if not to be reused on site, collected and disposed of at a licenced recycling or waste facility.

6.7.2 Safeguards and management measures

- A Waste Management Plan will need to be prepared to detail the procedures for waste minimisation and management, including the likely waste generation, method of on-site collection and storage and details of the intended method of recycling or disposal.

- All areas of the construction site/s will need to be kept free of rubbish and cleaned at the end of each work day.

- The resource management hierarchy principles of the *Waste Avoidance and Resource Recovery Act 2001*(WARR Act) should be adopted as follows:

  – Avoid unnecessary resource consumption as a priority.
  – Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling, and energy recovery).
  – Disposal at a licenced waste facility is undertaken as a last resort.

6.8 Flora & Fauna

6.8.1 Existing environment

Brick Pit Reserve is a well treed Reserve with a central waterbody that in its current condition is an urban bushland that has potential to provide habitat for a variety of flora and fauna. Site investigations carried out by Narla Environmental identified a wide variety of native and exotic vegetation, as well as several fauna species. However, no threatened fauna, or Critically Endangered Ecological Communities under both the NSW *Biodiversity and Conservation Act 2016* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were observed on the site.

6.8.2 Potential impacts

The proposed removal of twenty two (22) trees from the site constitutes a direct impact to the flora at the site. However, as discussed in Chapter 4, their removal will not significantly affect the ecological community and no direct impacts to threatened fauna within the site are anticipated.

As determined by the Tests of Significance carried out by Narla Environmental, the potential for impacts to potential breeding habitat for the Giant Burrowing Frog, Red-crowned Toadlet and Southern Brown Bandicoot, listed as vulnerable fauna under the EP&BC Act / BC Act is considered low.

Potential indirect impacts to flora and fauna at the site may include:

- Rubbish dumping.
- Noise and vibration that may affect local fauna.
- Surface and stormwater runoff from increased impervious areas associated with construction and any associated landscaped areas.
- Pathogens such as Phythophthora and Myrtle Rust causing dieback to retained vegetation. Caused through transportation of soil, water or plant materials.

However, these are considered to be short term and unlikely to significantly impact flora. Any fauna is expected to be highly mobile given the urban environment and would relocate if required.

A formal assessment of any TECs or threatened species, as a matter of National environmental significance, in the form of a Referral to the Commonwealth under the *Environment Protection and Biodiversity Conservation Act 1999* is not required for the proposed works due to a lack of suitable habitat.

Further, the proposed works are not likely to significantly affect threatened species, populations, ecological communities, or critical habitat and therefore a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) are not required under the *Biodiversity Conservation Act 2016*.

Notwithstanding, in order to minimise the potential for any impacts to flora or fauna, a number of safeguards and management measures are recommended, as outlined below:

6.8.1 Safeguards and management measures

- Prior to the implementation of the activity, the proponent should commission the services of a qualified and experienced Ecologist with a minimum tertiary degree in Science, Conservation, Biology, Ecology, Natural Resource Management, Environmental Science or Environmental Management. The Ecologist must be licensed with a current Department of Primary Industries Animal Research Authority permit and New South Wales Scientific License issued under the BC Act.

  The Ecologist will be commissioned to:

  - Undertake any required targeted searches for threatened flora prior to vegetation clearing;
  - Undertake an extensive pre-clearing survey which includes targeted searches for threatened fauna threatened flora and Priority Weeds, and delineating habitat-bearing trees and shrubs;
  - Supervise the clearance of any habitat trees or shrubs identified during the pre-clearing survey (native and exotic) in order to capture, treat and/or relocate any displaced fauna; and
  - Supervise the clearing/modification of any aquatic habitat including creeks and wetlands in order to capture, treat and/or relocate any displaced fauna.

- The proposed revegetation of the Subject Site and Project Area will involve the planting of species associated with the naturally occurring Coastal Shale-Sandstone Forest. Any additional landscaping should also comprise of species associated with Coastal Shale-Sandstone Forest.

- As a precaution, prior to construction or clearing, an amphibian pre-clearing survey should be undertaken for *Pseudophryne australis* (Red-crowned Toadlet) and *Heleioporus australiacus* (Giant Burrowing Frog) to ensure no species is present with the water feature being impacted.

- To avoid impacts to fauna, any nest box located on a tree to be removed must be relocated to another tree to be retained in the Project Area. Nest boxes should be moved under the supervision of a qualified Ecologist. If fauna are present, the attending ecologist should relocate the fauna back into translocated nest box or other appropriate habitat being retained on the site.

- The following three (3) priority weeds were identified within the Subject Site:

    - *Asparagus aethiopicus (Asparagus Fern);*
    - *Lantana camara (Lantana); and*
    - *Olea europaea subsp. cuspidata (African Olive).*

  All priority weeds should be removed in accordance with the Biosecurity Act 2015 and NSW WeedWise (DPI 2022). Environmental weeds should be managed with best practice techniques to improve the condition of the native vegetation within the Subject Site.

- If injured or abandoned fauna is found, WIRES or Sydney Wildlife Rescue should be contacted to hand over the animal for care, or the animal would be taken to the vet, whichever is the most appropriate option for the fauna species.

- Equipment must not be used if there are any signs of fuel, oil or hydraulic leaks. Leaks must be repaired immediately, or the equipment must be removed from the site until it is repaired or replaced with a leak-free item.

- Reschedule works during and after periods of heavy rainfall.

- Chemicals and rubbish must not be stockpiled near native vegetation or the waterways.

- No vegetation with signs of disease, pathogens or fungus should be planted on site.

6.9 Aboriginal Heritage

6.9.1 Potential impacts

In order to identify if Aboriginal objects are likely to be located within the area of the proposed works and, if so, whether the proposed works have the potential to harm those objects, a Heritage NSW (HNSW) Aboriginal Heritage Information Management System (AHIMS) search to confirm the presence or absence of known Aboriginal heritage within or in proximity to the works site was undertaken. The AHIMS search shows there are no Aboriginal places and no recorded Aboriginal sites within a 200m radius of the site.

Notwithstanding, Aboriginal objects are protected under the *National Parks & Wildlife Act 1974* (NP&W Act) regardless if they are registered on AHIMS or not. If suspected Aboriginal objects, such as stone artefacts are located during future works, works must cease in the affected area and an archaeologist called in to assess the finds. If the finds are found to be Aboriginal objects, Heritage NSW must be notified under section 89A of the NPW Act. Appropriate management and avoidance or approval under a section 90 AHIP should then be sought if Aboriginal objects are to be moved or harmed.

Therefore, it is recommended that an environmental safeguard with respect to any 'Unexpected Finds' of potential Aboriginal archaeology and/or cultural heritage be imposed.

6.9.2 Safeguards and management measures

- In the unlikely event that during works any objects are discovered that are suspected to be Aboriginal objects, Heritage NSW must be notified under section 89A of the NPW Act. Appropriate management and avoidance or approval under a section 90 AHIP should then be sought if Aboriginal objects are to be moved or harmed.

- In the extremely unlikely event that human remains are found, works should immediately cease, and the NSW Police should be contacted. If the remains are suspected to be Aboriginal, Heritage NSW may also be contacted at this time to assist in determining appropriate management.

6.10 Non-Aboriginal Heritage

6.10.1 Existing environment

Brick Pit Reserve is not listed as a heritage item, or within a heritage conservation area under Schedule 5 of *Warringah Local Environmental Plan 2011* and there are no heritage items or heritage conservation areas in the vicinity of the Reserve.

Notwithstanding, Damien O'Toole Town Planning & Heritage Services was commissioned to prepare a Heritage Impact Statement (HIS) to understand the potential heritage impact of the upgrade works upon the former brick pit site. The HIS is provided at ***Appendix F*** of this Review of Environmental Factors.

6.10.2 Potential impacts

The Heritage Impact Statement concludes that will not have an adverse or unsympathetic heritage impact on the significance of the Brick Pit Reserve for the following reasons:

- *The proposed concept design is made up of largely above ground works and excavation works will largely be minor.*
- *There is no known heritage fabric above ground that will be impacted by the works. The former structures associated with the brick pit have been cleared.*
- *There is low potential for sub-surface remains over the brick pit given the type of feature it is and its use post the closure of the brick pit. Further, the works are unlikely to impact this area in a significant way.*
- *As it currently stands, the historical and associative heritage values of the place are not connected to any physical evidence. As a result, our understanding of the site under this criterion will not be impacted by the works. The site will continue to have historical and associated heritage value as a former brick pit site established by William Hews.*
- *The proposal will provide public art and signage which can educate the community on the heritage values of the place.*
- *The proposal will vastly improve the visual setting of the place, and make it accessible / usable to the community which in turn extends the lifespan and relevance of the heritage place to the local community.*
- *There is no significant vegetation on the site.*
- *There are no documented Aboriginal sites or places on this property.*
- *There are no heritage impacts to heritage in the vicinity.*

Although the site is not a listed heritage item it has significance/value due to its former brick pit use. However, it is considered that the potential for the site to contain any non-Aboriginal heritage is low.

Notwithstanding, Damien O'Toole Town Planning & Heritage Services recommends that an environmental safeguard with respect to any 'Unexpected Finds' associated with non-Aboriginal heritage be imposed, as well as a requirement for the preparation of a Heritage Interpretation Plan for the site that presents both the Aboriginal and non-Aboriginal history and heritage of the place.

6.10.3 Safeguards and management measures

- Prior to works commencing, all staff, contractors and sub-contractors should undergo a heritage induction presented by a qualified heritage consultant. The induction must identify their statutory obligations for heritage under the *Heritage Act 1977* in relation to built heritage and archaeological relics and associated procedures to follow.

- In the unlikely event that during works any objects are discovered that are suspected to be non-Aboriginal objects, Heritage NSW must be notified.

- In the extremely unlikely event that human remains are found, works should immediately cease, and the NSW Police should be contacted.

- A Heritage Interpretation Plan is to be prepared for the site that presents both the Aboriginal and non-Aboriginal history and heritage of the place. Refer to the NSW Heritage Office, "Heritage Information Series: Interpreting Heritage Places and Items Guideline" to assist in preparing this document. The Plan should include traditional interpretation such as signage but also include interpretation related to any objects found at the site, as well as consideration of esoteric interpretation such as landscape treatments and art. This Plan must be physically implemented prior to the closure of the project.

6.11 Social and economic

6.11.1 Potential impacts

In the short term, there will be temporary negative social impacts associated with a restriction on public access to the Reserve and its facilities during the works period. However, it is noted that there are nearby reserves, parks and playgrounds that the public will have access to during this time.

Nevertheless, there are likely to be long term positive social and economic impacts associated with the proposed upgrade works such as the improved appearance, function and useability of the Reserve for user groups and the wider community.

6.11.2 Safeguards and management measures

No safeguards or management measures are considered necessary.

6.12 Community Enquiries and Complaints

6.12.1 Potential impacts

During the course of demolition and construction works there is the potential that affected businesses, residents or other members of the community may wish to make enquiries or complaints in relation to the works.

6.12.2 Safeguards and management measures

- A dedicated 'Community Liaison Officer' (Council's Project Manager or representative) should be contactable and available to respond to enquiries and address complaints or other issues during the works period.

- Signage on the temporary perimeter fencing is to include the Community Liaison Officer contact details for any enquiries or complaints.

- Surrounding properties are to be provided with a minimum of three (3) days notification (letterbox drop) prior to the commencement of works.

- A Register to record complaints from local residents, businesses or other members of the community is to be prepared and maintained by the appointed Community Liaison Officer.

6.13 Summary of construction phase beneficial effects

The main benefits of the proposed upgrade works at Brick Pit Reserve include:

- The provision of high quality public recreational facilities for the local and wider community, together with a significant improvement to the public safety, aesthetic quality, public domain amenity and legibility of Brick Pit Reserve.

- The provision of upgraded recreational facilities in keeping with the community's desires and expectations and identified strategic needs; and

- Improvement to the aesthetic, recreational and long term value of the Reserve.

6.14 Summary of construction phase environmental impacts

The main potential environmental impacts likely to arise during the upgrade works include:

- Tree removal and protection impacts;

- Traffic and parking impacts;

- Noise and vibration impacts;

- Air quality impacts;

- Water and stormwater quality impacts;

- Visual amenity impacts;

- Waste management and minimisation impacts.

As discussed above, the potential for impacts to Aboriginal and non-Aboriginal heritage at the site have also been considered and adverse impacts are unlikely. Notwithstanding, environmental safeguards and management measures have been recommended should any 'unexpected finds' eventuate during the works.

6.15 Traffic and Parking

6.15.1 Existing environment

There is currently parallel kerbside parking along the western side of Bantry Bay Road and approximately forty five (45) linemarked 90 degree parking spaces along the eastern side of Bantry Bay Road adjacent to the Reserve. A mature street tree at the approximate mid-point of the Reserves frontage to Bantry Bay Road is located within the road reserve and is currently enclosed by a low timber (coppers logs) fence. Many of these 90 degree parking spaces, particularly towards the southern end, are regularly occupied by caravans, boats and trailers that do not appear to be regularly moved. This effectively reduces the available parking at the Reserve as turn-over is minimal. Six (6) of the 90 degree spaces at the northern end of Bantry Bay Road are signposted 2P time limited between 9am and 6pm Mon-Fri and 8am to 12pm Saturdays. The remaining spaces do not appear to be time restricted and non of the spaces are designated as accessible parking.

6.15.2 Potential impacts

It is proposed to re-allocate and reduce the current on-street parking on the eastern side of Bantry Bay Road to provide thirteen (13) 90 degree spaces, including two (2) accessible spaces, separated by the required 'shared zone' to the south of the street tree and provide seven (7) parallel to kerb parking spaces to the north of the street tree. This will result in the loss of approximately twenty five (25) parking spaces in the locality. However, the provision of designated accessible parking spaces is considered beneficial to the community. In addition, in the event that Council chooses to signpost these parking spaces as time limited, this will eliminate the current practice of towable vehicles being left for extended periods in the street. Given this current practice, the overall loss of on-street parking is not considered unreasonable.

6.15.3 Safeguards and management measures

- No safeguards and management measures are considered necessary.

6.16 Acoustic amenity impacts

6.16.1 Potential impacts

There is potential for increased noise generated by users of the Reserve following completion of the upgrade. However, these impacts will generally be restricted to daylight hours and the existing background noise levels are already quite high due to traffic movements on both Warringah Road and the Wakehurst Parkway. On balance, it is considered that this will not result in unreasonable adverse acoustic impacts to the nearest residential receivers who are located in Bantry Bay Road, Fitzpatrick Avenue East or residents in the surrounding streets.

6.16.2 Safeguards and management measures

No safeguards or management measures are considered necessary.

6.17 Visual impacts

6.17.1 Potential impacts

The long term change to this visual environment will be the physical form of the upgraded Reserve, including the nature play area, shared pathways, viewing platforms, amenities block, new landscaping and other improvement works. However, this is not considered to be a negative visual impact and will improve the aesthetic quality and value of the locality.

6.17.2 Safeguards and management measures

No safeguards or management measures are considered necessary.

6.18 Social and economic

6.18.1 Potential impacts

The ongoing use of Brick Pit Reserve for public recreational purposes will have a generally positive socio-economic impact and the recreational facilities available to particular user groups and the wider community will be improved.

6.18.2 Safeguards and management measures

No environmental safeguards or management measures are proposed.

6.19 Summary of operational phase environmental impacts

The main environmental impacts to potentially arise during the operational phase of the public recreational facilities at Brick Pit Reserve include:

- Traffic and parking impacts;
- Acoustic amenity impacts;
- Visual amenity impacts;
- Social and economic impacts.

However, it is considered that these potential impacts can be adequately mitigated and will not have an unreasonable impact.

7 Environmental management

7.1 Environmental management plans

Environmental safeguards and management measures outlined in Table 7-1 below will minimise the identified potential adverse environmental impacts of the proposal on the surrounding environment.

A Construction Environmental Management Plan (CEMP) that incorporates all of the safeguards and management measures associated with the identified potential impacts and other construction management related issues will need to be prepared by the contractor/s prior to the commencement of works.

The CEMP will form the framework for establishing how the safeguards and management measures will be implemented and who will be responsible for their implementation. The environmental management of this proposal will need to be in accordance with this plan.

7.2 Summary of safeguards and management measures

The environmental safeguards and management measures outlined in this document will need to be incorporated into the detailed design and implemented prior to and/or maintained throughout the duration of the works at Brick Pit Reserve. These safeguards and management measures are aimed at minimising any potential adverse impacts on the surrounding environment and land uses arising from the proposed works. All safeguards and management measures described in the REF will also need to be incorporated into the CEMP. These are summarised in Table 7-1.

Table 7-1: Summary of impact specific environmental safeguards and management measures

No.	Impact	Environmental safeguards & management measures
1	Tree Removal and Protection	• Trees numbered 17, 26, 30, 31, 32, 33, 34, 35, 36, 54, 55, 56, 57, 58, 59, 70, 73, 81, 101, 113, 117 & 118 in the Arboricultural Impact Assessment prepared by Redgum Horticultural and dated 3 April 2023 may be removed. • Trees numbered 1 to 16, 19 to 25, 27, 28, 29, 37 to 53, 60, 71, 72, 74 to 80, 82 to 100, 102 to 106, 109, 111, 112, 115, 116, 119, 121 to 123 & 161 in the Arboricultural Impact Assessment prepared by Redgum Horticultural and dated 3 April 2023 are to be retained and protected. • All work is to be carried out in accordance with the recommendations and specifications set out in the Tree Management Plan prepared by Redgum Horticultural and dated 3 April 2023 (a copy of which is provided at *Appendix D* of this REF). • All tree removal is to be undertaken under the direct supervision of an arborist with minimum AQF Level 5

No.	Impact	Environmental safeguards & management measures
		qualifications, appointed by the Northern Beaches Council / Project Manager. • All remaining trees that are not identified in the Arboricultural Impact Assessment prepared by Redgum Horticultural and dated 3 April 2023 are to be retained and protected in accordance with the requirements of *AS4970 Protection of Trees on Development Sites (2009).* • Before the commencement of works, Tree Protection Zones (TPZs) must be established around all trees to be retained. Tree protection must be installed and maintained in accordance with *AS 4970 Protection of Trees on Development Sites* under the supervision of the Project Arborist. • The following works must be excluded from within any TPZs: (vii) Soil cut or fill including excavation and trenching; (viii) Soil cultivation, disturbance or compaction; (ix) Stockpiling, storage or mixing of materials; (x) The parking, storing, washing and repairing of tools, equipment and machinery; (xi) The disposal of liquids and refuelling; (xii) The disposal of building materials; (iii) The siting of offices or sheds; (iv) Any action leading to the impact on tree health or structure. • New trees should be grown in accordance with *AS 2303 Tree Stock for Landscape Use (2018)*.
2	Traffic and parking	• Where required, appropriate traffic management measures on Bantry Bay Road and Fitzpatrick Avenue East, such as temporary speed restrictions, precautionary signs, illuminated warning devices and manual and/or electronic traffic control to control access of construction vehicles etc to the park will need to be implemented (as guided by a Traffic and Pedestrian Management Plan) and maintained throughout the works period. •
3	Noise & Vibration	• Work is to be restricted to the following working hours and noisy work should be undertaken during less sensitive periods where possible:

No.	Impact	Environmental safeguards & management measures
		▪ Monday to Friday – 07:00 to 17:00; and ▪ Saturday – 08:00 to 13:00. No work is to be undertaken on: ▪ Sundays or Public Holidays. • Noise from construction activities shall comply with the *Protection of the Environment Operations (Noise Control) Regulation 2017*. • All plant, machinery and noise generating equipment should be maintained in good working order. Where practical / possible machinery should be fitted with exhaust silencers and / or noise reduction devices. • Plant and machinery will need to be turned off when not in use. • The construction noise levels shall not reach or exceed the exposure levels, including peak exposure (140dB[C]) and daily average (85dB[A]), as detailed in Clause 56 of the WH&S Regulation 2017. Work planning and preparation shall be considered to ensure noisy activities are minimised. The control measures developed shall meet the requirements of *AS2436 – 2010 – 'Guide to Noise and Vibration Control on Construction, Maintenance and Demolition Sites'* i.e. localised noise boxes or barriers. Appropriate tools and equipment shall be used to ensure noise levels are reduced and controlled.
4	Air Quality	• The Contractor is required to monitor and manage dust / air quality during the works. • All plant, machinery and noise generating equipment is to be maintained in good working order and is to be turned off when not in use for prolonged periods. • Where possible, all construction plant and machinery should be fitted with emission control devices complying with Australian Design Standards. • Any dust generating works should be stopped during periods of high wind. • Plastic sheeting shall be available to cover excavation faces and stockpiles.

No.	Impact	Environmental safeguards & management measures
5	Water Quality and Stormwater Drainage	• Erosion and sedimentation controls such as silt fences / bags, sediment traps, diversion drains, berms, sumps etc will need to be installed across the works site and around any stockpiles before the commencement of works to prevent sediment-laden runoff entering the local stormwater system. • A Construction Soil and Water Management Plan and/or Erosion and Sedimentation Control Plan is to be prepared in accordance with the Blue Book to detail processes, responsibilities and measures to manage potential impacts during construction. Any cleared areas are to be revegetated or stabilised as soon as practicable to prevent erosion of soil surfaces. • All chemicals must be stored in appropriately bunded and secure areas and not be located within or directly adjacent to drainage pits. • Spill kits are to be available to ensure any spills are appropriately managed. • Regular inspection and maintenance of the erosion and sedimentation controls is to be undertaken. Sediment build up is to be cleared from behind barriers where required and all controls are to be maintained in working order sufficient for a 10 year Average Recurrence Interval (ARI) rainfall event. • Building operations and stockpiles must not be located on the public footway or any other locations which could lead to the discharge of materials into the stormwater system.
6	Visual Amenity	• All parts of the work areas are to be kept clean and tidy at all times. • Shade cloth (or similar) incorporating project details should be used on temporary perimeter fencing to improve visual amenity during demolition and construction works.
7	Waste Minimisation and Management	• A Waste Management Plan will need to be prepared to detail the procedures for waste minimisation and management, including the likely waste generation, method of on-site collection and storage and details of the intended method of recycling or disposal. • All areas of the site will need to be kept free of rubbish and cleaned at the end of each work day. • The resource management hierarchy principles of the Waste

No.	Impact	Environmental safeguards & management measures
		Avoidance and Resource Recovery Act 2001(WARR Act) should be adopted as follows: – Avoid unnecessary resource consumption as a priority. – Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling, and energy recovery). – Disposal at a licenced waste facility is undertaken as a last resort.
8	Flora and Fauna	• Prior to the implementation of the activity, the proponent should commission the services of a qualified and experienced Ecologist with a minimum tertiary degree in Science, Conservation, Biology, Ecology, Natural Resource Management, Environmental Science or Environmental Management. The Ecologist must be licensed with a current Department of Primary Industries Animal Research Authority permit and New South Wales Scientific License issued under the BC Act. The Ecologist will be commissioned to: o Undertake any required targeted searches for threatened flora prior to vegetation clearing; o Undertake an extensive pre-clearing survey which includes targeted searches for threatened fauna threatened flora and Priority Weeds, and delineating habitat-bearing trees and shrubs; o Supervise the clearance of any habitat trees or shrubs identified during the pre-clearing survey (native and exotic) in order to capture, treat and/or relocate any displaced fauna; and o Supervise the clearing/modification of any aquatic habitat including creeks and wetlands in order to capture, treat and/or relocate any displaced fauna. • The proposed revegetation of the Subject Site and Project Area will involve the planting of species associated with the naturally occurring Coastal Shale-Sandstone Forest. Any additional landscaping should also comprise of species associated with Coastal Shale-Sandstone Forest. • As a precaution, prior to construction or clearing, an amphibian pre-clearing survey should be undertaken for *Pseudophryne australis* (Red-crowned Toadlet) and *Heleioporus australiacus* (Giant Burrowing Frog) to ensure no species is present with the water feature being impacted. • To avoid impacts to fauna, any nest box located on a tree to be removed must be relocated to another tree to be retained in the Project Area. Nest boxes should be moved under the

No.	Impact	Environmental safeguards & management measures
		supervision of a qualified Ecologist. If fauna are present, the attending ecologist should relocate the fauna back into translocated nest box or other appropriate habitat being retained on the site. • The following three (3) priority weeds were identified within the Subject Site: o *Asparagus aethiopicus (Asparagus Fern);* o *Lantana camara (Lantana); and* o *Olea europaea subsp. cuspidata (African Olive).* All priority weeds should be removed in accordance with the Biosecurity Act 2015 and NSW WeedWise (DPI 2022). Environmental weeds should be managed with best practice techniques to improve the condition of the native vegetation within the Subject Site. • If injured or abandoned fauna is found, WIRES or Sydney Wildlife Rescue should be contacted to hand over the animal for care, or the animal would be taken to the vet, whichever is the most appropriate option for the fauna species. • Equipment must not be used if there are any signs of fuel, oil or hydraulic leaks. Leaks must be repaired immediately, or the equipment must be removed from the site until it is repaired or replaced with a leak-free item. • Reschedule works during and after periods of heavy rainfall. • Chemicals and rubbish must not be stockpiled near native vegetation or the waterways. • No vegetation with signs of disease, pathogens or fungus should be planted on site.
9	Aboriginal Heritage	• In the unlikely event that during works any objects are discovered that are suspected to be Aboriginal objects, Heritage NSW must be notified under section 89A of the NPW Act. Appropriate management and avoidance or approval under a Section 90 AHIP should then be sought if Aboriginal objects are to be moved or harmed. • In the extremely unlikely event that human remains are found, works should immediately cease, and the NSW Police should be contacted. If the remains are suspected to be Aboriginal, Heritage NSW may also be contacted at this time to assist in determining appropriate management.

No.	Impact	Environmental safeguards & management measures
10	Non-Aboriginal Heritage	• Prior to works commencing, all staff, contractors and sub-contractors should undergo a heritage induction presented by a qualified heritage consultant. The induction must identify their statutory obligations for heritage under the Heritage Act 1977 in relation to built heritage and archaeological relics and associated procedures to follow. • In the unlikely event that during works any objects are discovered that are suspected to be non-Aboriginal objects, Heritage NSW must be notified. • In the extremely unlikely event that human remains are found, works should immediately cease, and the NSW Police should be contacted. • A Heritage Interpretation Plan is to be prepared for the site that presents both the Aboriginal and non-Aboriginal history and heritage of the place. Refer to the NSW Heritage Office, "Heritage Information Series: Interpreting Heritage Places and Items Guideline" to assist in preparing this document. The Plan should include traditional interpretation such as signage but also include interpretation related to any objects found at the site, as well as consideration of esoteric interpretation such as landscape treatments and art. This Plan must be physically implemented prior to the closure of the project.
11	Community Enquiries and Complaints	• A dedicated 'Community Liaison Officer' (Northern Beaches Council Project Manager or representative) should be contactable and available to respond to enquiries and address complaints or other issues during the works period. • Signage on the temporary perimeter fencing is to include the Community Liaison Officer contact details for any enquiries or complaints. • Surrounding properties are to be provided with a minimum of three (3) days notification (letterbox drop) prior to the commencement of works. • A Register to record complaints from local residents, businesses or other members of the community is to be prepared and maintained by the appointed 'Community Liaison Officer'.

8 Conclusion

8.1 Justification

The proposed works associated with the upgrade of Brick Pit Reserve have the potential to result in some minor and/or temporary environmental impacts with respect to tree removal and management, traffic and parking, noise and air quality, water quality, visual impacts and waste storage and disposal. Notwithstanding, the safeguards and management measures that are detailed in this Review of Environmental Factors will ameliorate or minimise these expected impacts.

The operational phase of the facilities at Brick Pit Reserve is not expected to result in any unacceptable environmental impacts with respect to traffic and parking and acoustics.

The proposal will also realise a number of positive impacts, including the provision of high quality public recreational facilities for the local and wider community, together with a significant improvement to the public safety, aesthetic quality, public domain amenity and legibility of Brick Pit Reserve. On balance the proposal is considered justified.

The environmental impacts of the proposal are not likely to be significant and therefore an Environmental Impact Statement (EIS) is not required for the proposal under Section 5.7 of the *Environmental Planning & Assessment Act 1979*. It is not likely to significantly affect threatened species, populations, ecological communities, or critical habitat and therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required. The proposal will not be likely to significantly impact on any matters of National environmental significance and referral to the Commonwealth Government is not required.

8.2 Objects of the Environmental Planning & Assessment Act, 1979

Decisions made under the *Environmental Planning & Assessment Act, 1979* must have regard to the objects of the Act, as set out in Section 1.3. The Objects are:

(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 proposed upgrade works at Brick Pit Reserve in Frenchs Forest are consistent with the Objects of the Act. In particular, the outcome following completion of the works represents the proper management of the public domain and promotes the social and economic welfare of the community by providing improved public recreational facilities at this location and encourages the use of the public open space for recreational pursuits, which in turn improves the value of the place.

8.3 Ecologically sustainable development

The National Strategy for Ecologically Sustainable Development (NSESD) has been formulated to ensure ESD is accounted for in all proposals. There are three core objectives:

- *Enhance the well-being and welfare of individuals and the community by following a path of economic development that safeguards the welfare of future generations;*
- *Provide for equity within and between generations;*
- *Protect biological diversity and maintain essential ecological processes and life-support systems.*

The *Environmental Planning & Assessment Act, 1979* acknowledges that ecologically sustainable development (ESD) should be considered in the assessment and approval of proposed development.

The proposed upgrade works at Brick Pit Reserve that are the subject of this REF have been assessed against the following four principles and programs of ecologically sustainable development (ESD) listed in the *Protection of the Environment Administration Act 1991*:

- *The precautionary principle;*
- *The principle of inter-generational equity;*
- *The principle of biological diversity and ecological integrity; and*
- *The principle of improved valuation, pricing and incentive mechanisms.*

A discussion on the degree to which the proposed works comply with these principles is provided below.

8.3.1 Precautionary principle

The precautionary principle states that:

> *if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*
>
> *In the application of the precautionary principle, public and private decisions should be guided by:*

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk weighted consequences of various options

A range of investigations have been undertaken in order to inform the preparation of this REF and to ensure that the potential environmental impacts are able to be understood with a high degree of certainty. The proposal is not likely to result in any substantial environmental impacts. Where the potential for environmental impacts has been identified, a range of safeguards and management measures have been recommended in order to minimise these adverse impacts. No management measures have been deferred due to a lack of scientific certainty. The proposal is therefore considered to be consistent with the precautionary principle.

8.3.2 Intergenerational equity

The principle of intergenerational equity states that:

the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The proposed upgrade works at Brick Pit Reserve and the ongoing public recreational use will not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for the future generations.

8.3.3 Conservation of biological diversity and ecological integrity

The principle of biological diversity and ecological integrity states that:

conservation of biological diversity and ecological integrity should be a fundamental consideration.

The proposed upgrade works at Brick Pit Reserve are unlikely to have a significant impact on biological diversity and ecological integrity. The proposed works are contained within a modified urban environment and the use of the Reserve for active and passive recreational pursuits will not impact on any endangered flora or fauna or threaten biological or ecological diversity.

8.3.4 Improved valuation, pricing and incentive mechanisms

The principle of improved valuation of environmental resources states that:

environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays – that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

The cost of environmental resources includes those costs that are incurred in order to protect the environment. In this way, any environmental safeguards that are imposed in order to minimise adverse impacts, result in economic costs to the construction and operation of the project. This indicates that the valuation of environmental resources has been assigned.

The implementation of appropriate safeguards and management measures (as recommended in this REF) where environmental impacts are expected will ensure that the proposed upgrade works at Brick Pit Reserve are undertaken with minimal impact on the environment.

8.4 Conclusion

The proposed works associated with the upgrade of Brick Pit Reserve at Frenchs Forest have been the subject of an assessment under Part 5 of the *Environmental Planning & Assessment Act 1979*. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity. The proposed works, as described in the REF, will meet the project objectives but will still result in some minor and/or temporary impacts during construction with respect to tree removal and protection, traffic and parking, noise and air quality, water quality, visual amenity and waste storage and disposal. Notwithstanding, the implementation and effective management of the safeguards and management measures that are detailed in this REF will ameliorate or minimise these expected impacts, such that they will have no more than a minor impact.

The operational phase of the public recreational facilities at Brick Pit Reserve is not expected to result in any unacceptable environmental impacts with respect to traffic and parking, visual impacts and acoustics.

The proposal will realise a number of positive impacts, including the provision of high quality public recreational facilities for the local and wider community, together with a significant improvement to the aesthetic quality, public domain amenity and legibility of Brick Pit Reserve.

On balance, the proposal is considered justified and may proceed subject to implementation of the recommended safeguards and management measures to mitigate or reduce potential environmental impacts identified in the REF.

The environmental impacts of the proposal are not likely to be significant and therefore an Environmental Impact Statement (EIS) is not required for the proposal under Section 5.7 of the *Environmental Planning & Assessment Act 1979*. It is not likely to significantly affect threatened species, populations, ecological communities, or critical habitat and therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required. The proposal will not be likely to significantly impact on any matters of National environmental significance and referral to the Commonwealth Government is not required.

Having regard to the above, it is concluded that the proposal is not likely to significantly affect the environment within the meaning of Section 5.7 of the *Environmental Planning & Assessment Act 1979*.

9 Certification

This Review of Environmental Factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.

The Review of Environmental Factors identifies the likely impacts of the proposal on the environment and details the environmental safeguards and mitigation measures to be implemented to minimise the potential impact to the environment.

The assessment has concluded that the proposed works as described in this REF, including any proposed environmental safeguards and management measures, will not result in a significant effect on the environment.

The proposed activity will not have a substantial impact on any matters of National environmental significance and therefore, does not require referral to the Commonwealth Government under the EPBC Act.

Andrew Robinson MPIA
Director
Andrew Robinson Planning Services Pty Ltd
Date: 24 August 2023

Determining Authority Certification:

I certify that I have reviewed and endorsed the contents of this REF document and, to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under clause 170 of the EP&A Regulation, and the information it contains is neither false or misleading.

Decision Statement:

In this regard, based on the REF document and other documents appended to it:

- The proposed activity is not likely to have a significant impact on the environment and therefore an Environmental Impact Statement (EIS) is not required.

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

- The proposed activity may proceed as it will not result in a significant effect on the environment and will not have a substantial impact on any matters of National environmental significance and therefore, does not require referral to the Commonwealth Government under the EPBC Act.

- Mitigation measures are required to eliminate, minimise or manage environmental impacts and these are set out in Chapter 6 and summarised in tabular form in Chapter 7 of this REF.

Signature:

Name:

Position:

Date:

10 References

The following publications and documents have been used in the preparation of this REF:

AHIMS Web Services Search (Aboriginal Heritage), 2023, Brick Pit Reserve, Frenchs Forest *(with 200m buffer)*

Frenchs Forest 2041 Placed Strategy (DPIE 2021)

Northern Beaches Council – Hospital Precinct Structure Plan

Northern Beaches Council website *(www.northernbeaches.nsw.gov.au)*

Warringah Local Environmental Plan 2011

Appendix A

Consideration of clause 171(2) factors and matters of National environmental significance

Clause 171(2) Checklist

The factors that need to be taken into consideration when reviewing the likely environmental impact of a proposed activity are listed in clause 171(2) of the *Environmental Planning and Assessment Regulation 2021.* The table below provides a summary of the consideration of these factors.

Factor	Impact
a. The environmental impact on the community? Minor environmental impacts may occur during the works period. Notwithstanding, any impacts would be minimised through the implementation of the safeguards described in Table 7-1.	Short term: Negligible
b. The transformation of the locality? The proposed works at Brick Pit Reserve will provide improvements and landscape/public domain embellishment works to this public reserve that will benefit the local and wider community and will provide a substantial improvement to the quality, useability and accessibility of the Reserve.	Long term: Positive
c. The environmental impact on the ecosystems of the locality? The proposed works at Brick Pit Reserve will not have an unreasonable impact on any ecosystems in the locality.	Nil
d. Reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality? The works at Brick Pit Reserve will significantly improve the recreational value and scenic quality of the Reserve to benefit the local and wider community.	Short Term: Minor Long Term: Positive
e. The effects on any locality, place or building that has – ***(i) aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or*** ***(ii) other special value for present or future generations?*** Despite its value as a former brick pit, the land on which Brick Pit Reserve is located is not of statutory heritage significance and there is no evidence to suggest that the land is of particular archaeological, cultural, scientific or social significance.	Nil

Factor	Impact
f. The impact on the habitat of protected animals (within the meaning of the Biodiversity Conservation Act 2016)? Brick Pit Reserve is in an urban environment that has been highly modified and is not known to provide specific habitat for any protected or critically endangered fauna.	Nil
g. The endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? Brick Pit Reserve is in an urban environment that has been highly modified and is not known to provide specific habitat for any endangered fauna.	Nil
h. Long-term effects on the environment? The proposal will not result in any substantial long-term adverse effects on the environment.	Negligible
i. Degradation of the quality of the environment? The works will not result in any degradation of the quality of the environment.	Nil
j. Risk to the safety of the environment? Provided that the proposed works are carried out in accordance with the methodologies and safeguards and management measures detailed in this REF, they will not generate any significant risk to the safety of the environment.	Nil
k. Reduction in the range of beneficial uses of the environment? There will be no reduction in the range of beneficial uses of the environment as a result of the proposal.	Nil
l. Pollution of the environment? There is the potential for some minor noise, air and water pollution during the works. However, due to the relatively short term nature of the works, these impacts are considered to be negligible and can be suitably ameliorated through appropriate site and environmental management measures.	Short term: Negative

Factor	Impact
m. Environmental problems associated with the disposal of waste? The proposed works will not generate a substantial quantity of waste. However, all waste will need to be appropriately stored, sorted and disposed of / recycled. Where possible, waste material is to be reused / recycled. All waste that is not able to be reused or recycled will need to be collected and disposed of at a licenced waste facility.	Negligible
n. Increased demands on natural or other resources that are, or are likely to become, in short supply? The proposed works will not place an undue demand on resources that are, or are likely to become, in short supply.	Nil
o. The cumulative environmental effect with other existing or likely future activities? There will be no cumulative impacts or environmental effects and the proposed works will realise a generally positive impact on the locality and will deliver a significant public benefit through the provision of upgraded public recreational facilities at Brick Pit Reserve.	Nil
p. The impact on coastal processes and coastal hazards, including those under projected climate change conditions? Brick Pit Reserve is not in a coastal area and is not subject to coastal processes or hazards.	Nil

Factor	Impact
q. Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1? As described earlier, the upgrade of Brick Pit Reserve aligns with Frenchs Forest 2041 Place Strategy that seeks the creation of diverse, sustainable and accessible areas of open space within proximity of the new Town Centre, as well as the creation of a new neighbourhood centre on Bantry Bay Road to assist with the activation of Brick Pit Reserve. The proposed upgrade works at Brick Pit Reserve Park are consistent with the Northern Beaches Council Local Strategic Planning Statement – Towards 2040 (LSPS) March 2020 and will enhance the recreational benefits and scenic character of the Reserve commensurate with Planning Priorities 5 and 6 that seek to provide greener urban environments and high quality open space for recreation. The LSPS aims to help deliver the vision set under the Greater Sydney Region Plan, A Metropolis of Three Cities and the North District Plan to reinforce the role that the Northern Beaches four strategic centres, including Frenchs Forest play in the greater metropolitan area and builds on the Northern Beaches strengths as a focus of economic activity, essential services, natural assets, culture and creativity. As such, the proposed upgrade works to Brick Pit Reserve are also considered to be consistent with the vision and intent of these regional and district strategic plans.	Nil
r. Other relevant environmental factors? There are no other relevant environmental factors that require consideration.	Nil

Matters of National environmental significance

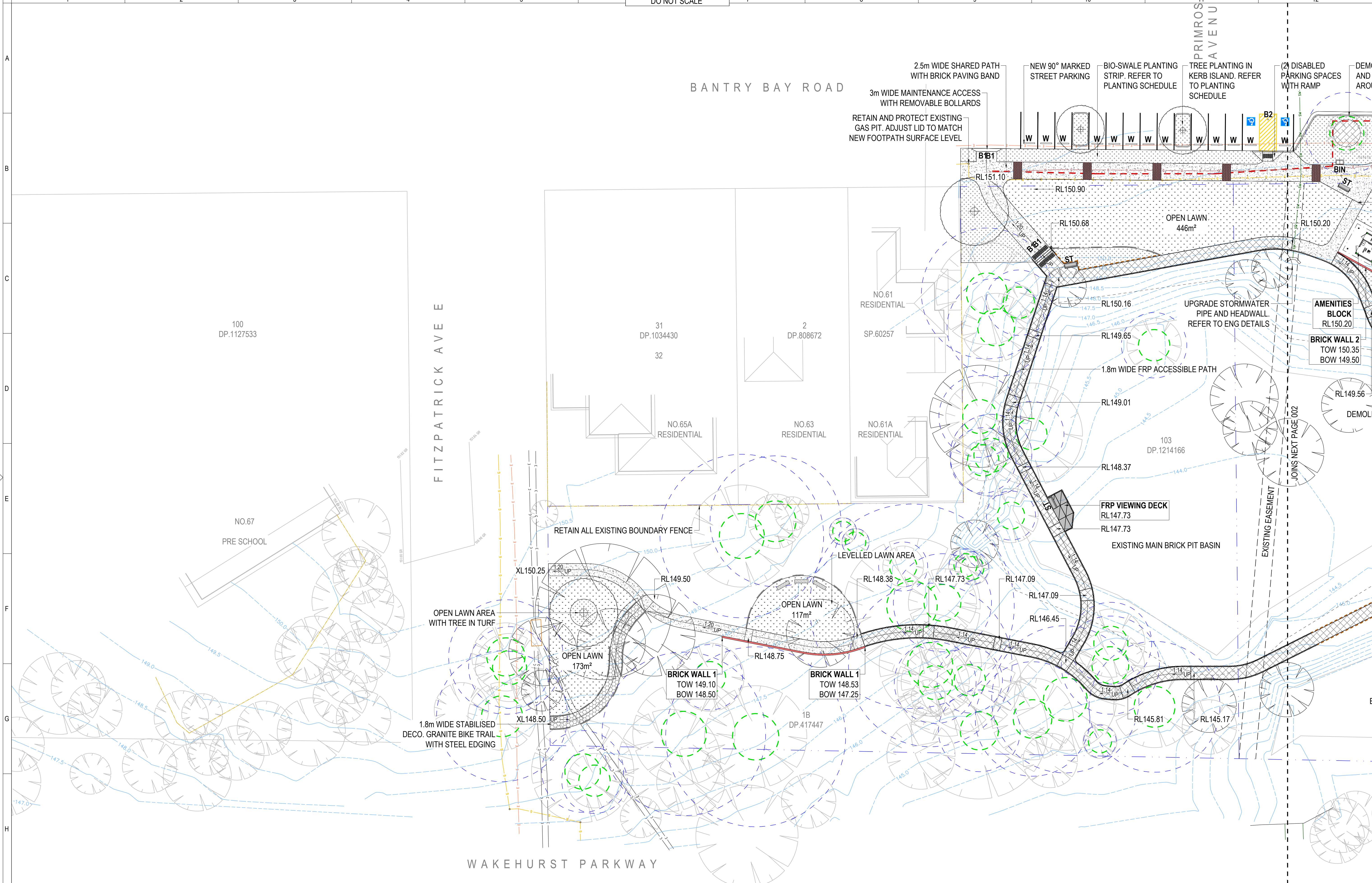
Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following matters of National environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of Agriculture, Water and the Environment.

Factor	Impact
a. Any impact on a World Heritage property? The proposal will not have an impact on a World Heritage property.	Nil
b. Any impact on a National Heritage place? The proposal will not have an impact on a National Heritage place.	Nil
c. Any impact on a wetland of international importance? The proposal will not have an impact on a wetland of international importance.	Nil
d. Any impact on a listed threatened species or communities? The proposal will not have an impact on a threatened species or community.	Nil
e. Any impacts on listed migratory species? The proposal will not have an impact on a listed migratory species.	Nil
f. Any impact on a Commonwealth marine area? The proposal will not have an impact on a Commonwealth marine area.	Nil
g. Does the proposal involve a nuclear action (including uranium mining)? The proposal does not involve a nuclear action.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land? The proposal will not have an impact (either direct or indirect) on Commonwealth Land.	Nil

Appendix B

70% Detailed Design – General Arrangement Plans

DO NOT SCALE



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Design Check: EM
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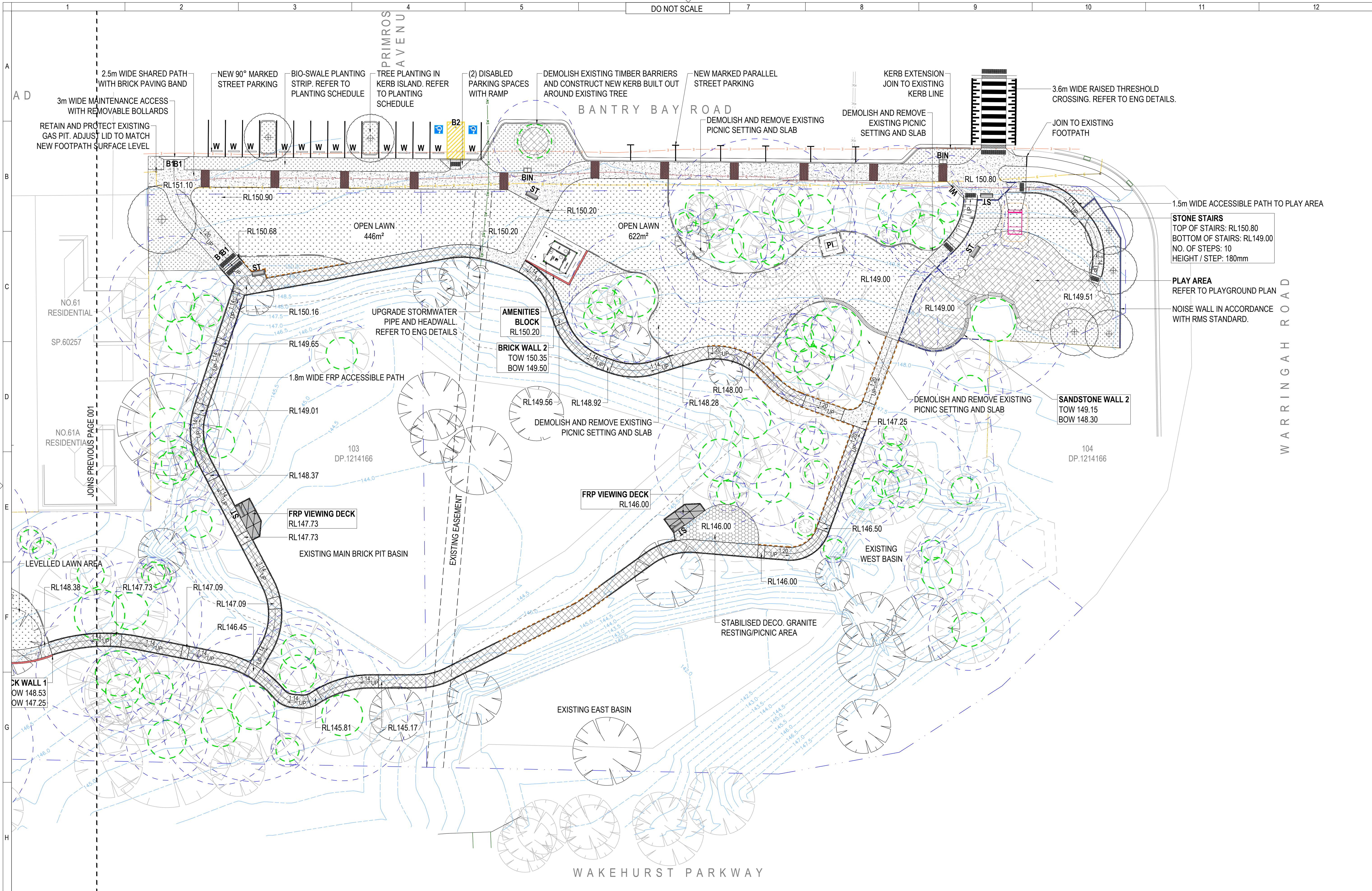
Client and Job: Northern Beaches Council
Detailed Design Services for Frenchs Forest Town Centre Park Upgrades

Title: BRICK PIT RESERVE
General Arrangement Plan

Dwg No: 3544-BP-GA-001
Sheet: 01 OF 02
Size: A1
Rev: C



No.	Revision - Revise on CAD do not amend by hand	Checked	Approved	Date
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B	50% DETAILED DESIGN - REVISED	SS	EM	05/06/23
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Client and Job: Northern Beaches Council
Detailed Design Services for Frenchs Forest Town Centre Park Upgrades

Title: BRICK PIT RESERVE
General Arrangement Plan

Dwg No: 3544-BP-GA-002 — Sheet: 02 OF 02 — Size: A1 — Rev: C

Appendix C

Flora and Fauna Assessment

Flora and Fauna Assessment Report

Brick Pit Reserve

Report prepared by Narla Environmental Pty Ltd

for Complete Urban on behalf of Northern Beaches Council

July 2023

NARLA
environmental

Report:	Flora and Fauna Assessment Report – Brick Pit Reserve
Prepared for:	Complete Urban on behalf of Northern Beaches Council
Prepared by:	Narla Environmental Pty Ltd
Project no:	COUR1
Date:	July 2023
Version:	Final v1.0

Narla Environmental Pty Ltd

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Report Certification

Works for this report were undertaken by:

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Document Control

Revision	Document Name	Issue Date	Internal Document Review
Draft v1.0	Flora and Fauna Assessment Report – Brick Pit Reserve	30/11/2022	Jonathan Coy
Draft v2.0	Flora and Fauna Assessment Report – Brick Pit Reserve	28/02/2023	Jonathan Coy
Final v1.0	Flora and Fauna Assessment Report – Brick Pit Reserve	26/07/2023	Jonathan Coy

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Glossary

Acronym/ Term	Definition
APZ	Asset Protection Zone
BAM	Biodiversity Assessment Method
BC Act	New South Wales Biodiversity Conservation Act 2016
Biodiversity values	The composition, structure, and function of ecosystems, including threatened species, populations and ecological communities, and their habitats
CEMP	Construction Environmental Management Plan
DA	Development Application
DCP	Warringah Development Control Plan 2010 (WDCP)
Development	The use of land, and the subdivision of land, and the carrying out of a work, and the demolition of a building or work, and the erection of a building, and any other act, matter or thing referred to in section 26 that is controlled by an environmental planning instrument but does not include any development of a class or description prescribed by the regulations for the purposes of this definition (EP&A Act 1979).
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment (now known as DPE)
EP&A Act	Environmental Planning & Assessment Act 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ha	Hectares
km	Kilometre
IPA	Inner Protection Area
LEP	Northern Beaches Local Environmental Plan 2013
LGA	Local Government Area
Locality	A 10km x 10km cell centred on the Project Area
m	metres
Native Vegetation	Any of the following types of plants native to New South Wales: (a) trees (including any sapling or shrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation) and (d) plants occurring in a wetland.
OEH	Office of Environment and Heritage (now known as the DPE)
SEPP	State Environmental Planning Policy
Project Area	Brick Pit Reserve, Frenchs Forest
Subject Site	The footprint of the proposed activity, including the APZ.
Threatened species, populations, and ecological communities	Species, populations, and ecological communities specified in Schedules 1 and 2 of the BC Act 2016.

1. Introduction

1.1 Project Background

Narla Environmental Pty Ltd (Narla) was commissioned by Complete Urban on behalf of the Northern Beaches Council (the proponent) to undertake a Flora and Fauna Assessment (FFA) for the proposed activity at Brick Pit Reserve (‘Project Area’; **Figure 1**)

The proposed activity aims to improve functionality and capacity for passive and active recreational open space and to restore natural areas within the reserve to provide the community with respite from increased urbanisation, and includes the following (together referred to as the Subject Site; **Figure 1**, **Appendix A**):

- Open space areas;
- Revegetation;
- Community Playground;
- New boardwalks;
- Picnic areas;
- Stormwater swale; and
- Concrete paths.

Narla have produced this report to assess any potential impacts associated with the proposed activity on terrestrial ecology (biodiversity), particularly threatened species, populations and ecological communities listed under the Biodiversity Conservation Act 2016 (BC Act). The report will also recommend appropriate measures to mitigate any potential impacts in line with all relevant State Environmental Planning Policies (SEPP) and local government plans, namely the Warringah Local Environmental Plan (WLEP) 2011 and Warringah Development Control Plan 2011 (WDCP).

1.2 Site Description and Location

The Project Area is located at Brick Pitt Reserve, a park situated within a suburban setting, covering an area of approximately 1.61ha within the Northern Beaches Local Government Area (LGA) and is bounded by Warringah Road to the north, Wakehurst Parkway to the east, Fitzpatrick Ave East to the south and Bantry Bay Road to the west. The Subject Site is approximately 0.6ha and is composed of remnant native vegetation, an exotic vegetated dam, exotic dominated vegetation and open recreation area.

1.2.1 Topography, Geology and Soil

The Subject Site ranges from 148m to 154m above sea level (asl; Google 2023) and is situated on the ‘Lucas Heights’ soil landscape as described in Soil Landscapes of the Sydney 1:100,000 Sheet map (Chapman et. al 2009). The Lucas Heights soil landscape is characterised by gently undulating crests and ridges on plateau surfaces of the Mittagong formation which is comprised of interbedded shale, laminate and fine to medium grained quartz sandstone. Local relief occurs to 30 m with slopes <10% and the absence of rock outcrops. The soils are moderately deep (50–150 cm), and comprised of hard setting Yellow Podzolic Soils and Yellow Soloths and Yellow Earths on outer edges. The Subject Site is not mapped as having any risk of acid sulfate soils.

1.2.2 Hydrology

No water features are mapped as occurring within the Project Area, however one (1) unmapped dam during the site assessment (**Figure 2**).

1.3 Scope of Assessment

The objectives of this FFA were to:

- Establish the likelihood of occurrence of migratory species, threatened species, endangered populations, and threatened ecological communities as listed under the New South Wales BC Act and/or the Commonwealth EPBC Act;
- Assess any potential impacts to species and/or communities listed under the BC Act and EPBC Act;
- Identify and map the distribution of vegetation communities within the Subject Site;
- Record the presence and extent of any known or potential fauna habitat features such as nests, dreys, caves, crevices, culverts, pools, soaks, flowering trees, fruiting trees, hollow-bearing trees and provide recommendations for on-going management of these habitat features and any fauna present;
- Record the presence and extent of any priority weeds or weed infestations and provide recommendations for on-going management; and
- Recommend any controls or additional actions to be taken to protect or improve environmental outcomes of the proposed activity.

1.4 Study Limitations

This study was not intended to provide a complete inventory of all flora and fauna species with potential to occur on the Subject Site. The timing of the survey may not have coincided with emergence times of some species of flora and fauna, such as seasonally flowering herbs, seasonal migratory fauna, or nocturnal fauna.

To account for those species that could not be identified during the field survey, detailed habitat assessments were combined with desktop research and local ecological knowledge to establish an accurate prediction of the potential for such species to occur on or adjacent to the Subject Site.

Figure 1. The components of the Proposed Activity

Figure 2. Waterfeatures within the Project Area

1.5 Relevant Legislation and Policy

The legislation and policy that are addressed in this report are listed in **Table 1.**

Table 1. Relevant legislation and policy addressed.

Legislation/ Policy	Relevant Ecological Feature on Site	Triggered	Action Required
Environmental Planning and Assessment Act 1979 (EP&A Act)	All threatened species, populations and ecological communities and their habitat that occur or are likely to occur on the Subject Property during a part of their lifecycle.	Yes	This FFA and all subsequent recommendations relevant to the planning process under 'Part 5 Development assessment and consent'.
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (Commonwealth)	No EPBC Act listed Endangered Ecological Communities occurs within the Subject Site. No EPBC Act listed species were identified within Subject Site. Other EPBC Act listed threatened species have the potential to occur within the Subject Site.	Yes	This FFA, particularly the likelihood tables for EPBC Act listed fauna and flora species occurring or potentially occurring within the Subject Site, as well as severity of potential impacts (**Table 6, Table 8**). An EPBC Assessment of Significant Impact was prepared for *Heleioporus australiacus* (Giant Burrowing Frog) and *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern)) due to potential breeding habitat (**Appendix F; Appendix G**).
New South Wales Biodiversity Conservation Act 2016 (BC Act)	No BC Act listed Endangered Ecological Communities (EEC) occurs within the Subject Site. No BC Act listed species were identified within Subject Site. Other BC Act listed threatened species have the potential to occur within the Subject Site.	Yes	This FFA, particularly the likelihood tables for threatened fauna and flora species occurring or potentially occurring within the Subject Site, as well as severity of potential impacts (**Table 6, Table 8**). A 5-part test of significance was prepared for *Heleioporus australiacus* (Giant Burrowing Frog), *Pseudophryne australis* (Red-crowned Toadlet) and *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern)) due to potential breeding habitat (**Appendix D; Appendix E**).
Biosecurity Act 2015 (Bio Act)	The following priority weeds were identified within the Subject Site: ▪ *Asparagus aethiopicus* (Asparagus Fern); ▪ *Lantana camara* (Lantana*);* and ▪ *Olea europaea* subsp. *cuspidata* (African Olive).	Yes	All priority weeds must be managed in accordance with the Biosecurity Act
State Environmental Planning Policy (Biodiversity and Conservation) 2021 – Chapter 4 Koala Habitat Protection 2021	This Chapter of the SEPP does not apply to Part 5 developments. Therefore, no action is required under this chapter.	No	None.

Legislation/ Policy	Relevant Ecological Feature on Site	Triggered	Action Required
State Environmental Planning Policy (Resilience and Hazards) 2021 - Chapter 2 Coastal Management	The Subject Site does not contain areas mapped as 'Coastal Wetlands,' 'Littoral Rainforest,' or proximity to either, therefore, Chapter 2 of this SEPP does not apply.	No	None

1.6 Biodiversity Assessment Pathway

Activities requiring an environmental assessment under Part 5 of the EP&A Act 1979 are to consider biodiversity as part of the environmental assessment process. The test of significance (under s.7.3 of the BC Act) determines whether the proposed activity is likely to significantly affect threatened species, ecological communities or their habitats.

If the activity is likely to have a significant impact, or will be carried out in a declared Area of Outstanding Biodiversity Value (AOBV), the proponent can opt in to the Biodiversity Offsets Scheme (BOS). The environmental impact of activities that will not have a significant impact on threatened species will continue to be assessed under Section 5.5 of the Environmental Planning and Assessment Act 1979.

1.7 Warringah Local Environment Plan (LEP) 2011

1.7.1 Zoning

The Project Area is zoned under 'RE1: Public Recreation'. The Northern Beaches LEP requires that the development satisfies the zone objectives, which are:

- Zone RE1: Public Recreation
    - To enable land to be used for public open space or recreational purposes.
    - To provide a range of recreational settings and activities and compatible land uses.
    - To protect and enhance the natural environment for recreational purposes.
    - To protect, manage and restore public land that is of ecological, scientific, cultural or aesthetic value.
    - To prevent development that could destroy, damage or otherwise have an adverse effect on those values.

1.8 Warringah Development Control Plan 2011 (WDCP)

1.8.1 Wildlife Corridors

Vegetation mapped as 'Wildlife Corridor' on the WDCP map occurs within the Subject Property and meets the DCP's definition of Prescribed Vegetation. The objectives of this clause are to:

- To preserve and enhance the area's amenity, whilst protecting human life and property;
- To improve air quality, prevent soil erosion, assist in improving water quality, carbon sequestration, storm water retention, energy conservation and noise reduction;
- To provide natural habitat for local wildlife, maintain natural shade profiles and provide psychological & social benefits;
- To retain and enhance native vegetation and the ecological functions of wildlife corridors;
- To reconstruct habitat in non-vegetated areas of wildlife corridors that will sustain the ecological function of a wildlife corridor and that, as far as possible, represents the combination of plant species and vegetation structure of the original 1750 community:

The proposed activity will see the removal of land mapped as Wildlife Corridor on the WDCP map however, the development is situated and designed to minimise the impact on prescribed vegetation, including remnant canopy trees, understorey vegetation, and ground cover species.

1.8.1 Native Vegetation

This control applies to land identified on DCP Map Native Vegetation. The objectives of this control are as follows:

- To preserve and enhance the area's amenity, whilst protecting human life and property.
- To improve air quality, prevent soil erosion, assist in improving water quality, carbon sequestration, storm water retention, energy conservation and noise reduction.
- To provide natural habitat for local wildlife, maintain natural shade profiles and provide psychological & social benefits.
- Promote the retention of native vegetation in parcels of a size, condition and configuration which will as far as possible enable local plant and animal communities to survive in the long term.
- To maintain the amount, local occurrence and diversity of native vegetation in the area

For modification of native vegetation where the area of land supporting the vegetation to be modified is greater than 100m2 or the land supporting the vegetation to be modified forms part of an allotment where vegetation has been modified in the last five years:

- The applicant must demonstrate that the objectives have been achieved through a Flora and Fauna Assessment prepared in accordance with Council guidelines; and
- The applicant must demonstrate that the objectives have been achieved through a Biodiversity Management Plan prepared in accordance with Council guidelines that will protect native vegetation on the subject property.

1.8.2 Threatened species, populations, ecological communities listed under State or Commonwealth legislation, or High Conservation Habitat

This control applies as part of the Subject Site is identified on DCP Map Threatened and High Conservation Habitat. The objectives of this control are:

- To protect and promote the recovery of threatened species, populations and endangered ecological communities.
- To protect and enhance the habitat of plants, animals and vegetation communities with high conservation significance.
- To preserve and enhance the area's amenity, whilst protecting human life and property.
- To improve air quality, prevent soil erosion, assist in improving water quality, carbon sequestration, storm water retention, energy conservation and noise reduction.
- To provide natural habitat for local wildlife, maintain natural shade profiles and provide psychological & social benefits.

The proposed activity seeks the enhance the vegetation onsite in the long-term. As a result it should increase the area's amenity, improve environmental quality and continue to provide natural habitat for local wildlife.

2. Methodology

2.1 Desktop Assessment and Literature Review

A thorough literature review of local information relevant to the Northern Beaches LGA was undertaken. Searches using NSW Wildlife Atlas (BioNet; DPE 2023d) and the Commonwealth Protected Matters Search Tool (DCCEEW 2023) were conducted to identify all current threatened flora and fauna, as well as migratory fauna records within a 10km x 10km cell centred on the Project Area. These data were used to assist in establishing the presence or likelihood of any ecological values as occurring on or adjacent to the Project Area and helped inform our Ecologist on what to look for during the site assessment.

Soil landscape and geological mapping was examined to gain a deeper understanding of the geology of the Subject Site that assists in determining whether any threatened flora or ecological communities may occur (Chapman et. al, 2009).

2.2 Ecological Site Assessment

2.2.1 General Survey

A site assessment was undertaken by Narla Ecologists Brodie Miller and Elly Baker on the 19th October 2022. During the site assessment, the following activities were undertaken:

- Identifying and recording the vegetation communities within the Subject Site, with focus on identifying any threatened ecological communities (TECs);
- Recording a detailed list of flora species encountered within the Subject Site, with a focus on threatened species, species diagnostic of threatened ecological communities and priority weeds;
- Recording opportunistic sightings of any fauna species seen or heard on or within the immediate surrounds of the Subject Site;
- Targeted surveys for threatened flora;
- Identifying and recording the locations of notable fauna habitat such as important nesting, roosting or foraging microhabitats;
- Targeting the habitat of any threatened and regionally significant fauna including:
    - Tree hollows (habitat for threatened large forest owls, parrots, and arboreal mammals);
    - Caves and crevices (habitat for threatened reptiles, small mammals, and microbats);
    - Termite mounds (habitat for threatened reptiles);
    - Soaks (habitat for threatened frogs);
    - Wetlands (habitat for threatened fish, frogs, and water birds);
    - Drainage lines (habitat for threatened fish and frogs);
    - Fruiting trees (food for threatened frugivorous birds and mammals);
    - Flowering trees (food for threatened nectarivorous mammals and birds);
    - Trees and shrubs supporting nest structures (habitat for threatened birds and arboreal mammals); and
    - Any other habitat features that may support fauna (particularly threatened) species.
- Assessing the connectivity and quality of the vegetation within the Subject Site and surrounding area.

2.2.2 Weather Conditions

Weather conditions recorded at the nearest weather station prior to and during the general flora and fauna survey period are provided in **Table 2** (BOM 2022). This data reveals minor rainfall and mild temperatures leading up to the survey, which is may be conducive to the emergence/flowering of threatened species that could potentially occur within the Subject Site.

Table 2. Weather conditions recorded at Terrey Hills AWS (station 066059) preceding and during the survey periods (survey dates in bold).

Survey date	Day	Minimum Temp. (°C)	Maximum Temp. (°C)	Rainfall (mm)
11-Oct-22	We	10.6	19.1	0
12-Oct-22	Th	14.1	19.4	0.2
13-Oct-22	Fr	15.1	23.1	0.4
14-Oct-22	Sa	11.5	20.7	1.4
15-Oct-22	Su	13.8	20.5	0
16-Oct-22	Mo	13.2	17.9	4.0
17-Oct-22	Tu	13.1	17.5	2.6
18-Oct-22	We	15.4	23.8	0.4

2.3 Mapping and Analysis of Vegetation Communities

Narla examined local satellite imagery, geological mapping, soil landscape mapping and topographic mapping, in addition to existing vegetation mapping (OEH 2016a) in order to stratify the Subject Site and guide the site assessment survey efforts. The following resources were consulted during the site assessment to assist with the identification of vegetation communities present within the Subject Site:

- eSPADE v2.2 (DPE 2023e);
- Soil Landscapes of the Sydney 1:100,000 Sheet (Chapman et al 2009);
- The Native Vegetation of the Sydney Metropolitan Area - Version 3.1, VIS_ID 4489 (OEH 2016a); and
- The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles (OEH 2016b).

2.4 Impact Assessment

Locally occurring threatened species (as per DPE 2023d) were assessed for their potential to occur within the Subject Site (Table 6; Table 8). It was then determined whether a further impact assessment (test of significance; 5-part test) was required.

A 5-part test of significance was prepared for *Heleioporus australiacus* (Giant Burrowing Frog), *Pseudophryne australis* (Red-crowned Toadlet) and *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern)) due to potential breeding habitat (Appendix D; Appendix E). An EPBC Assessment of Significant Impact was prepared for *Heleioporus australiacus* (Giant Burrowing Frog) and *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern)) due to potential breeding habitat (Appendix F; Appendix G).

3. Native Vegetation

3.1 Vegetation Community

3.1.1 Historically Mapped Vegetation Communities

Historical vegetation mapping identified the following vegetation community within the Project Area (OEH 2016a; Figure 3):

- Coastal shale-sandstone forest

3.1.2 Field Validated Vegetation Communities

Field survey conducted by the Narla Ecologists identified three (3) vegetation communities within the Subject Site (Figure 4):

- Coastal shale-sandstone forest
- Urban Exotic/Native Vegetation
- Exotic Vegetated dam

The vegetation zones are detailed in Table 3 and Table 4.

Figure 3. Historically mapped vegetation communities (OEH 2016a)

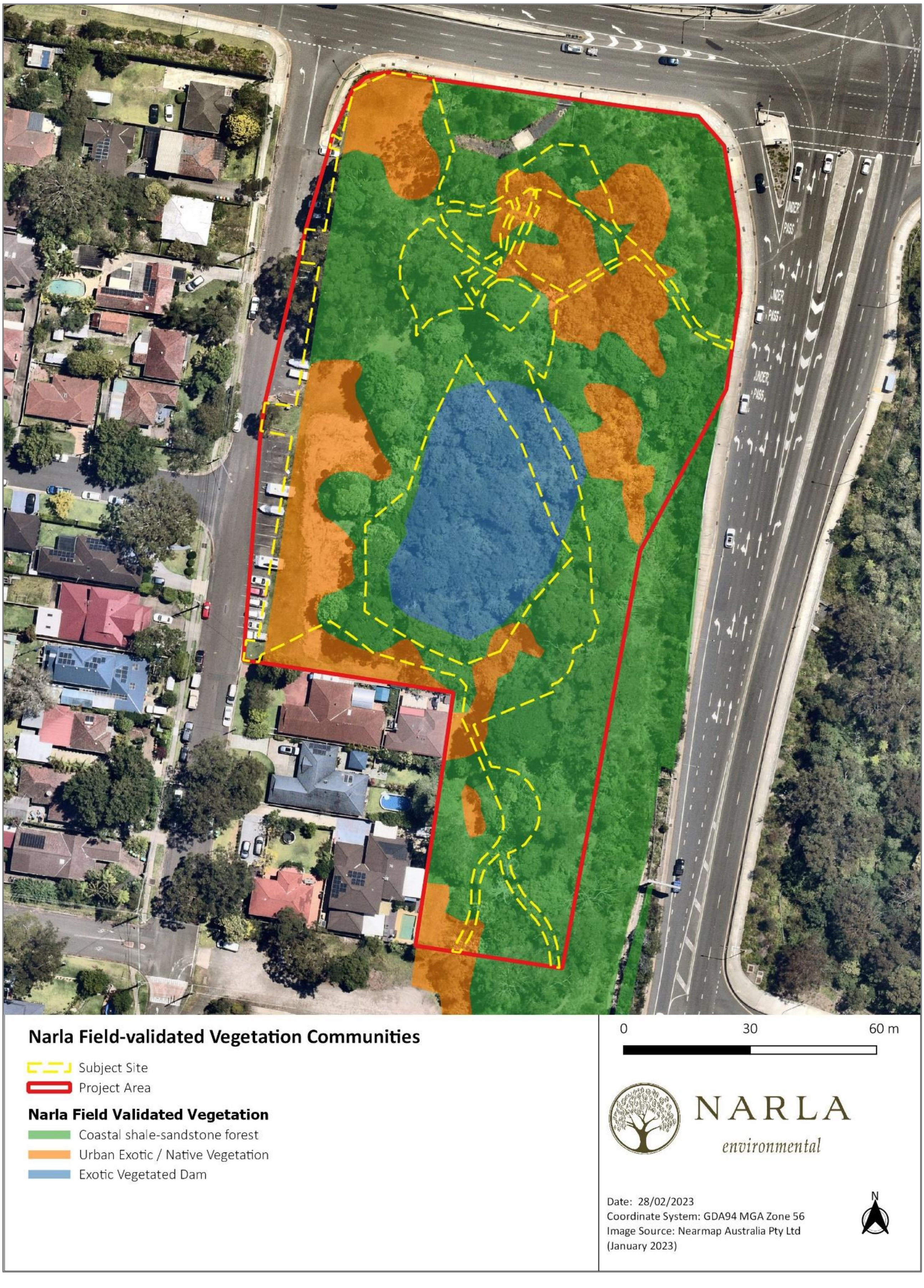

Figure 4. Narla field-validated vegetation communities within the Project Area.

Table 3. Coastal shale-sandstone forest identified within the Subject Site

Coastal shale-sandstone forest	
	
Extent within the Subject Site (approx.)	0.35ha
Extent within the Project Area (approx.)	0.93ha
Description (OEH, 2016)	
Coastal Shale-Sandstone Forest is often a tall open eucalypt forest with a sparse layer of dry sclerophyllous shrubs and a grassy ground cover. It occurs on clay-influenced soils associated with residual shale or lateritic capping, shale bands in the sandstone bedrock or downslope shale wash on exposed sandstone slopes. The eucalypts that occur consistently are tall Red Bloodwood (*Corymbia gummifera*) and Smooth-barked Apple (*Angophora costata*), but it is the local abundance of Blackbutt (*Eucalyptus pilularis*), Turpentine (*Syncarpia glomulifera*) and Mahogany (*Eucalyptus resinifera, E. umbra*) that make the forest distinctive from the surrounding sandstone woodlands. A tall sparse layer of Casuarinas (*Allocasuarina littoralis*) is found above an open layer of dry shrubs including banksias, wattles, hakeas and geebungs. A diverse combination of grasses, rushes and herbs provide a continuous ground cover. In some areas the forest may form a low open woodland comprising Smooth-barked Apple, Brown Stringybark (*Eucalyptus capitellata*) and Scribbly Gum (*Eucalyptus racemosa*) amongst other species. A thin layer of clay soil is sufficient to retain the grassy ground covers that help to distinguish the community. Coastal Shale-Sandstone Forest is found in areas that receive an average of more than 900 millimeteres of rainfall per annum and are between two and 372 metres above sea level.	

Coastal shale-sandstone forest	
Description of the Vegetation in the Subject Site	
This zone is dominated by native vegetation however has exotic species present in the mid and ground layer. The terrain is mostly flat. The canopy contained a mix of native Eucalyptus species, including *Eucalyptus piluaris, E. saligna* and *E. piperita*. Other canopy species include *Angophora costata*, *Syncarpia glomulifera* and *Corymbia gummifera*. The exotic *Pinus radiata* was present near homes on the western side of the site. The mid-layer had a high prescence of *Acacia* species. Acacias include *Acacia floribunda*, *A. linifolia*, *A. longifolia* and *A. ulicifolia*. A tall sparse layer of *Allocasuarina littoralis* was present closer to the wetlands. Other native species in the mid layer include but are not limited to *Breynia oblongifolia*, *Melaleuca stypheloides, Banksia serrata, B. aemula, Callicoma serratifolia Cyathea cooperi, Kunzea ambigua, Westringia fruticosus* and *Persoonia pinifolia*. Exotic species in the mid layer include *Ligustrum lucidum, L. sinense,* and *Lantana camara*. Native species in the ground layer include but are not limited to *Dianella caerula, Entolasia marginata, E. stricta, Gahnia aspera, G. sieberiana, Hardenbergia violaceae, Hibbertia scandens, Microlaena stipoides, Lomandra longifolia* and *Pteridium esculentum.* Limited exotic weed cover was present in these zones, however some populations of *Erhata erecta, Araujia sericifera, Hedera helix, Lonicera japonica* and *Nephrolepsis cordifolia* were present.	
Justification of Vegetation Assignment	The determination of this community was based on the geographical region, landscape attributes including soil landscapes and elevation, and the presence of diagnostic species (representing each stratum).
BC Act 2016 Status	N/A. Some stands of this forest have been described as a variant of Duffys Forest Ecological Community, an Endangered Ecological Community under the NSW BC Act. However, the species list in the determination for that Endangered Ecological Community (EEC) does not encompass characteristic species that occur in this community (OEH 2016b). Therefore Coastal Shale-Sandstone Forest is not considered to be a component of that EEC.
EPBC Act 1999 Status	N/A
References	Office of Environment and Heritage (OEH) (2016b) The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles. Version 3.0, Department of Premier and Cabinet, Sydney.

Table 4. Exotic Vegetation identified within the Subject Site

Urban Exotic/Native Vegetation	
	
Extent within the Subject Site (approx.)	0.19ha
Extent within the Project Area (approx.)	0.38ha
Description of the Vegetation in the Subject Site	
This zone contains primarily exotic vegetation and a mostly flat terrain. Informal paths have been formed by mountain bikes in some areas, leading to bare soil and large levels of erosion. This zone is dominated by *Ligustrum lucidum, L. sinense* and *Lantana camara*, all existing as a tall mid-layer to canopy. However, some sections of this zone present as lawns, containing species such as *Cenchrus clandestinus* and *Stenotaphrum secundatum*. Other exotic species in the mid-layer include *Ochna serrulata*, *Olea europea* sub. *cuspidata* and *Polygala myrtifolia*. Native species in the mid-layer include *Acacia* spp. seedlings, *Callicoma serratifolia, Glochidion ferdinandi, Pittosporum undulatum* and *Cyathea cooperi*. Exotic species in the ground layer include but are not limited to *Araujia sericifera, Asparagus aethiopicus, Ipomea indica, Nephrolepsis cordifolia, Plantago lancelota, Tradescantia fluminensis* and *Hedichyum spp.* Native species in the ground layer include *Dichondra repens, Entolasia stricta, Microlaena stipoides* and *Oplismenus spp.*	
Justification of Vegetation Assignment	The vegetation within this area consisted of exotic vegetation with minimal native species. As the vegetation could not be classified as a native community it has been classified as Urban Exotic / Native..
BC Act 2016 Status	N/A
EPBC Act 1999 Status	N/A

Table 5. Exotic Vegetated Dam present within the Subject Site.

Exotic Vegetated Dam	
	
Extent within the Subject Site (approx.)	0.03ha
Extent within the Project Area (approx.)	0.2ha
Description of the Vegetation in the Subject Site	
This zone contains primarily exotic vegetation contained within a wetland/dam. This zone is dominated by *Cyperus papyrus* and *Zantedeschia aethiopica,* however other exotic species such as *Senna pendula* var. *glabrata* and *Rumex crispus* are present throughout the dam. Exotic species in the ground layer around the periphery of the dam include *Cyperus alternifolius, Erhata erecta, Nephrolepsis cordifolia, Plantago lancelota* and *Tradescantia fluminensis*. Native species in the ground layer around the periphery of the dam include *Dichondra repens, Entolasia stricta, Microlaena stipoides, Centella asiatica* and *Oplismenus spp*.	
Justification of Vegetation Assignment	The vegetation within this area consisted of exotic vegetation with minimal native species. As the vegetation could not be classified as a native community it has been classified as an Exotic Vegetated Dam
BC Act 2016 Status	N/A
EPBC Act 1999 Status	N/A

4. Threatened Entities

4.1 Threatened Ecological Communities (TECs)

The vegetation within the Subject Land does not conform to any TEC. Some stands of this forest have been described as a variant of Duffys Forest Ecological Community, an Endangered Ecological Community under the NSW BC Act. However, the species list in the determination for that Endangered Ecological Community (EEC) does not encompass characteristic species that occur in this community. Therefore Coastal Shale-Sandstone Forest is not considered to be a component of that EEC (OEH 2016b).

4.2 Threatened Flora

Desktop analysis revealed several threatened flora species as occurring within a 10km x 10km cell centred on the Project Area. These species were assessed for their potential to occur within the Subject Site (**Table 6**). Where possible, targeted surveys were undertaken throughout the Subject Site for potentially occurring threatened flora species although none were found within the Subject Site during the site assessment. The survey effort for this assessment is presented in **Figure 5**.

It was determined that the proposed activity is unlikely to have a significant impact on threatened species. Therefore, no further assessment of impacts pursuant to the BC Act (e.g., Biodiversity Development Assessment Report (BDAR)) and/or EPBC Act Referral to Commonwealth will be required.

Table 6. Likelihood of occurrence of threatened flora species within the Subject Site (V=Vulnerable; E=Endangered; CE=Critically Endangered)

Species	BC Act	EPBC Act	Likelihood of occurrence within the Subject Site	Further Impact Assessment Required?
Acacia bynoeana (Bynoe's Wattle)	E	V	Absent. Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple. Unlikely to occur within the Subject Site due to presence of shale-laminate soils and the lack of diagnostic canopy species. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Acacia terminalis subsp. Eastern Sydney (Sunshine wattle)	E	E	Low. Occurs in coastal scrub and dry sclerophyll woodland on sandy soils. However, it has a very limited distribution, mainly in near-coastal areas from the northern shores of Sydney Harbour south to Botany Bay, with most records from the Port Jackson area and the eastern suburbs of Sydney. Recorded from North Head, Middle Head, Dover Heights, Parsely Bay, Nielsen Park, Cooper Park, Chifley, Watsons Bays, Wollstonecraft and Waverley. As the Subject Site is outside of this distribution it is unlikely to occur one the Subject Site.	No

Species	BC Act	EPBC Act	Likelihood of occurrence within the Subject Site	Further Impact Assessment Required?
Caladenia tessellata (Thick Lip Spider Orchid)	E	V	Absent. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. The Subject Site does not contain clay loam, making it unlikely this species would occur. The Subject Site does contain sandstone; however, a targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Callistemon linearifolius (Netted Bottle Brush)	V	-	Absent. Grows in dry sclerophyll forest on the coast and adjacent ranges. The species was more widespread in the past, however there are currently only 5-6 populations remaining from the 22 populations historically recorded in the Sydney area. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Chamaesyce psammogeton (Sand Spurge)	E	-	Absent. Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (*Spinifex sericeus*) and Prickly Couch (*Zoysia macrantha*). The Subject Site does not contain such habitat. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Darwinia biflora	V	V	Absent. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated overstorey species include *Eucalyptus haemastoma*, *Corymbia gummifera* and/or *E. squamosa*. The vegetation structure is usually woodland, open forest or scrub-heath. Whilst some of the associated overstory species are present, the Subject Site does not occur on a ridge thus making this species unlikely to occur. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Epacris purpurascens var. *purpurascens*	V		Absent. Found in a range of habitat types, most of which have a strong shale soil influence. Lifespan is recorded to be 5-20 years, requiring 2-4 years before seed is produced in the wild. Killed by fire and re-establishes from soil-stored seed. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Eucalyptus camfieldii (Camfield's Stringybark)	V	V	Absent. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of *Eucalyptus oblonga, E. capitellata* and *E. haemastoma*. The Subject Site does not contain heaths nor the associated species, making this species unlikely to occur. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Grevillea caleyi (Caley's Grevillea)	E	CE	Absent. All sites occur on the ridgetop between elevations of 170 to 240m asl, in association with laterite soils and a vegetation community of open forest, generally dominated by	No

Species	BC Act	EPBC Act	Likelihood of occurrence within the Subject Site	Further Impact Assessment Required?
			Eucalyptus sieberi and *Corymbia gummifera*. Commonly found in the endangered Duffys Forest ecological community. The Subject Site does not occur at the minimum elevation nor a ridgetop, making this species unlikely to occur. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	
Haloragodendron lucasii	E	E	Absent. Reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Associated with dry sclerophyll forest with high soil moisture and relatively high soil-phosphorus levels. The Subject Site does not contain sandy loam nor does it occur below cliff lines, making this species unlikely to occur. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Hibbertia puberula	E		Absent. Habitats are typically dry sclerophyll woodland communities, although heaths are also occupied. One of the recently (2012) described subspecies also favours upland swamps. Occurs on sandy soil often associated with sandstone, or on clay. The Subject Site does not contain clay or heaths, making this species unlikely to occur. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Hibbertia superans	E		Absent. The species occurs on sandstone ridgetops often near the shale/sandstone boundary. The Subject Site does not occur on ridgetops, making this species unlikely to occur. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Lasiopetalum joyceae	V	V	Absent. This species has broad habitat requirements, but grows in heath on sandstone. The Subject Site does not contain heath, making this species unlikely to occur. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Leptospermum deanei	V	V	Low. Woodland on lower hill slopes or near creeks. Sandy alluvial soil or sand over sandstone. The Subject Site does not occur on lower hill slopes or near a creek, making this species unlikely to occur. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Melaleuca deanei (Deane's Paperbark)	V	V	Absent. The species occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone. The Subject Site does not occur on ridgetops nor does it contain heath, making this species unlikely to occur. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Persoonia hirsuta (Hairy Geebung)	E	E	Absent. The Hairy Geebung is found in clayey and sandy soils in dry sclerophyll open forest, woodland and heath, primarily on	No

Species	BC Act	EPBC Act	Likelihood of occurrence within the Subject Site	Further Impact Assessment Required?
			the Mittagong Formation and on the upper Hawkesbury Sandstone. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	
Pimelea curviflora var. *curviflora*	V	V	Absent. The Hairy Geebung is found in clayey and sandy soils in dry sclerophyll open forest, woodland and heath, primarily on the Mittagong Formation and on the upper Hawkesbury Sandstone. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Prostanthera marifolia (Seaforth Mintbush)	E	CE	Absent. Located on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses, a soil type which only occurs on ridge tops and has been extensively urbanised. The Subject Site does not occur on ridgetops, making this species unlikely to occur. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No
Syzygium paniculatum (Magenta Lilly Pilly)	E	V	Low. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities. The Subject Site does not contain littoral rainforest communities.	No
Tetratheca glandulosa	V		Absent. Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gymea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Whilst the soil types are appropriate for this species, the Subject Site does not contain such topography. A targeted survey was undertaken within the approved survey period (DPE, 2022) and no specimens were found.	No

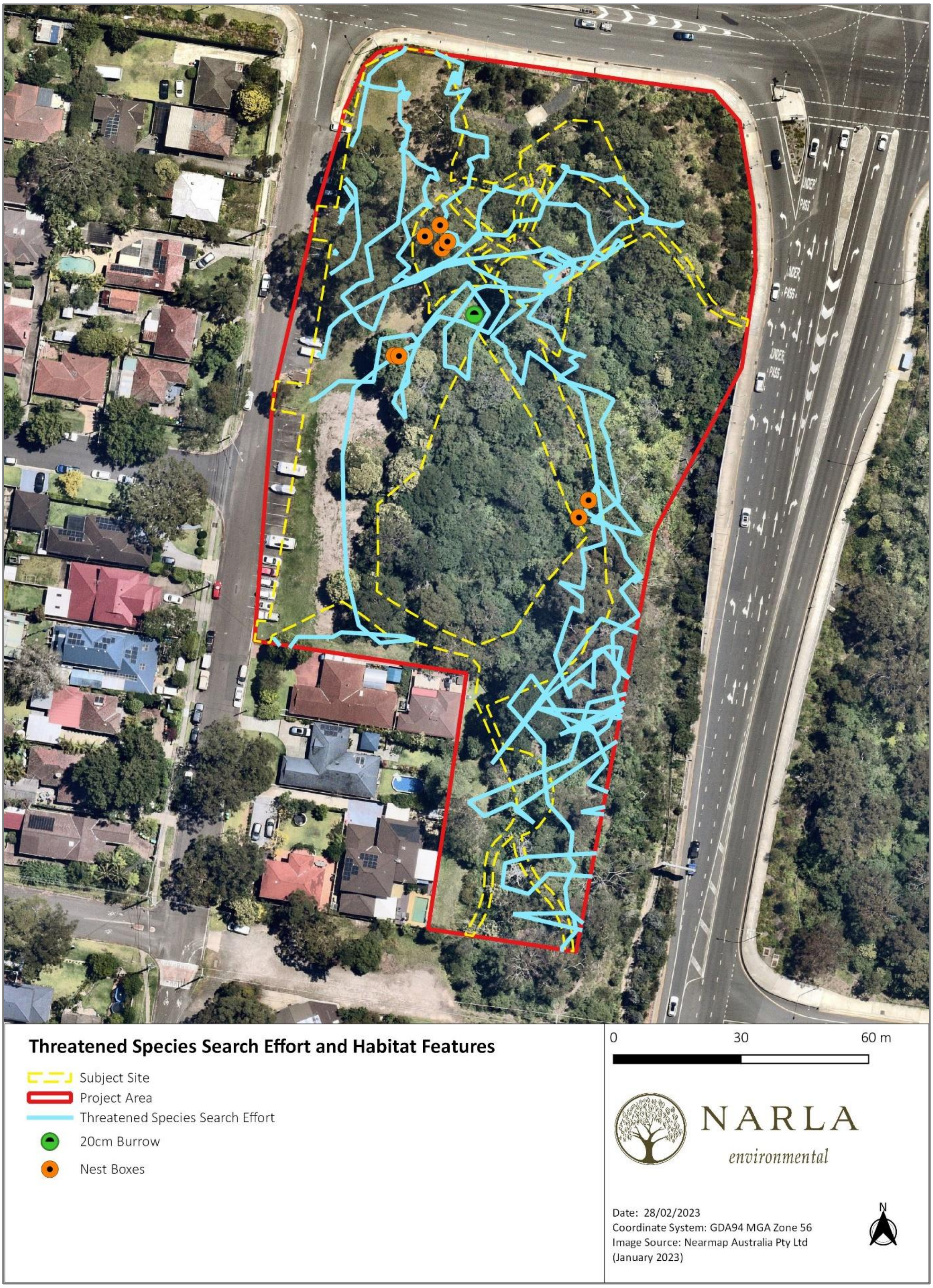

Figure 5. Threatened species search effort and habitat features identified with the Project Area.

4.3 Threatened Fauna

Several habitat features were present within the Subject Site (**Table 7**). Desktop analysis revealed that several threatened fauna species have the potential to utilise such habitat within the Subject Site during part of their lifecycles (**Table 8**). No threatened fauna species were observed within the Subject Site by the Narla Ecologist during the site assessment in October 2022.

A 5-part test of significance was prepared for *Heleioporus australiacus* (Giant Burrowing Frog), *Pseudophryne australis* (Red-crowned Toadlet) and *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern)) due to potential breeding habitat (**Appendix D; Appendix E**). An EPBC Assessment of Significant Impact was prepared for *Heleioporus australiacus* (Giant Burrowing Frog) and *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern)) due to potential breeding habitat (**Appendix F; Appendix G**).

It is unlikely that the proposed works will have a significant impact such that a local viable population or occurrence of any of the threatened fauna species will be placed at risk of extinction (**Table 8**). Therefore, no BDAR or EPBC Act Referral to Commonwealth is required for the proposed activity.

Table 7. Fauna habitat values.

Habitat component	Site values
Coarse woody debris	Absent.
Rock outcrops and bush rock	Absent.
Caves, crevices, and overhangs	Absent.
Culverts, bridges, mine shafts, or abandoned structures	Absent.
Nectar/lerp-bearing Trees	The Subject Site and surrounds contained numerous eucalypts and acacias. Such trees and shrubs may provide intermittent nectar and/or lerp sources for a suite of species.
Nectar-bearing shrubs	Present.
Koala Feed Trees	Present.
Large stick nests	Absent.
Sap and gum sources	Eucalypts were present within the Subject Site.
She-oak fruit (Glossy Black Cockatoo feed)	Present.
Seed-bearing trees and shrubs	Seed bearing trees such as Eucalypts may provide foraging habitat for Gang-gang Cockatoos.
Soft-fruit-bearing trees	Present.
Dense shrubbery and leaf litter	Present.
Tree hollows	Eight (8) installed nest boxes in lieu of hollows are present within the Subject Site.
Decorticating bark	Absent.
Wetlands, soaks, and streams	A dam is present in the Subject Site.

Habitat component	Site values
Open water bodies	Absent.
Estuarine, beach, mudflats, and rocky foreshores	Absent.

4.3.1 Migratory Fauna Species

Desktop analysis revealed following EPBC Act listed migratory terrestrial fauna species were considered to have the potential to utilise habitat within the Subject Site (e.g., foraging or passage) during part of their lifecycles:

- *Apus pacificus* (Fork-tailed Swift);
- *Hirundapus caudacutus* (White-throated Needletail);
- *Pluvialis squatarola* (Grey Plover);
- *Limosa lapponica* (Bar-tailed Godwit); and
- *Tringa nebularia* (Common Greenshank);

It was deemed that the proposed works will have no significant impact on these species. Therefore, no EPBC Act Referral to the Commonwealth is required.

Table 8. List of potential threatened fauna that may occupy the Subject Site at some stage of their lifecycles. Vulnerable = V, Endangered = E, Endangered Population = EP, Critically Endangered = CE.

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
Anthochaera phrygia (Regent Honeyeater)	CE	CE	Low	A generalist forager, although it feeds on the nectar from a small number of eucalypts that produce high volumes of nectar. Potential foraging habitat is present within the Subject Site.	This species breeds in temperate woodlands and riparian gallery forests in only three known locations: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra Barraba region. The Subject Site is not located within this region.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No impact to breeding habitat. Furthermore, the Subject Site is not mapped on the Regent Honeyeater Important Areas Map (DPE 2022c).	No
Artamus cyanopterus cyanopterus (Dusky Woodswallow)	V	-	Low	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and groundcover of grasses or sedges and fallen woody debris. Primarily eats invertebrates, insects, which are captured whilst hovering or sallying above the canopy or over water. Also frequently hovers, sallies and pounces under the canopy, primarily over leaf litter and dead timber, and occasionally take nectar, fruit, and seed. Potential	Nest is an open, cup-shape, made of twigs, grass, fibrous rootlets and occasionally casuarina needles, and may be lined with grass, rootlets or infrequently horsehair, occasionally unlined. Nest sites vary, but occur in shrubs or low trees, living or dead, horizontal, or upright forks in branches, spouts, hollow stumps, or logs, behind loose bark or in a hollow in the top of a wooden fence post. Nest sites may be exposed or well concealed by foliage. No nests were observed within the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				foraging habitat is present within the Subject Site.			
Callocephalon fimbriatum (Gang-gang Cockatoo)	V	E	Low	Occurs within a variety of forest and woodland types. Usually frequents forested areas with old growth attributes required for nesting and roosting purposes. Also utilises less heavily timbered woodlands and urban fringe areas to forage, but appears to favour well-timbered country through which it habitually flies as it moves about. Potential foraging habitat is present within the Subject Site.	Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10cm in diameter or larger and at least 9m above the ground in eucalypts. Nest boxes of this size are present within the Subject Site, however all nest boxes will be retained (**Section 6**).	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Calyptorhynchus lathami (Glossy Black-Cockatoo)	V	V	Low	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Potential foraging habitat is present within the Subject Site.	Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May. Nest boxes of this size in lieu of hollows were present within the Subject Site, however all nest boxes will be retained (**Section 6**).	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Cercartetus nanus (Eastern Pygmy-possum)	V	-	Low	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath	Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum dreys or thickets of vegetation, (e.g., grass-tree skirts). Nest boxes in lieu of	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				appear to be preferred. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes. Soft fruits are eaten when flowers are unavailable. Also feeds on insects throughout the year. Potential foraging habitat is present within the Subject Site.	hollows are present within the Subject Site, however all nest boxes will be retained (**Section 6**).	anticipated impact breeding on habitat.	
Chalinolobus dwyeri (Large-eared Pied Bat)	V	V	Low	The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. Potential foraging habitat is present within the Subject Site.	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. No caves are present within the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Daphoenositta chrysoptera (Varied Stilleta)	V	-	Low	Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees	Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				and small branches and twigs in the tree canopy. Potential foraging habitat is present within the Subject Site.	re-uses the same fork or tree in successive years. No nests were present within the Subject Site.	surrounding area. No anticipated impact breeding on habitat.	
Dasyurus maculatus (Spotted-tailed Quoll)	V	E	Low	Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits, reptiles, and insects. Also eats carrion and takes domestic fowl. Potential prey items may occur within the Subject Site.	This species uses hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. No suitable den sites were identified within the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Falsistrellus tasmaniensis (Eastern false pipistrelle)	V	-	Low	Hunts beetles, moths, weevils, and other flying insects above or just below the tree canopy. Potential foraging habitat is present within the Subject Site.	Roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Nest boxes in lieu of hollows are present within the Subject Site, however all nest boxes will be retained (**Section 6**).	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Glossopsitta pusilla (Little Lorikeet)	V	-	Low	This species forages primarily in the canopy of open Eucalypt forests and woodlands. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Potential foraging habitat is present within the Subject Site.	Nests in proximity to feeding areas, if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3 cm) and high above the ground (2–15 m). Nest boxes in lieu of hollows are present within the Subject Site, however all nest boxes will be retained (**Section 6**).	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
Haliaeetus leucogaster (White-bellied Sea-Eagle)	V	-	Low	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries, and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs, and saltmarsh. No such habitat was identified within the Subject Site.	Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nests are large structures built from sticks and lined with leaves or grass. No nests were identified within the Subject Site.	Negligible impact to foraging or breeding habitat	No
Heleioporus australiacus (Giant Burrowing Frog)	V	V	Low	Found in heath, woodland, and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. They eat invertebrates including ants, beetles, cockroaches, spiders, centipedes, and scorpions. Potential foraging habitat exists within the Subject Site.	When breeding, frogs will call from open spaces, under vegetation or rocks or from within burrows in the creek bank. A vegetated dam is present within the Subject Site, which may provide potential breeding habitat, albeit sub-optimal due to the urban nature of the site.	Low anticipated impact to potential foraging habitat given the urbanisation of the Subject Site. Low anticipated impact to potential foraging habitat given the urbanisation of the Subject Site. Although a wetland is proposed to be enhanced by the proposed activity, there will still be minor impacts to breeding habitat when it is established.	A 5-part test of significance has been prepared due to presence of a dam (**Appendix E**).
Hieraaetus morphnoides (Little Eagle)	V	-	Low	Occupies open eucalypt forest, woodland, or open woodland. She-oak or Acacia woodlands and riparian woodlands of	Nests in tall living trees within a remnant patch, where pairs build a large stick nest in	Minimal impact to foraging habitat given the mobility of the species and areas of	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				interior NSW are also used. Preys on birds, reptiles, and mammals, occasionally adding large insects and carrion. Potential prey items may occur within the Subject Site.	winter. No nests were identified within the Subject Site.	suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	
Isoodon obesulus obesulus (Southern Brown Bandicoot)	E	E	Low	They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruiting) fungi. Their searches for food often create distinctive conical holes in the soil. Potential foraging habitat is present within the Subject Site.	Nest during the day in a shallow depression in the ground covered by leaf litter, grass or other plant material. Nests may be located under Grass trees Xanthorrhoea spp., blackberry bushes and other shrubs, or in rabbit burrows. The upper surface of the nest may be mixed with earth to waterproof the inside of the nest. A burrow is present within the Subject Site, however it is sub-optimal due to the urban nature of the site.	Low anticipated impact to potential foraging habitat given the urbanisation of the Subject Site. Large areas of potential foraging habitat are proposed for retention and will continue to exist within the surrounding area. Minimal anticipated impact to breeding habitat and is unlikely to be utilised by this species given the fragmented nature of the site.	A 5-part test of significance has been prepared due to presence of a burrow (**Appendix D**).
Ixobrychus flavicollis (Black Bittern)	V	-	Low	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. Feeds on frogs, reptiles, fish and invertebrates, including snails, dragonflies,	Nests are built in spring. They are located on a branch overhanging water and consist of a bed of sticks and reeds on a base of larger sticks. No nests or suitable sites were observed within the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				shrimps and crayfish. Potential foraging habitat is present within the Subject Site.			
Lathamus discolor (Swift Parrot)	E	CE	Low	On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Potential foraging habitat present within the Subject Site.	Breeds in Tasmania.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. The Subject Site is not mapped on the Swift Parrot Important Areas Map (DPE 2022c). No impact to breeding habitat.	No
Lophoictinia isura (Square Tailed Kite)	V	-	Low	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. Potential foraging habitat present within the Subject Site	Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs. No nests or suitable sites were observed within the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Micronomus norfolkensis (Eastern Coastal Free-tailed Bat)	V	-	Low	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range, feeding on insects. Potential foraging	Roost in tree hollows but will also roost under bark or in manufactured structures. Nest boxes in lieu of hollows are present within the Subject Site,	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				habitat is present within the Subject Site.	however all nest boxes will be retained (**Section 6**).	anticipated impact breeding on habitat.	
Miniopterus australis (Little Bent-winged Bat)	V	-	Low	Found in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests, and banksia scrub. Generally found in well-timbered areas. at night forage for small insects beneath the canopy of densely vegetated habitats. Potential foraging habitat is present within the Subject Site.	This species only breeds in caves. No caves are present within the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Miniopterus orianae oceanensis (Large Bent-winged Bat)	V	-	Low	Hunt in forested areas, catching moths and other flying insects above the tree tops. Potential foraging habitat is present within the Subject Site.	This species only breeds in caves. No caves are present within the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Myotis macropus (Southern Myotis)	V	-	Low	This species forages over streams and pools catching insects and small fish by raking their feet across the water surface. A medium sized dam exists within the Subject Site.	Roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Nest boxes in lieu of hollows are present within the Subject Site, however all nest	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
					boxes will be retained (**Section 6**).		
Neophema pulchella (Turquoise Parrot)	V	-	Low	Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Potential foraging habitat is present within the Subject Site.	Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust. Nest boxes in lieu of hollows are present within the Subject Site, however all nest boxes will be retained (**Section 6**).	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Ninox connivens (Barking Owl)	V	-	Low	Preferentially hunts small arboreal mammals such as Squirrel Gliders and Common Ringtail Possums, but when loss of tree hollows decreases these prey populations the owl becomes more reliant on birds, invertebrates, and terrestrial mammals such as rodents and rabbits. Potential foraging habitat is present within the Subject Site.	Eggs are laid in hollows of large, old trees. No hollows of a suitable size were present within the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Ninox strenua (Powerful Owl)	V	-	Low	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar	Powerful Owls nest in large tree hollows (at least 0.5m deep), in large eucalypts (diameter at breast height of 80-240cm) that are at least 150 years old. No hollows of a suitable size were present within the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				Glider. As most prey species require hollows and a shrub layer, these are important habitat components for the owl. Potential foraging habitat is present within the Subject Site.			
Pandion cristatus (Eastern Osprey)	V	-	Low	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. No such habitat is present within the Subject Site.	Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea. No nests were identified within the Subject Site.	Negligible impact to foraging or breeding habitat.	No
Petroica boodang (Scarlet Robin)	V	-	Low	Lives in dry eucalypt forests and woodlands. Habitat usually contains abundant logs and fallen timber: these are important components of its habitat. Birds forage from low perches, fence-posts or on the ground, from where they pounce on small insects and other invertebrates which are taken from the ground, or off tree trunks and logs; they sometimes forage in the shrub or canopy layer. Potential foraging habitat is present within the Subject Site.	This species' nest is an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than 2 metres above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub. No nests were identified within the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
Phascolarctos cinereus (Koala)	V	-	Low	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Potential foraging habitat is present within the Subject Site.	Potential feed trees occur within the Subject Site; however, these are not preferred browse species.	Minimal impact to potential foraging and breeding habitat given lack of proximal records and the small area of removal.	No
Pseudomys novaehollandiae (New Holland mouse)	-	V	Low	Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. Potential foraging habitat is present within the Subject Site.	Nests communally in underground burrows during the day. No burrows of a suitable size were identified within the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Pseudophryne australis (Red-crowned Toadlet)	V	-	Low	Disperses outside the breeding period where they are found under rocks and logs on sandstone ridges and forage amongst leaf-litter. Potential foraging habitat is present within the Subject Site.	Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. A vegetated dam is present within the Subject Site, which may provide potential breeding habitat, albeit sub-optimal due to the urban nature of the site.	Low anticipated impact to potential foraging habitat given the urbanisation of the Subject Site. Although a wetland is proposed to be enhanced by the proposed activity, there will still be minor impacts to breeding habitat when it is established.	A 5-part test of significance has been prepared due to presence of potential breeding habitat (**Appendix E**).
Pteropus poliocephalus (Grey-headed Flying-fox)	V	V	Low	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, and swamps as well as urban gardens and cultivated fruit	Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. No camps	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				crops. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. Potential foraging habitat is present within the Subject Site.	were observed within the Subject Site.	anticipated impact breeding on habitat.	
Ptilinopus regina (Rose-crowned fruit dove)	V	-	Low	Feed entirely on fruit from vines, shrubs, large trees and palms, and are thought to be locally nomadic as they follow the ripening of fruits. Potential foraging habitat is present within the Subject Site.	Rose-crowned Fruit-Doves breed in rainforests with a dense growth of vines. No rainforest communities are present with the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Ptilinopus superbus (Superb Fruit Dove)	V	-	Low	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Potential foraging habitat is present within the Subject Site.	The nest is a structure of fine interlocked forked twigs, and is usually 5-30 metres up in rainforest and rainforest edge tree and shrub species. No nests were identified within the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Saccolaimus flaviventris (Yellow-bellied Sheathtail-bat)	V	-	Low	When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees.	This species requires tree hollows for breeding/roosting. Nest boxes in lieu of hollows are present within the Subject Site, however all nest boxes will be retained (**Section 6**).	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				Potential foraging habitat is present within the Subject Site.		anticipated impact breeding on habitat.	
Scoteanax rueppellii (Greater Broad-nosed Bat)	V	-	Low	Forages after sunset, flying slowly and directly along creek and river corridors. Potential foraging habitat is present within the Subject Site	This species requires tree hollows for breeding/roosting. Nest boxes in lieu of hollows are present within the Subject Site, however all nest boxes will be retained (**Section 6**).	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Tyto novaehollandiae (Masked Owl)	V	-	Low	Lives in dry eucalypt forests and woodlands from sea level to 1100m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Potential foraging habitat is present within the Subject Site.	Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Nest boxes in lieu of hollows are present within the Subject Site, however all nest boxes will be retained (**Section 6**).	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Tyto tenebricosa (Sooty Owl)	V	-	Low	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Hunts by night for small ground mammals or tree-dwelling mammals. Potential foraging habitat is present within the Subject Site.	Nests in very large tree-hollows. No hollows of a suitable size were present within the Subject Site.	Minimal impact to foraging habitat given the mobility of the species and areas of suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	No
Varanus rosenbergi (Rosenberg's Goanna)	V	-	Low	Found in heath, open forest and woodland. Individuals require large areas of habitat.	Lays up to 14 eggs in a termite mound; the hatchlings dig themselves out of the mounds.	Minimal impact to foraging habitat given the mobility of the species and areas of	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				Feeds on carrion, birds, eggs, reptiles and small mammals. Potential foraging habitat is present within the Subject Site.	No termite mounds were observed within the Subject Site.	suitable habitat within the surrounding area. No anticipated impact breeding on habitat.	

5. Impact Summary

5.1 Vegetation Loss

The following vegetation within the Subject Site will be impacted by the proposed activity:

- 0.35ha of Coastal Shale-Sandstone Forest;
- 0.19ha of Urban Exotic / Native Vegetation; and
- 0.03ha of Exotic Vegetated Dam.

5.2 Threatened Species

The proposed development is unlikely to have a significant impact on any BC Act or EPBC Act listed species. Any potential impacts will be mitigated by the actions detailed in **Section 6**. Due to the presence of potential breeding habitat of *Pseudophryne australis* (Red Crowned Toadlet), *Heleioporus australiacus* (Giant Burrowing Frog) and *Isoodon obesulus obesulus* a BC test of significance (5-Part-Test) has been prepared for each species, detailed in **Appendix E** and **Appendix E**. An EPBC Assessment of Significant Impact was prepared for *Heleioporus australiacus* (Giant Burrowing Frog) and *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern)) due to potential breeding habitat (**Appendix F; Appendix G**).

6. Recommendations

This section of the report details recommended efforts to avoid and minimise impact on biodiversity values associated with the proposed activity. Measures to be implemented before, during and post construction to avoid and minimise the impacts of the project are detailed in **Table 9**.

Table 9. Table of measures to be implemented before, during and after construction to avoid and minimise the impacts of the project.

Action	Outcome	Timing	Responsibility
Project Location, Design and Planning	The proposed activity has been strategically designed to have as little impact on native vegetation as possible and includes the improvement of existing wetland. Furthermore, rehabilitation works in the form of plantings, exotic species control and assisted regeneration will assist in revegetation of the Project Area to ensure bushland is kept intact and connectivity remains into the broader locality.	Pre-construction phase	Proponent
Assigning a Project Ecologist	Prior to the implementation of the activity, the proponent should commission the services of a qualified and experienced Ecologist with a minimum tertiary degree in Science, Conservation, Biology, Ecology, Natural Resource Management, Environmental Science or Environmental Management. The Ecologist must be licensed with a current Department of Primary Industries Animal Research Authority permit and New South Wales Scientific License issued under the BC Act. The Ecologist will be commissioned to: ▪ Undertake any required targeted searches for threatened flora prior to vegetation clearing; ▪ Undertake an extensive pre-clearing survey which includes targeted searches for threatened fauna threatened flora and Priority Weeds, and delineating habitat-bearing trees and shrubs; ▪ Supervise the clearance of any habitat trees or shrubs identified during the pre-clearing survey (native and exotic) in order to capture, treat and/or relocate any displaced fauna; and ▪ Supervise the clearing/modification of any aquatic habitat including creeks and wetlands in order to capture, treat and/or relocate any displaced fauna.	Pre-construction phase	Proponent
Tree Protections	Australian Standard 4970 (2009) Protection of Trees on Development Sites (AS-4970) outlines that a Tree Protection Zone (TPZ) is the principal means of protecting trees on construction sites. It is an area isolated from construction disturbance so that the tree remains viable. Ideally, works should be avoided within the TPZ. A Minor Encroachment is less than 10% of the TPZ and is outside the structural root zone (SRZ). A Minor Encroachment is considered acceptable by AS-4970 when it is compensated for elsewhere and contiguous within the TPZ. A Major Encroachment is greater than 10% of the TPZ or inside the SRZ. Major Encroachments require root investigations undertaken by non-destructive methods or the use of tree sensitive construction methods.	Pre-construction phase	Proponent Arborist

Action	Outcome	Timing	Responsibility
	Tree protection fencing is to be installed around all trees proposed for retention in the immediate vicinity of the proposed works.		
Erection of temporary fencing	Temporary barriers (e.g., flagging tape) should be erected around retained native vegetation that may incur indirect impacts on biodiversity values due to the construction works.	Pre-construction phase	Proponent Construction Contractor
Revegetation and Landscaping	The proposed revegetation of the Subject Site and Project Area will involve the planting of species associated with the naturally occurring Coastal Shale-Sandstone Forest. Any additional landscaping should also comprise of species associated with Coastal Shale-Sandstone Forest.	Pre-construction phase	Proponent Arborist Project Ecologist
Amphibian Pre-Clearing Survey	As a precaution, prior to construction or clearing, an amphibian pre-clearing survey should be undertaken for *Pseudophryne australis* (Red-crowned Toadlet) and *Heleioporus australiacus* (Giant Burrowing Frog) to ensure no species is present within the water feature being impacted.	Pre-construction phase	Proponent Project Ecologist
Nest Boxes Management	To avoid impacts to fauna, any nest box located on a tree to be removed must be relocated to another tree to be retained in the Project Area. Nest boxes should be moved under the supervision of a qualified Ecologist. If fauna are present, the attending ecologist should relocate the fauna back into translocated nest box or other appropriate habitat being retained on the site.	Pre-construction phase	Proponent
Erosion and Sedimentation	Appropriate erosion and sediment control must be erected and always maintained during construction to avoid the potential of incurring indirect impacts on biodiversity values. An Erosion and Sediment Control Plan should be developed to the Soils and Construction Managing Urban Stormwater Standards (Landcom 2004).	Construction phase	Proponent Construction Contractor
Weed Removal	The following three (3) priority weeds were identified within the Subject Site: ▪ *Asparagus aethiopicus (Asparagus Fern);* ▪ *Lantana camara (Lantana); and* ▪ *Olea europaea subsp. cuspidata (African Olive).* All priority weeds should be removed in accordance with the Biosecurity Act 2015 and NSW WeedWise (DPI 2022). Environmental weeds should be managed with best practice techniques to improve the condition of the native vegetation within the Subject Site.	Post-construction phase	Proponent
Storage and stockpiling (soil and materials)	Allocate all storage, stockpile, and laydown sites away from any native vegetation that is planned to be retained. Avoid importing any soil from outside the site as this can introduce weeds and pathogens to the site to avoid the potential of incurring indirect impacts on biodiversity values.	Construction phase	Construction Contractors
Stormwater	The proposed activity is unlikely to result in significant changes to storm-water runoff so it is expected there will be no exacerbated impact on native flora and fauna.	Post-construction phase	Proponent Construction Architect

7. Conclusion

This assessment indicates that the relevant provisions of the Environmental Planning and Assessment Act 1979, Biodiversity Conservation Act 2016, the Warringah Local Environmental Plan 2011, and the Warringah Development Control Plan 2011 have been satisfied.

In summary, the proposed activity will require the clearing of:

- 0.35ha of Coastal Shale-Sandstone Forest;
- 0.19ha of Urban Exotic / Native Vegetation; and
- 0.03ha of Exotic Vegetated Dam.

Due to the presence of potential breeding habitat of *Pseudophryne australis* (Red Crowned Toadlet), *Heleioporus australiacus* (Giant Burrowing Frog) and *Isoodon obesulus obesulus* a BC test of significance (5-Part-Test) has been prepared for each species, detailed in **Appendix E** and **Appendix E**. An EPBC Assessment of Significant Impact was prepared for *Heleioporus australiacus* (Giant Burrowing Frog) and *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern)) due to potential breeding habitat (**Appendix F; Appendix G**).

Several impact mitigation and minimisation measures, as outlined in this report, are to be implemented to reduce impacts to native vegetation and fauna where possible. The proposed development is unlikely to have a significant impact on any BC Act or EPBC Act listed species.

8. References

Australian Standard 4970 (2009) Protection of Trees on Development Sites (AS-4970)

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9. Appendices

Appendix A. Concept Design (Northern Beaches Council, 2023)

Appendix B. Flora species identified within the Subject Site (and immediate surrounds) during the October 2022 site assessment.

Appendix C. Fauna species identified within and surrounding the Subject Site during the October 2022 site assessment.

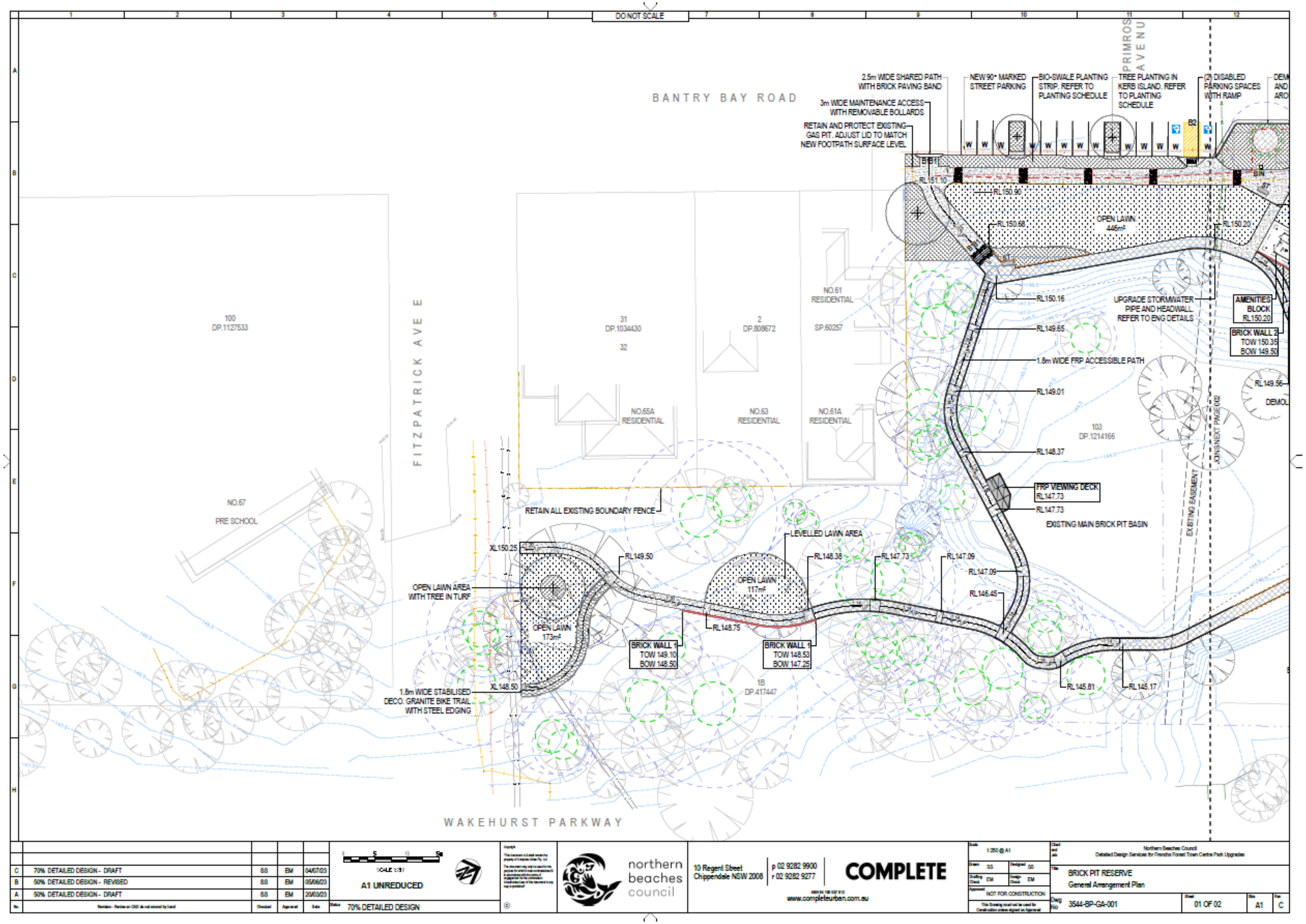
Appendix D. BC Act Assessment of Significance (5-part Test) for Isoodon obesulus obesulus (Southern Brown Bandicoot (eastern))

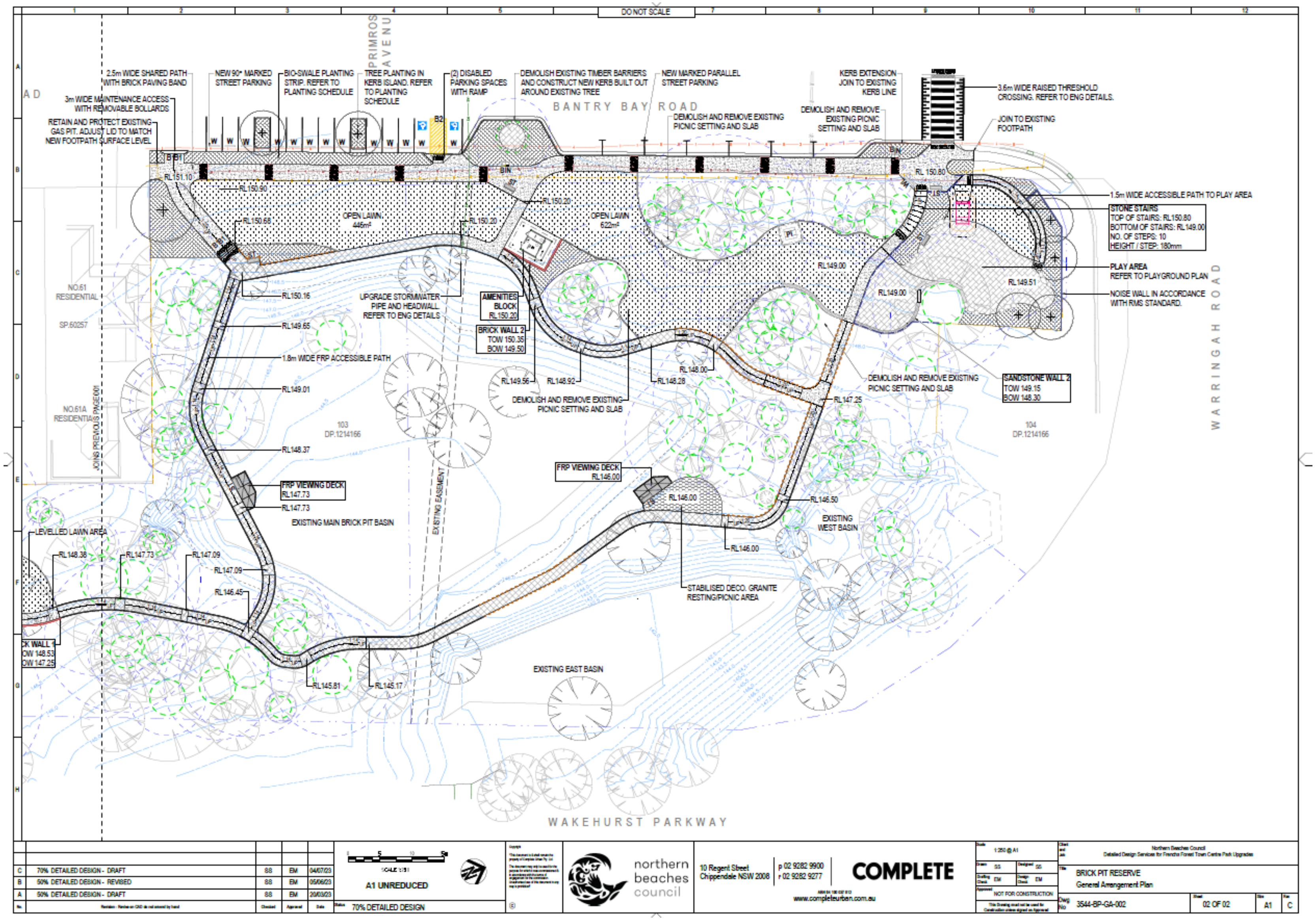
Appendix E. BC Act Assessment of Significance (5-part Test) for Heleioporus australiacus (Giant Burrowing Frog) and Pseudophryne australis (Red-crowned Toadlet)

Appendix F. EPBC Assessment of Significant Impact for Isoodon obesulus obesulus (Southern Brown Bandicoot (eastern))

Appendix G. EPBC Assessment of Significant Impact for Giant Burrowing Frog (Heleioporus australiacus)

Appendix A. Concept Design (Northern Beaches Council, 2023)





DO NOT SCALE
BANTRY BAY ROAD
PRIMROSE AVENUE
WARRINGAH ROAD
WAKEHURST PARKWAY
2.5m WIDE SHARED PATH WITH BRICK PAVING BAND
3m WIDE MAINTENANCE ACCESS WITH REMOVABLE BOLLARDS
RETAIN AND PROTECT EXISTING GAS PIT. ADJUST LID TO MATCH NEW FOOTPATH SURFACE LEVEL
NEW 90° MARKED STREET PARKING
BIO-SWALE PLANTING STRIP. REFER TO PLANTING SCHEDULE
TREE PLANTING IN KERB ISLAND. REFER TO PLANTING SCHEDULE
(2) DISABLED PARKING SPACES WITH RAMP
DEMOLISH EXISTING TIMBER BARRIERS AND CONSTRUCT NEW KERB BUILT OUT AROUND EXISTING TREE
NEW MARKED PARALLEL STREET PARKING
KERB EXTENSION JOIN TO EXISTING KERB LINE
3.6m WIDE RAISED THRESHOLD CROSSING. REFER TO ENG DETAILS.
JOIN TO EXISTING FOOTPATH
DEMOLISH AND REMOVE EXISTING PICNIC SETTING AND SLAB
1.5m WIDE ACCESSIBLE PATH TO PLAY AREA
STONE STAIRS
TOP OF STAIRS: RL150.80
BOTTOM OF STAIRS: RL149.00
NO. OF STEPS: 10
HEIGHT / STEP: 180mm
PLAY AREA
REFER TO PLAYGROUND PLAN
NOISE WALL IN ACCORDANCE WITH RMS STANDARD.
SANDSTONE WALL 2
TOW 149.15
BOW 148.30
OPEN LAWN 446m²
OPEN LAWN 622m²
AMENITIES BLOCK RL150.20
BRICK WALL 2
TOW 150.35
BOW 149.50
UPGRADE STORMWATER PIPE AND HEADWALL REFER TO ENG DETAILS
1.8m WIDE FRP ACCESSIBLE PATH
FRP VIEWING DECK RL147.73
FRP VIEWING DECK RL146.00
EXISTING MAIN BRICK PIT BASIN
EXISTING WEST BASIN
EXISTING EAST BASIN
EXISTING EASEMENT
STABILISED DECO. GRANITE RESTING/PICNIC AREA
LEVELLED LAWN AREA
NO.61 RESIDENTIAL
SP.60257
NO.61A RESIDENTIAL
JOINS PREVIOUS PAGE 001
103 DP.1214166
104 DP.1214166
RL151.10
RL150.90
RL150.66
RL150.20
RL150.80
RL149.00
RL149.51
RL150.16
RL149.65
RL149.01
RL148.37
RL147.73
RL149.56
RL148.92
RL148.28
RL148.00
RL147.25
RL146.50
RL146.00
RL148.38
RL147.09
RL146.45
RL145.81
RL145.17
C 70% DETAILED DESIGN - DRAFT
B 50% DETAILED DESIGN - REVISED
A 50% DETAILED DESIGN - DRAFT
SCALE 1:250
A1 UNREDUCED
70% DETAILED DESIGN
northern beaches council
10 Regent Street Chippendale NSW 2008
p 02 9282 9900
f 02 9282 9277
www.completeurban.com.au
COMPLETE
1:250 @ A1
NOT FOR CONSTRUCTION
BRICK PIT RESERVE
General Arrangement Plan
3544-BP-GA-002
02 OF 02
A1
C

Appendix B. Flora species identified within the Subject Site (and immediate surrounds) during the October 2022 site assessment.

Species	Canopy	Mid Layer	Ground Layer
Acacia floribunda		x	
Acacia linifolia		x	
Acacia longifolia		x	
Acacia ulicifolia		x	
Allocasuarina littoralis		x	
Angophora costata	x		
*Araujia sericifera**			x
*Asparagus aethiopicus***			x
Banksia aemula		x	
Banksia serrata		x	
*Bidens pilosa**			
*Brachychiton acerifolius**	x		
*Brachychiton rupestris**	x		
*Briza major**			
*Briza minor**			
*Bromus catharticus**			
Callicoma serratifolia		x	
Callistemon citrinus		x	
Carex fascicularis			x
*Cenchrus clandestinus**			
*Centaurium erythraea**			
Centella asiatica			
*Colocasia sp.**			
*Conyza bonariensis**			
Corymbia gummifera	x		
Cyathea cooperi		x	
Cynodon dactyldon			x
*Cyperus alternifolius**			x
*Cyperus papyrus**			x
Dianella caerulea			x
Dichondra repens			x
*Dietes grandiflora**			x
Entolasia marginata			x
Entolasia stricta			x
*Erhata erecta**			x
Eucalyptus piluaris	x		
Eucalyptus piperita	x		
Eucalyptus saligna	x		
Gahnia aspera			x
Gahnia sieberiana			x
Geranium solanderi			x
Glochidion ferdinandi		x	
*Gnaphalium sp.**			x

Grevillea linarifolia		x	
Hardenbergia violaceae			x
*Hedera helix**			x
*Hedychium spp.**			x
Hibbertia scandens			x
Hydrocotyle hirta			x
Imperata cylindrica			x
*Ipomea indica**			x
Kunzea ambigua		x	
*Lantana camara***		x	
Lasiopetalum baueri		x	
Leptospermum laevigatum		x	
*Ligustrum lucidum**		x	
*Ligustrum sinense**		x	
*Liquidambar styraciflua**	x		
Lobelia purparescens			x
Lomandra longifolia			x
*Lonicera japonica**			x
Melaleuca styphelioides		x	
Microlaena stipoides			x
*Modiola caroliniana**			x
*Nephrolepsis cordifolia**			x
*Ochna serrulata**		x	
*Olea europea sub. cuspidata***		x	
Oplismenus aemulus			x
*Oxalis corniculata**			x
Oxalis perrans			x
*Oxalis violacea**			x
*Parvonia hastata**			x
Patersonia sericea			x
Persoonia pinifolia		x	
*Pinus radiata**	x		
Pittosporum undulatum		x	
*Plantago lancelota**			x
*Polygala myrtifolia**		x	
Pteridium esculentum			x
Pultenaea stipularis		x	
*Rumex crispus**			x
*Senna pendula var. glabrata**			x
*Sida rhombifolia**			x
*Solanum nigrum**			x
*Sonchus oleraceus**			x
*Stellaria media**			x
*Stenotaphrum secundatum**			x
Syncarpia glomulifera	x		
*Taraxacum sp.**			x

*Tradescantia fluminensis**			x
Typha australis			x
*Verbena bonariensis**			x
*Veronica persica**			x
Westriginia fruticosus		x	
Xanthorrea australis		x	
*Zantedeschia aethiopica**			x

**Represents exotic species; **represents priority weeds*

Appendix C. Fauna species identified within and surrounding the Subject Site during the October 2022 site assessment.

Class	Species	Common	Status
Amphibia	*Limnodynastes peronii*	Striped Marsh Frog	Protected
Aves	*Acridotheres tristis*	Indian Myna	Exotic
	Dacelo novaeguineae	Kookaburra	Protected
	Strepera graculina	Pied Currawong	
	Manorina melanocephala	Noisy Miner	
	Acanthorhynchus tenuirostris	Eastern Spinebill	
	Anthochaera chrysoptera	Little Wattlebird	
	Alectura lathami	Australian Brush Turkey	
	Malurus cyaneus	Superb Fairy Wren	
Reptilia	*Lampropholis delicata*	Common Garden Skink	Protected
	Eulamprus quoyii	Eastern Water Skink	

Appendix D. BC Act Assessment of Significance (5-part Test) for *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern))

<table>
<tr><th colspan="3">Biodiversity Conservation Act 2016 – Test of Significance (5-part Test)
for
Isoodon obesulus obesulus (Southern Brown Bandicoot (eastern))</th></tr>
<tr><th colspan="3">BC Act Status: Endangered</th></tr>
<tr><td>(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</td><td colspan="2">The proposed activity is not likely to substantially and adversely have an effect on Isoodon obesulus obesulus where it is likely they will be placed at risk of extinction. One (1) burrow proposed to be impacted along with 0.35ha of potential foraging habitat. However, potential habitat is expected to be retained and enhanced in the broader Project Area.</td></tr>
<tr><td rowspan="2">(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</td><td>(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</td><td>Not applicable.</td></tr>
<tr><td>(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,</td><td>Not applicable.</td></tr>
<tr><td rowspan="3">(c) in relation to the habitat of a threatened species or ecological community:</td><td>(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</td><td>One (1) burrow proposed to be impacted along with 0.35ha of potential foraging habitat.</td></tr>
<tr><td>(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</td><td>Habitat connectivity is expected to remain in the broader Project Area and greater locality, with vegetation to be retained and enhanced in the broader Project Area. Therefore, the site is not expected to become fragmented or isolated from other areas of bushland in the locality.</td></tr>
<tr><td>(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</td><td>All areas of habitat are important for these species. However, the Subject Site is highly modified due to historic disturbance and edge effects from the urban environment, making the habitat sub-optimal for these species.</td></tr>
<tr><td>(d) whether the proposed development or activity is likely to have an adverse effect on any</td><td colspan="2">The proposed activity is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.</td></tr>
</table>

Biodiversity Conservation Act 2016 – Test of Significance (5-part Test) for *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern))	
BC Act Status: Endangered	
declared area of outstanding biodiversity value (either directly or indirectly),	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The following Key Threatening Processes (KTPs) listed under Schedule 4 of the BC Act are relevant to the protection of potential habitat in the scope of the proposed activity within the Subject Site for this EEC: ▪ Clearing of native vegetation The proposed activity will see a temporary increase in the impact on clearing of native vegetation however any impacts will be minimised where possible.
References NSW Government (2017) NSW Legislation: Biodiversity Conservation act 2016 No 63, Schedule 4: Key Threatening Processes https://www.legislation.nsw.gov.au/acts/2016-63.pdf Department of Planning and Environment (2022)Southern Brown Bandicoot (eastern) – profile: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10439	

Appendix E. BC Act Assessment of Significance (5-part Test) for *Heleioporus australiacus* (Giant Burrowing Frog) and *Pseudophryne australis* (Red-crowned Toadlet)

<table>
<tr><th colspan="3">Biodiversity Conservation Act 2016 – Test of Significance (5-part Test)
for
Heleioporus australiacus (Giant Burrowing Frog); and
Pseudophryne australis (Red-crowned Toadlet)</th></tr>
<tr><th colspan="3">BC Act Status: Vulnerable</th></tr>
<tr><td>(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</td><td colspan="2">The proposed activity is not likely to substantially and adversely have an effect on Heleioporus australiacus (Giant Burrowing Frog) or Pseudophryne australis (Red-crowned Toadlet) such that they will be placed at risk of extinction. Approximately 0.03ha of the dam (potential breeding habitat) will be impacted by the proposed activity. However, works also include the rehabilitation and improvement of the dam to be a functional wetland, retaining this habitat for the future.</td></tr>
<tr><td rowspan="2">(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</td><td>(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</td><td>Not applicable.</td></tr>
<tr><td>(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,</td><td>Not applicable.</td></tr>
<tr><td rowspan="3">(c) in relation to the habitat of a threatened species or ecological community:</td><td>(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</td><td>Approximately 0.03ha of the dam (potential breeding habitat) will be impacted by the proposed activity.</td></tr>
<tr><td>(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</td><td>As the wetland will be retained and enhanced, the proposed activity is not expected exacerbate fragmentation or isolation for these species as works also include the rehabilitation and improvement of the dam to be a functional wetland, retaining this habitat for the future.</td></tr>
<tr><td>(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</td><td>All areas of habitat are important for these species. However, the existing dam is highly degraded, dominated by exotic weeds, making the habitat sub-optimal for these species.</td></tr>
<tr><td>(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</td><td colspan="2">The proposed activity is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.</td></tr>
<tr><td>(e) whether the proposed development or activity is or is part of a key threatening</td><td colspan="2">The following Key Threatening Processes (KTPs) listed under Schedule 4 of the BC Act are relevant to the protection of potential habitat in the scope of the proposed activity within the Subject Site for this EEC:</td></tr>
</table>

Biodiversity Conservation Act 2016 – Test of Significance (5-part Test) for *Heleioporus australiacus* (Giant Burrowing Frog); and *Pseudophryne australis* (Red-crowned Toadlet)	
BC Act Status: Vulnerable	
process or is likely to increase the impact of a key threatening process.	▪ Clearing of native vegetation The proposed activity will see a temporary increase in the impact on clearing of native vegetation however any impacts will be minimised where possible.

References

NSW Government (2017) NSW Legislation: Biodiversity Conservation act 2016 No 63, Schedule 4: Key Threatening Processes https://www.legislation.nsw.gov.au/acts/2016-63.pdf

Department of Planning and Environment (2022) Giant Burrowing Frog – profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10398

Department of Planning and Environment (2022) Red-crowned Toadlet – profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10692

Appendix F. EPBC Assessment of Significant Impact for *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern))

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern))	
BC Act Status: Endangered	
Significant impact criteria An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
lead to a long-term decrease in the size of a population	The proposed activity is not likely to lead to a decrease in population size for *Isoodon obesulus obesulus*. One (1) burrow that could be used by the species is proposed to be impacted along with 0.35ha of potential foraging habitat. However, potential habitat will be retained and enhanced in the broader Project Area, connecting the better-quality remnant bushland in the greater locality.
reduce the area of occupancy of the species	The proposed activity is not likely to lead to a decrease in the area of occupancy for *Isoodon obesulus obesulus*. One (1) burrow that could be used by the species is proposed to be impacted along with 0.35ha of potential foraging habitat. However, potential habitat will be retained and enhanced in the broader Project Area, connecting the better-quality remnant bushland in the greater locality.
fragment an existing population into two or more populations	The proposed activity is not likely to fragment a population of *Isoodon obesulus obesulus* into two or more. The Subject Site is located on the edge of an urbanised area, and the proposed activity will not fragment the existing bushland, retaining the wildlife corridor and connectivity for this species.
adversely affect habitat critical to the survival of a species	The proposed activity is not likely to adversely affect habitat critical to *Isoodon obesulus obesulus.* The vegetation in the Subject Site is sub-optimal due to proximity to the surrounding urban landscape. Furthermore, potential habitat is expected to be retained and enhanced in the broader Project Area, connecting the better-quality remnant bushland in the greater locality.
disrupt the breeding cycle of a population	The proposed activity is not likely to lead to disrupt the breeding cycle of *Isoodon obesulus obesulus*. One (1) burrow that could be used by the species is proposed to be impacted along with 0.35ha of potential foraging habitat. Even if the burrow is utlised by the species, there will continue to be potential breeding habitat in the greater locality connected the Project Area, therefore allowing the breeding cycle to continue uninterrupted.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed activity is not likely to remove or modify habitat for *Isoodon obesulus obesulus* to the extent that the species would decline. One (1) burrow that could be used by the species is proposed to be impacted along with 0.35ha of potential foraging habitat. However, potential habitat will be retained and enhanced in the broader Project Area, connecting the better-quality remnant bushland in the greater locality.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or	It is expected that invasive flora and fauna are already present within the Project Area. It is not expected that the proposed activity will exacerbate this issues, especially as potential habitat will be retained and enhanced in the broader Project Area, connecting the better-quality remnant bushland in the greater locality.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern))	
BC Act Status: Endangered	
critically endangered species' habitat	
introduce disease that may cause the species to decline	The proposed activity is not expected to introduce a disease that will cause the decline of the species.
interfere with the recovery of the species	It is not expected that the proposed activity will interfere with any of the recover plan actions and objectives, as listed in the Southern Brown Bandicoot (*Isoodon obesulus*) Recovery Plan (DEC 2007), including: ▪ To Continue State-Wide Recovery Team and Establish Regional Groups to Enable Efficient Implementation of Recovery Program; ▪ To Identify and Implement Land Management Practices That Assist in the Recovery of the Species; ▪ Clarify the Status of the Species by Better Defining its Distribution and Relative Abundance; ▪ Undertake Research to Broaden the Knowledge Base on the Species, Gathering Critical Information to Assist in its Recovery; and ▪ Improve Community Awareness of Conservation Significance of the Southern Brown Bandicoot

References

Department of Planning and Environment (2022) Southern Brown Bandicoot (eastern) – profile: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10439

Department of Environment and Conservation (DEC) (2006) Southern Brown Bandicoot (*Isoodon obesulus*) Recovery Plan. NSW DEC, Hurstville NSW

Threatened Species Scientific Committee (2016). Conservation Advice *Isoodon obesulus obesulus* southern brown bandicoot (eastern). Canberra: Department of the Environment.

Appendix G. EPBC Assessment of Significant Impact for Giant Burrowing Frog (*Heleioporus australiacus*)

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for Giant Burrowing Frog *(Heleioporus australiacus)*	
BC Act Status: Vulnerable	
Significant impact criteria An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
lead to a long-term decrease in the size of an important population of a species	The proposed activity is not likely to lead to a decrease in population size for *Heleioporus australiacus*. Approximately 0.03ha of the dam (potential breeding habitat) will be impacted by the proposed activity. However, works include the rehabilitation and improvement of the dam to be a functional wetland, retaining this habitat for the future.
reduce the area of occupancy of an important population	The proposed activity is not likely to lead to a decrease in the area of occupancy for *Heleioporus australiacus*. Approximately 0.03ha of the dam (potential breeding habitat) will be impacted by the proposed activity. However, works include the rehabilitation and improvement of the dam to be a functional wetland, retaining this habitat for the future.
fragment an existing important population into two or more populations	The proposed activity is not likely to fragment a population of *Heleioporus australiacus*. into two or more. The Subject Site is located on the edge of an urbanised area, and the proposed activity will not fragment the existing dam from other areas of potential habitat as connectivity to other areas of bushland (that may contain watercourses or other water features) is expected to remain.
adversely affect habitat critical to the survival of a species	The proposed activity is not likely to adversely affect habitat critical to *Heleioporus australiacus*. The dam in the Subject Site is sub-optimal due to proximity to the surrounding urban landscape. Furthermore, works include the rehabilitation and improvement of the dam to be a functional wetland, retaining this habitat for the future.
disrupt the breeding cycle of an important population	The proposed activity is not likely to lead to disrupt the breeding cycle of *Heleioporus australiacus*. Approximately 0.03ha of the dam (potential breeding habitat) will be impacted by the proposed activity. However, works include the rehabilitation and improvement of the dam to be a functional wetland, retaining this habitat for the future, therefore allowing the breeding cycle to continue uninterrupted.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed activity is not likely to remove or modify habitat for *Heleioporus australiacus* to the extent that the species would decline. Approximately 0.03ha of the dam (potential breeding habitat) will be impacted by the proposed activity. However, works include the rehabilitation and improvement of the dam to be a functional wetland, retaining this habitat for the future.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	It is expected that invasive flora and fauna are already present within dam. It is not expected that the proposed activity will exacerbate this issues, especially as the proposed activity seeks to improve the dams quality in the long term.
introduce disease that may cause the species to decline	The proposed activity is not expected to introduce a disease that will cause the decline of the species.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for Giant Burrowing Frog *(Heleioporus australiacus)*	
BC Act Status: Vulnerable	
interfere with the recovery of the species	It is not expected that the proposed activity will interfere with any of the recover plan actions and objectives, as listed in the Giant Burrowing Frog (*Heleioporus australiacus*) Conservation Advice (Department of the Environment 2014), including: ▪ Develop a list of key populations of the giant burrowing frog to focus recovery actions; ▪ Develop a protocol for monitoring populations throughout the species range. Once a monitoring protocol is developed, incorporate it into site management plans; ▪ Determine priorities for populations to be included in a gene bank to provide an assurance for populations that may become extinct; ▪ Develop a captive husbandry protocol in case rapid declines occur ▪ Conduct surveys in Victoria around historic locations and within areas of likely high-quality habitat to assess the status of the species at the southern end of its range; ▪ Ensure records are accurately collated; and ▪ Coordinate implementation, including management and analysis data, reviewing the progress of recovery and effectiveness of management actions, and adapting actions if necessary

References

Department of Planning and Environment (2022) Giant Burrowing Frog – profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10398

Department of the Environment (2014). Approved Conservation Advice for *Heleioporus australiacus* (giant burrowing frog). Canberra: Department of the Environment.

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Appendix D

Arboricultural Impact Assessment and Tree Management Plan

REPORT

A): ARBORICULTURAL IMPACT ASSESSMENT

and

B). TREE MANAGEMENT PLAN
(Trees to be retained and protected)

Brick Pit Reserve, Bantry Road, Frenchs Forest NSW

Prepared 07 November 2022
Our Ref: 7877

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Appendix F Site Plan - Redgum Survey of Subject Trees to be retained & Tree Protection Zones

1.0 PREFACE

Redgum Horticultural has prepared this report for and on behalf of Complete Urban Pty Ltd *(the applicant)*, 10 Regent Street, Chippendale NSW. Mr. Neville Shields *(the author)* attended Brick Pit Reserve, Bantry Road, Frenchs Forest NSW (*the site*), on 06-08 September 2022 and the trees and their growing environment were examined. The site is subject to a Development Application, this report and any works recommended herein that require approval from the consenting authority forms part of that Development application. This report takes into consideration the trees within the site and within five metres of the common boundary affected by the development.

2.0 INTRODUCTION

The land is situated in the Northern Beaches Council (*the Council)* Local Government Area (*LGA*) and the trees are protected under Development Control Plan and Tree Preservation Order Policy - PL 440 (Former Warringah). The Council is the consenting authority for development works on the site. This report involves 155 trees (*the trees*), as indicated on Site Plan A - Survey of Subject Trees (Appendix C) and considers the removal and replacement of seven (7) trees with a further fifteen (15) weed, dead or collapsed specimens recommended for removal independent to the proposed development and the retention of T.B.A. trees within the property. The trees will be considered as 1 stand to encompass all trees within and immediately adjacent to the site, where appropriate, as marked on Appendix C, Survey of Subject Trees. ***Tree Protection Zone*** fences or works are marked on the Appendix F, Trees to be Retained and Tree Protection Zones.

The site is comprised of reserve where the existing structures are to be demolished with proposed redevelopment of the site. As part of the Landscape Plan where appropriate, the tree cover on the site will be enhanced by planting with advanced specimens/s of appropriate tree species for the space available above and below ground being soil volumes available and to prevent future conflict between trees and built structures.

The proposed building design and its configuration and infrastructure were arrived at prior to the undertaking of an arboricultural assessment of the trees on the site to determine their significance by Redgum Horticultural. The plans provided do not show the location of sewer, water or electricity supply to the proposed development.

Setbacks for the new works and associated infrastructure should provide sufficient space to protect the existing growing environments both above and below ground for trees to be retained, and so that trees within the property and on adjoining properties will not be adversely affected. The proposed design has considered the spatial requirements for the trees to be retained based on the information available or provided at the time of compiling this report, and those areas to be protected will be discussed further. The Summary lists the general condition of trees and a summary of works in Table 1.0. In section 7.0 each individual tree is described in greater detail including protective or remedial works. Tree maintenance works including pruning, removal or transplantation are detailed in section 14.0.

3.0 SUMMARY

This report considers 155 trees within the site with Trees T.B.A to be retained and protected and Trees 18, 55, 56, 58, 59, 70 & 81are recommended to be removed and replaced with Trees 17, 30, 31, 32, 33, 34, 35, 36, 54, 57, 73, 101, 113, 117 & 118 recommended for removal independent to the proposed development works and Tree 120 was missing at the time of inspection.

WORK IN PROGRESS –
TO BE COMPLETED

4.0 AIMS

Part A: (AIA) Arboricultural Impact Assessment

4.1 Detail the condition of the trees or large shrubs on the site or on adjoining sites where such trees or large shrubs may be affected by the proposed works, by assessment of individual specimens or stands.

4.2 Provide as an outcome of the visual tree assessment (VTA), the following: a description of the trees or large shrubs, observations made, discussion of the effects the location of the proposed building works may have on the trees or large shrubs and make recommendations required for remedial or other works to the trees or large shrubs, if and where appropriate.

Part B: (TPP) Tree Protection Specification & Tree Protection Plan

4.3 Provide a detailed specification for remedial works or protection measures for their retention in a safe and healthy condition, or a condition not less than that at the time of initial inspection for this report, or in a reduced but sustainable condition due to the impact of the development but ameliorated through tree protection measures able to be applied, and will consider the location and condition of the trees or large shrubs in relation to the proposed building works, or recommend removal and replacement where appropriate.

4.4 Determine from the assessment the works or measures required to ameliorate the impact upon the trees or large shrubs to be retained, by the proposed building works or future impacts the trees or large shrubs may have upon the new building works if and where appropriate, or the benefits of removal and replacement if appropriate for the medium to long term safety and amenity of the site.

5.0 OBJECTIVES

Part A: Arboricultural Assessment Report

5.1 Assess the condition of the subject trees.
5.2 Determine impact of development on the subject trees.
5.3 Provide recommendations for retention or removal of the subject trees.

Part B: Tree Protection Plan

5.3 Provide recommendations for retention or removal of the subject trees or large shrubs.

6.0 METHODOLOGY (This Methodology where utilised is applied to both Parts A and B).

6.1 The method of assessment of tree/s applied is adapted from the principles of visual tree assessment undertaken from the ground, which considers:

- Tree health and subsequent stability, both long and short term
- Sustainable Retention Index Value (SRIV) Version 4 (IACA 2010) ©
- Hazard potential to people and property
- Amenity values
- Habitat values
- Significance

6.2 This assessment is undertaken using standard tree assessment criteria for each tree based on the values above and is implemented as a result of at least one comprehensive and detailed site inspection to undertake a visual tree assessment from the ground of each individual tree, or stand of trees, or a representative population sample. Any dimensions recorded as averages, or by approximation are noted accordingly.

6.3 This report adopts Australian Standard AS4970 2009 *Protection of trees on development sites* as a point of reference and guide for the recommended minimum setbacks (Table 2 – Part B) from the centre of a tree's trunk to development works and the distances may be increased or decreased by the author in accordance with AS4970 – Section 3.3.4 as a result of other factors providing mitigating circumstances or constraints as indicated by but not restricted to the following:

1. Condition of individual trees,
2. Tolerance of individual species to disturbance,
3. Geology e.g., physical barriers in soil, rock floaters, bedrock to surface
4. Topography e.g., slope, drainage,
5. Soil e.g., depth, drainage, fertility, structure,
6. Microclimate e.g., due to landform, exposure to dominant wind,
7. Engineering e.g., techniques to ameliorate impact on trees such as structural soil, gap graded fill, lateral boring,
8. Construction e.g., techniques to ameliorate impact on trees such as pier and beam, bridge footings, suspended slabs,
9. Root mapping,
10. Physical limitations - existing modifications to the environment and any impact to tree/s by development e.g., property boundaries, built structures, houses, swimming pools, road reserves, utility services easements, previous impact by excavation, or construction in other directions, soil level changes by cutting or filling, existing landscaping works within proximity, modified drainage patterns,
11. Extraneous factors e.g., potential future impacts from development on adjoining land when the tree is located on or near to a property boundary.

6.4 Trees in groups may be referred to as stands and a stand may exclusively contain specimens to be either retained or removed or a combination of both. A stand may be used to discuss all the trees on a given site to expedite their assessment or refer to trees growing proximate to one another or within a defined space. Stands may be comprised by mass boundary or screen plantings, to form a group of the same or a mixture of taxa. Each stand is considered as a single unit with each component tree assessed and expressed in tabular form or indicated by a given percentage as a population sample of each stand. Where it is appropriate for a stand of trees to be retained in full or part, the location and setback of Tree Protection Zone fences or works, are prescribed to provide for the preservation of the stand or selected component trees, in a condition not less than that at the time of initial inspection for its incorporation into the landscape works for the site, or in a reduced but sustainable condition due to the impact of the development but ameliorated through tree protection measures.

6.5 The meanings for terminology used herein are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009. An extract from the IACA Dictionary forms a glossary of terms included as Appendix E.

Table 1.0 General condition and Schedule of works of trees or large shrubs. Trees described in greater detail in section 7.0.

Tree No. / Point No. (from survey)	***Genus and species***	**Common name**	**Condition G = Good, F = Fair P = Poor, D = Dead W= Weed**	**Description of work to be done – to be confirmed**
1 / 117	*Lophostemon confertus*	Queensland Brush Box	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
2 / 232	*Eucalyptus saligna*	Sydney Blue Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
3 / 5064	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
4 / 119	*Lophostemon confertus*	Queensland Brush Box	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
5 / 5065	*Eucalyptus paniculata*	Grey Ironbark	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
6 / 233	*Eucalyptus saligna*	Sydney Blue Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
7 / 234	*Eucalyptus saligna*	Sydney Blue Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
8 / 235	*Eucalyptus saligna*	Sydney Blue Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
9 / 236	*Eucalyptus saligna*	Sydney Blue Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
10 / 237	*Eucalyptus saligna*	Sydney Blue Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
11 / 239	*Eucalyptus saligna*	Sydney Blue Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
12 / 238	*Lophostemon confertus*	Queensland Brush Box	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
13 / 182	*Syncarpia glomulifera*	Turpentine	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
14 / 183	*Syncarpia glomulifera*	Turpentine	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.

Tree No. / Point No. (from survey)	*Genus and species*	Common name	Condition G = Good, F = Fair P = Poor, D = Dead W= Weed	Description of work to be done
15 / 184	*Syncarpia glomulifera*	Turpentine	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
16 / 185	*Syncarpia glomulifera*	Turpentine	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
17 / 5069	*Ligustrum lucidum*	Broad-Leaf Privet	W	Remove – *Noxious weed species*
18 / 120	*Eucalyptus nicholii*	Narrow leafed Black Peppermint	F	Remove and replace with new plantings as per Landscape Plan
19 / 121	*Lophostemon confertus*	Queensland Brush Box	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
20 / 5066	*Eucalyptus saligna*	Sydney Blue Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
21 / 123	*Eucalyptus paniculata*	Grey Ironbark	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
22 / 124	*Eucalyptus punctata*	Grey Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
23 / 187	*Brachychiton rupestris*	Bottle Tree	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
24 / 186	*Eucalyptus sp.*	Eucalypt	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
25 / 5078	*Brachychiton discolor*	Lace Bark Tree	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
26 / 5076	*Ceratonia siliqua*	Carob Tree	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
27 / 122	*Eucalyptus saligna*	Sydney Blue Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
28 / 5067	*Brachychiton acerifolius*	Illawarra Flame Tree	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
29 / 181	*Eucalyptus sp.*	Eucalypt	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
30 / 5001	*Ligustrum lucidum*	Broad-Leaf Privet	W	Remove – *Noxious weed species*

Tree No. / Point No. (from survey)	***Genus and species***	**Common name**	**Condition** G = Good, F = Fair P = Poor, D = Dead W= Weed	**Description of work to be done**
31 / 5002	*Ligustrum lucidum*	Broad-Leaf Privet	W	Remove – *Noxious weed species*
32 / 5003	*Ligustrum lucidum*	Broad-Leaf Privet	W	Remove – *Noxious weed species*
33 / 611	*Ligustrum lucidum*	Broad-Leaf Privet	W	Remove – *Noxious weed species*
34 / 612	*Ligustrum lucidum*	Broad-Leaf Privet	W	Remove – *Noxious weed species*
35 / 613	*Ligustrum lucidum*	Broad-Leaf Privet	W	Remove – *Noxious weed species*
36 / 614	*Ligustrum lucidum*	Broad-Leaf Privet	W	Remove – *Noxious weed species*
37 / 5000	*Eucalyptus paniculata*	Grey Ironbark	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
38 / 338	*Eucalyptus saligna*	Sydney Blue Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
39 / 339	*Eucalyptus saligna*	Sydney Blue Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
40 / 340	*Eucalyptus saligna*	Sydney Blue Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
41 / 5088	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
42 / 5086	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
43 / 5085	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
44 / 5079	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
45 / 5080	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.

Tree No. / Point No. (from survey)	***Genus and species***	**Common name**	**Condition G = Good, F = Fair P = Poor, D = Dead W= Weed**	**Description of work to be done**
46 / 317	*Pittosporum undulatum*	Native Daphne	F	Remove and replace with new plantings as per Landscape Plan
47 / 5081	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
48 / 5082	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
49 / 318	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
50 / 319	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
51 / 321	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
52 / 322	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
53 / 323	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
54 / 324	*Ligustrum lucidum*	Broad-Leaf Privet	W	Remove – *Noxious weed species*
55 / 325	*Glochidion ferdinandi*	Cheese Tree	F	Remove and replace with new plantings as per Landscape Plan
56 / 326	*Glochidion ferdinandi*	Cheese Tree	F	Remove and replace with new plantings as per Landscape Plan
57 / 311	*Ligustrum lucidum*	Broad-Leaf Privet	W	Remove – *Noxious weed species*
58 / 352	*Pinus radiata*	Radiata Pine	P	Remove and replace with new plantings as per Landscape Plan
59 / 361	*Pinus radiata*	Radiata Pine	P	Remove and replace with new plantings as per Landscape Plan
60 / 320	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.

Tree No. / Point No. **(from survey)**	***Genus and species***	**Common name**	**Condition** **G = Good, F = Fair** **P = Poor, D = Dead** **W= Weed**	**Description of work to be done**
61 / 395	*Acacia glaucescens*	Coastal Myall Wattle	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
62 / 394	*Acacia glaucescens*	Coastal Myall Wattle	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
63 / 396	*Acacia glaucescens*	Coastal Myall Wattle	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
64 / 388	*Acacia floribunda*	Gossamer Wattle	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
65 / 387	*Acacia floribunda*	Gossamer Wattle	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
66 / 385	*Acacia floribunda*	Gossamer Wattle	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
67 / 386	*Acacia glaucescens*	Coastal Myall Wattle	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
68 / 384	*Acacia glaucescens*	Coastal Myall Wattle	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
69 / 383	*Acacia floribunda*	Gossamer Wattle	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
70 / 363	*Glochidion ferdinandi*	Cheese Tree	F	Remove and replace with new plantings as per Landscape Plan
71 / 228	*Eucalyptus paniculata*	Grey Ironbark	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
72 / 229	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
73 / 230	*Ligustrum lucidum*	Broad-Leaf Privet	W	Remove – *Noxious weed species*
74 / 231	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
75 / 456	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.

Tree No. / Point No. (from survey)	*Genus and species*	Common name	Condition G = Good, F = Fair P = Poor, D = Dead W= Weed	Description of work to be done
76 / 457	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
77 / 458	*Glochidion ferdinandi*	Cheese Tree	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
78 / 459	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
79 / 460	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
80 / 461	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
81 / 362	*Glochidion ferdinandi*	Cheese Tree	F	Remove and replace with new plantings as per Landscape Plan
82 / 370	*Eucalyptus piperita*	Sydney Peppermint	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
83 / 5129	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
84 / 373	*Eucalyptus piperita*	Sydney Peppermint	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
85 / 378	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
86 / 5119	*Eucalyptus piperita*	Sydney Peppermint	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
87 / 371	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
88 / 372	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
89 / 402	*Eucalyptus piperita*	Sydney Peppermint	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
90 / 397	*Eucalyptus piperita*	Sydney Peppermint	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.

Tree No. / Point No. (from survey)	*Genus and species*	Common name	Condition G = Good, F = Fair P = Poor, D = Dead W= Weed	Description of work to be done
91 / 5106	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
92 / 5107	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
93 / 465	*Pinus radiata*	Radiata Pine	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
94 / 464	*Pinus radiata*	Radiata Pine	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
95 / 463	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
96 / 5108	*Glochidion ferdinandi*	Cheese Tree	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
97 / 5109	*Glochidion ferdinandi*	Cheese Tree	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
98 / 477	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
99 / 478	*Cedrus deodara*	Himalayan Cedar	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
100 / 479	*Pinus radiata*	Radiata Pine	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
101 / 474	*Dead*		D	Remove dead specimen
102 / 5120	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
103 / 398	*Eucalyptus piperita*	Sydney Peppermint	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
104 / 399	*Eucalyptus piperita*	Sydney Peppermint	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
105 / 400	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.

Tree No. / Point No. (from survey)	***Genus and species***	**Common name**	**Condition** G = Good, F = Fair P = Poor, D = Dead W= Weed	**Description of work to be done**
106 / 401	*Eucalyptus oblonga*	White Stringybark	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
107 / 407	*Pittosporum undulatum*	Native Daphne	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
108 / 409	*Corymbia gummifera*	Red Bloodwood	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
109 / 415	*Eucalyptus fibrosa*	Broad-leaved Ironbark	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
110 / 418	*Eucalyptus fibrosa*	Broad-leaved Ironbark	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
111 / 416	*Eucalyptus oblonga*	White Stringybark	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
112 / 417	*Eucalyptus oblonga*	White Stringybark	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
113 / 434	*Dead*		D	Remove dead specimen
114 / 419	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
115 / 420	*Allocasuarina torulosa*	Forest She Oak	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
116 / 421	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
117 / 432	*Dead*		D	Remove dead specimen
118 / 433	*Collapsed*			Remove collapsed specimen
119 / 424	*Eucalyptus oblonga*	White Stringybark	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
120 / 544	*Missing*			Missing at time of inspection

Tree No. / Point No. (from survey)	*Genus and species*	Common name	Condition G = Good, F = Fair P = Poor, D = Dead W= Weed	Description of work to be done
121 / 429	*Corymbia eximia*	Yellow Bloodwood	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
122 / 428	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
123 / 5093	*Glochidion ferdinandi*	Cheese Tree	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
124 / 527	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
125 / 528	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
126 / 529	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
127 / 530	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
128 / 531	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
129 / 532	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
130 / 533	*Corymbia eximia*	Yellow Bloodwood	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
131 / 534	*Eucalyptus oblonga*	White Stringybark	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
132 / 535	*Eucalyptus piperita*	Sydney Peppermint	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
133 / 536	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
134 / 537	*Corymbia gummifera*	Red Bloodwood	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
135 / 538	*Eucalyptus piperita*	Sydney Peppermint	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.

Tree No. / Point No. (from survey)	***Genus and species***	**Common name**	**Condition** G = Good, F = Fair P = Poor, D = Dead W= Weed	**Description of work to be done**
136 / 549	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
137 / 550	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
138 / 551	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
139 / 553	*Eucalyptus piperita*	Sydney Peppermint	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
140 / 546	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
141 / 547	*Corymbia gummifera*	Red Bloodwood	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
142 / 554	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
143 / 559	*Corymbia gummifera*	Red Bloodwood	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
144 / 557	*Corymbia eximia*	Yellow Bloodwood	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
145 / 556	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
146 / 573	*Eucalyptus piperita*	Sydney Peppermint	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
147 / 578	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
148 / 574	*Corymbia gummifera*	Red Bloodwood	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
149 / 563	*Allocasuarina torulosa*	Forest She Oak	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
150 / 575	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.

Tree No. / Point No. (from survey)	*Genus and species*	Common name	Condition G = Good, F = Fair P = Poor, D = Dead W= Weed	Description of work to be done
151 / 564	*Allocasuarina torulosa*	Forest She Oak	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
152 / 565	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
153 / 566	*Corymbia gummifera*	Red Bloodwood	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
154 / 567	*Allocasuarina torulosa*	Forest She Oak	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
155 / 568	*Allocasuarina torulosa*	Forest She Oak	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
156 / 577	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
157 / 579	*Eucalyptus oblonga*	White Stringybark	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
158 / 589	*Corymbia eximia*	Yellow Bloodwood	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
159 / 586	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
160 / 585	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
161 / 422	*Eucalyptus sp.*	*Eucalypt*	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
162 / 569	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
163 / 581	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
164 / 580	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
165 / 570	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.

Tree No. / Point No. (from survey)	***Genus and species***	**Common name**	**Condition** G = Good, F = Fair P = Poor, D = Dead W= Weed	**Description of work to be done**
166 / 571	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
167 / 572	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
168 / 582	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
169 / 584	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
170 / 583	*Angophora costata*	Sydney Red Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.

7.0 TREE ASSESSMENT – 7.1 - Assessment of a stand of Trees

Tree No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation N= north S= South E= East W=West				Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk Orientation other than R = radial, e.g., N/S g = ground	Trunk Lean 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / ST = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form F = Fair Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
1	*Lophostemon confertus*	M	GV	G	MGVG – 10	C	10	4	4	4	4	70	700 / R	1/R	4	NO	NO	G	1
					1			N	S	E	W	70	750 DARB	ST					1
	Queensland Brush Box	Comments: Trunk to 4 metres, crown deliquescent, orientation radial, symmetrical.																	
2	*Eucalyptus saligna*	M	GV	G	MGVG – 10	C	12	4	4	4	4	70	500 / R	1/R	1	NO	NO	G	1
					1			N	S	E	W	70	520 DARB	ST					1
	Sydney Blue Gum	Comments: Trunk to 2 metres, crown deliquescent, orientation radial, symmetrical.																	
3	*Angophora costata*	Y	GV	F	YGVF – 8	S	5	1	1	1	1	20	100/R	1/R	1	YES	NO	P	2
					2			N	S	E	W	60	110 DARB	ST					3
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Suppressed sapling with 30% deadwood																	
4	*Lophostemon confertus*	M	GV	G	MGVG – 10	C	12	5	5	5	5	70	800 / R	1/R	4	NO	NO	G	1
					1			N	S	E	W	70	840 DARB	ST					1
	Queensland Brush Box	Comments: Trunk to 1.5 metres then bifurcate, crown deliquescent, orientation radial, symmetrical.																	
5	*Eucalyptus paniculata*	Y	LV	F	YLVF – 3	S	5	1	1	1	1	20	100# /R	5/E	1	YES	NO	P	2
					2.5			N	S	E	W	50	150 DARB	Sc					3
	Grey Ironbark	Comments: Acaulescent or short trunk @ or near ground with slight lean to the east correcting in mid-crown, crown deliquescent, orientation radial, symmetrical. 20% deadwood																	
6	*Eucalyptus saligna*	M	GV	F	MGVF – 9	D	15	7	3	4	4	50	920 / R	5/N	1	YES	NO	P	2
					2			N	S	E	W	70	940 DARB	SC					3
	Sydney Blue Gum	Comments: Trunk with severe lean to the north, self-correcting, crown deliquescent, orientation N/S, asymmetrical bias to the north.																	
7	*Eucalyptus saligna*	M	GV	G	MGVG – 10	D	18	6	6	6	6	70	400 / R	1/R	1	NO	NO	G	1
					1			N	S	E	W	70	420 DARB	ST					1
	Sydney Blue Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Progeny growing under canopy.																	
8	*Eucalyptus saligna*	M	GV	G	MGVG – 10	C	25	10	10	10	10	70	1300 / R	1/R	1	YES	NO	G	1
					1			N	S	E	W	70	1340 DARB	ST					1
	Sydney Blue Gum	Comments: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical. **Habitat tree**																	
9	*Eucalyptus saligna*	M	GV	G	MGVG – 10	C	25	7	7	7	7	70	500 / R	1/R	1	YES	NO	G	1
					1			N	S	E	W	70	550 DARB	ST					1
	Sydney Blue Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. **Habitat tree**																	
10	*Eucalyptus saligna*	M	GV	G	MGVG – 10	S	10	4	4	4	4	60	400 / R	1/R	1	NO	NO	F	2
					1			N	S	E	W	60	410 DARB	ST					2
	Sydney Blue Gum	Comments: Trunk to 3 metres, crown deliquescent, orientation radial, symmetrical.																	

Tree No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation N= north	S= South	E= East	W=West	Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk Orientation other than R = radial, e.g., N/S g = ground	Trunk Lean 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / ST = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form F = Fair Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
11	*Eucalyptus saligna*	M	GV	G	MGVG – 10 / 1	C	20	6 / N	6 / S	6 / E	6 / W	70 / 70	500 /R / 540 DARB	1/R / ST	1	YES	NO	G	1 / 1
	Sydney Blue Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. **Habitat tree**																	
12	*Lophostemon confertus*	M	GV	G	MGVG – 10 / 2	S	8	3 / N	3 / S	3 / E	3 / W	50 / 70	300 /R / 340 DARB	1/R / ST	1	NO	NO	F	2 / 2
	Queensland Brush Box	Comments: Trunk to 500mm, crown deliquescent, orientation radial, symmetrical.																	
13	*Syncarpia glomulifera*	M	GV	G	MGVG – 10 / 1	C	8	4 / N	4 / S	4 / E	4 / W	70 / 70	400 / R	1/R / ST	1	NO	NO	G	1 / 1
	Turpentine	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
14	*Syncarpia glomulifera*	M	GV	G	MGVG – 10 / 1	C	8	3 / N	3 / S	3 / E	3 / W	70 / 70	400 / R	1/R / ST	1	NO	NO	G	1 / 1
	Turpentine	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
15	*Syncarpia glomulifera*	M	GV	G	MGVG – 10 / 1	C	8	3 / N	3 / S	3 / E	3 / W	70 / 70	400 / R	1/R / ST	1	NO	NO	G	1 / 1
	Turpentine	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
16	*Syncarpia glomulifera*	M	GV	G	MGVG – 10 / 1	C	12	4 / N	4 / S	4 / E	4 / W	70 / 70	800 /R / 820 DARB	1/R / ST	1	NO	NO	G	1 / 1
	Turpentine	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
17	*Ligustrum lucidum*																		4
	Broad-Leaf Privet	Comments: *Noxious weed species*																	
18	*Eucalyptus nicholii*	O	LV	F	OLVF - 2 / 2	C	10	2 / N	2 / S	2 / E	5 / W	30 / 30	500 /R / 520 DARB	2/W / ST	1	YES	NO	F	2 / 3
	Narrow leafed Black Peppermint	Comments: Trunk to 3 metres with moderate lean to the west, crown deliquescent, orientation E.W, asymmetrical bias to the west. Senescent specimen																	
19	*Lophostemon confertus*	M	GV	F	MGVF - 9 / 2	C	7	3 / N	3 / S	3 / E	3 / W	60 / 60	300 /R / 330 DARB	1/R / ST	1	NO	NO	F	2 / 2
	Queensland Brush Box	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
20	*Eucalyptus saligna*	Y	LV	F	YLVF - 3 / 2	C	8	2 / N	2 / S	2 / E	2 / W	50 / 60	200 / R	1/R / ST	1	NO	NO	P	2 / 3
	Sydney Blue Gum	Comments: Sapling specimen																	

Tree No.	***Genus & Species*** **Common Name**	**Age** Y = Young M = Mature O = Overmature	**Vigour** GV = Good Vigour LV = Low Vigour	**Condition** G = Good F = Fair P = Poor D = Dead	**1. SRIV** Age, Vigour, Condition / Index Rating www.iaca.org.au / **2. Estimated Life Expectancy** 1. Long 2. Medium 3. Short	**Crown Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Ht.** Approx. metres	**Crown Spread** approx. metres / **Orientation** N= north S= South E= East W=West				**Crown Cover** % / **Crown Density** % / D = dormant	**DBH** in mm @ 1.4m, or other, as indicated / **Trunk Orientation** other than R = radial, e.g., N/S g = ground	**Trunk Lean** 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / **Orientation** / ST = Static P = Progressive Sc = Self-correcting	**Roots Evident at Root Crown** 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	**Pests, Diseases & Damage** No or Yes If Yes see comments	**Branch Bark Included** No or Yes or N/A	**Form** G = Good Form F = Fair Form P = Poor Form	**Significance scale** 1=High 2=Medium 3=Low / **Retention Value** 1=High 2=Medium 3=Low 4=Remove
21	*Eucalyptus paniculata*	M	GV	F	MGVF – 9 2	C	8	3 N	3 S	3 E	3 W	70 70	300 R	1/R ST	1	NO	NO	G	2 2
	Grey Ironbark	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
22	*Eucalyptus punctata*	M	GV	F	MGVF – 9 2.5	C	15	6 N	6 S	6 E	6 W	60 60	500 R	2/SE ST	1	YES	NO	P	2 3
	Grey Gum	Comments: Trunk with moderate lean to the south-east. Major trunk wound and cavity to basal area of trunk.																	
23	*Brachychiton rupestris*	M	GV	G	MGVG - 10 1	C	5	2 N	2 S	2 E	2 W	50 60	400 R	1/R ST	1	NO	NO	F	2 2
	Bottle Tree	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
24	*Eucalyptus sp.*	M	GV	F	MGVF – 9 2	E	7	2 N	2 S	2 E	2 W	70 70	250 R	2/S ST	1	NO	NO	P	2 3
	Eucalypt	Comments: Trunk with moderate lean to the south, crown deliquescent, orientation radial, symmetrical.																	
25	*Brachychiton discolor*	Y	GV	G	YGVG – 9 1	C	5	2 N	2 S	2 E	2 W	70 70	100 R	1/R ST	1	NO	NO	G	2 2
	Lace Bark Tree	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
26	*Ceratonia siliqua*	M	GV	F	MGVF – 9 2	C	5	3 N	3 S	3 E	3 W	50 60	250#@g R	5/R ST	1	NO	NO	F	2 3
	Carob Tree	Comments: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.																	
27	*Eucalyptus saligna*	M	GV	G	MGVG – 10 1	D	20	9 N	9 S	9 E	9 W	70 70	1200 / R 1300 DARB	1/R ST	1	NO	NO	G	1 1
	Sydney Blue Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
28	*Brachychiton acerifolius*	M	GV	F	MGVF – 9 2	E	6	3 N	3 S	3 E	3 W	60 60	200/R 240 DARB	1/R ST	1	NO	NO	F	2 2
	Illawarra Flame Tree	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
29	*Eucalyptus sp.*	M	GV	F	MGVF – 9 2	D		N	S	E	W		R	1/R ST	1	YES	NO	P	2 3
	Eucalypt	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Termite nest evident in upper canopy																	
30	*Ligustrum lucidum*																		 4
	Broad-Leaf Privet	Comments: *Noxious weed species*																	

Tree No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation N= north S= South E= East W=West				Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk Orientation other than R = radial, e.g., N/S g = ground	Trunk Lean 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / ST = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form F = Fair Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
31	*Ligustrum lucidum*																		4
	Broad-Leaf Privet	Comments: *Noxious weed species*																	
32	*Ligustrum lucidum*																		4
	Broad-Leaf Privet	Comments: *Noxious weed species*																	
33	*Ligustrum lucidum*																		4
	Broad-Leaf Privet	Comments: *Noxious weed species*																	
34	*Ligustrum lucidum*																		4
	Broad-Leaf Privet	Comments: *Noxious weed species*																	
35	*Ligustrum lucidum*																		4
	Broad-Leaf Privet	Comments: *Noxious weed species*																	
36	*Ligustrum lucidum*																		4
	Broad-Leaf Privet	Comments: *Noxious weed species*																	
37	*Eucalyptus paniculata*	M	GV	G	MGVG – 10 1	D	15	4 N	4 S	4 E	4 W	70 70	400 R	1/R ST	1	NO	NO	G	2 2
	Grey Ironbark	Comments:																	
38	*Eucalyptus saligna*	M	GV	G	MGVG – 10 1	C	18	6 N	6 S	6 E	6 W	70 70	500 R	1/R ST	1	NO	NO	G	1 1
	Sydney Blue Gum	Comments:																	
39	*Eucalyptus saligna*	M	GV	G	MGVG – 10 1	C	12	6 N	6 S	6 E	6 W	70 70	800 R	1/R ST	1	NO	NO	G	1 1
	Sydney Blue Gum	Comments:																	
40	*Eucalyptus saligna*	M	GV	G	MGVG – 10 1	C	15	6 N	6 S	6 E	6 W	70 70	700 R	1/R ST	1	NO	NO	G	1 1
	Sydney Blue Gum	Comments:																	

Tree No.	***Genus & Species*** **Common Name**	**Age** Y = Young M = Mature O = Overmature	**Vigour** GV = Good Vigour LV = Low Vigour	**Condition** G = Good F = Fair P = Poor D = Dead	**1. SRIV** Age, Vigour, Condition / Index Rating www.iaca.org.au / **2. Estimated Life Expectancy** 1. Long 2. Medium 3. Short	**Crown Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Ht.** Approx. metres	**Crown Spread** approx. metres / **Orientation** N= north S= South E= East W=West				**Crown Cover** % / **Crown Density** % / D = dormant	**DBH** in mm @ 1.4m, or other, as indicated / **Trunk Orientation** other than R = radial, e.g., N/S g = ground	**Trunk Lean** 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / **Orientation** / ST = Static P = Progressive Sc = Self-correcting	**Roots Evident at Root Crown** 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	**Pests, Diseases & Damage** No or Yes If Yes see comments	**Branch Bark Included** No or Yes or N/A	**Form** G = Good Form F = Fair Form P = Poor Form	**Significance scale** 1=High 2=Medium 3=Low / **Retention Value** 1=High 2=Medium 3=Low 4=Remove
41	*Pittosporum undulatum*	M	GV	F	MGVF – 2	C	10	3	3	3	3	70	200	1/R	1	NO	NO	F	2
					2			N	S	E	W	70	R	ST					2
	Native Daphne	Comments: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.																	
42	*Pittosporum undulatum*	M	GV	F	MGVF – 2	C	6	2	2	2	2	60	100	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
43	*Pittosporum undulatum*	M	GV	F	MGVF – 2	C	5	1	1	1	1	60	100	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
44	*Pittosporum undulatum*	M	GV	F	MGVF – 2	C	9	2	2	2	2	60	200	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
45	*Pittosporum undulatum*	M	GV	F	MGVF – 2	C	7	2	2	2	2	60	200	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
46	*Pittosporum undulatum*	M	GV	F	MGVF – 2	C	6	1	1	1	1	60	200	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
47	*Pittosporum undulatum*	M	GV	F	MGVF – 2	C	5	2	2	2	2	60	200	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
48	*Pittosporum undulatum*	M	GV	F	MGVF – 2	C	7	2.5	2.5	2.5	2.5	60	200	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
49	*Pittosporum undulatum*	M	GV	F	MGVF – 2	C	10	5	5	5	5	60	300	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
50	*Pittosporum undulatum*	M	GV	F	MGVF – 2	C	10	4	4	4	4	60	400	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	

Tree No.	***Genus & Species*** **Common Name**	**Age** Y = Young M = Mature O = Overmature	**Vigour** GV = Good Vigour LV = Low Vigour	**Condition** G = Good F = Fair P = Poor D = Dead	**1. SRIV** Age, Vigour, Condition / Index Rating www.iaca.org.au / **2. Estimated Life Expectancy** 1. Long 2. Medium 3. Short	**Crown Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Ht.** Approx. metres	**Crown Spread** approx. metres / **Orientation** N= north S= South E= East W=West				**Crown Cover** % / **Crown Density** % / D = dormant	**DBH** in mm @ 1.4m, or other, as indicated / **Trunk Orientation** other than R = radial, e.g., N/S g = ground	**Trunk Lean** 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Aculescent / **Orientation** / ST = Static P = Progressive Sc = Self-correcting	**Roots Evident at Root Crown** 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	**Pests, Diseases & Damage** No or Yes If Yes see comments	**Branch Bark Included** No or Yes or N/A	**Form** G = Good Form F = Fair Form P = Poor Form	**Significance scale** 1=High 2=Medium 3=Low / **Retention Value** 1=High 2=Medium 3=Low 4=Remove
51	*Pittosporum undulatum*	M	GV	F	MGVF – 2 2	C	12	4 N	4 S	4 E	4 W	60 60	400 R	1/R ST	1	NO	NO	F	2 2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
52	*Pittosporum undulatum*	M	GV	F	MGVF – 2 2	C	12	4 N	4 S	4 E	4 W	60 60	400 R	1/R ST	1	NO	NO	F	2 2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
53	*Pittosporum undulatum*	M	GV	F	MGVF – 2 2	C	15	5 N	5 S	5 E	5 W	60 60	500 R	1/R ST	1	NO	NO	F	2 2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
54	*Ligustrum lucidum*																		4
	Broad-Leaf Privet	Comments: *Noxious weed species*																	
55	*Glochidion ferdinandi*	O	LV	F	OLVF – 2 2	C	15	5 N	3 S	3 E	3 W	50 50	600 R	1/R ST	1	YES	NO	F	2 3
	Cheese Tree	Comments: Senescent specimen																	
56	*Glochidion ferdinandi*	O	LV	F	OLVF – 2 2	C	10	4 N	4 S	4 E	4 W	50 50	600 R	1/R ST	1	YES	NO	F	2 3
	Cheese Tree	Comments: Senescent specimen																	
57	*Ligustrum lucidum*																		4
	Broad-Leaf Privet	Comments: *Noxious weed species*																	
58	*Pinus radiata*	O	LV	P	OLVP – 0 2.5	D	16	5 N	5 S	5 E	5 W	60 60	600 R	1/R ST	1	YES	NO	P	3 4
	Radiata Pine	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Senescent specimen																	
59	*Pinus radiata*	O	LV	P	OLVP – 0 2.5	D	18	4 N	4 S	4 E	4 W	60 60	700 R	1/R ST	1	YES	NO	P	3 4
	Radiata Pine	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Senescent specimen																	
60	*Pittosporum undulatum*	M	GV	F	MGVF – 2 2	C	7	2 N	2 S	2 E	2 W	60 60	300 R	1/R ST	1	NO	NO	G	2 2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	

Tree No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation N= north S= South E= East W=West				Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk Orientation other than R = radial, e.g., N/S g = ground	Trunk Lean 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / ST = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form F = Fair Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
61	*Acacia glaucescens*	Y	GV	G	YGVG - 9	C	12	4	4	4	4	70	400	1/R	1	NO	NO	G	2
					1			N	S	E	W	70	R	ST					2
	Coastal Myall Wattle	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
62	*Acacia glaucescens*	Y	GV	G	YGVG - 9	C	12	2	2	2	2	70	400	1/R	1	NO	NO	G	2
					1			N	S	E	W	70	R	ST					2
	Coastal Myall Wattle	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
63	*Acacia glaucescens*	Y	GV	G	YGVG -9	C	10	2	2	2	2	70	400	1/R	1	NO	NO	G	2
					1			N	S	E	W	70	R	ST					2
	Coastal Myall Wattle	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
64	*Acacia floribunda*	Y	GV	G	YGVG - 9	C	12	2	2	2	2	70	400	1/R	1	NO	NO	G	2
					1			N	S	E	W	70	R	ST					2
	Gossamer Wattle	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
65	*Acacia floribunda*	Y	GV	G	YGVG - 9	C	10	2	2	2	2	70	400	1/R	1	NO	NO	G	2
					1			N	S	E	W	70	R	ST					2
	Gossamer Wattle	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
66	*Acacia floribunda*	Y	GV	G	YGVG - 9	C	12	4	4	4	4	70	300	1/R	1	NO	NO	G	2
					1			N	S	E	W	70	R	ST					2
	Gossamer Wattle	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
67	*Acacia glaucescens*	Y	GV	G	YGVG - 9	C	15	4	4	4	4	70	300	1/R	1	NO	NO	G	2
					1			N	S	E	W	70	R	ST					2
	Coastal Myall Wattle	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
68	*Acacia glaucescens*	Y	GV	G	YGVG - 9	C	15	2	2	2	2	70	300	1/R	1	NO	NO	G	2
					1			N	S	E	W	70	R	ST					2
	Coastal Myall Wattle	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
69	*Acacia floribunda*	Y	GV	G	YGVG - 9	C	12	2	2	2	2	70	300	1/R	1	NO	NO	G	2
					1			N	S	E	W	70	R	ST					2
	Gossamer Wattle	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
70	*Glochidion ferdinandi*	M	LV	F	MLVF - 4	C	12	5	5	2	2	40	300	1/R	1	YES	NO	F	2
					2			N	S	E	W	40	R	ST					3
	Cheese Tree	Comments: Trunk erect, straight, gradually tapering & continuous, orientation N/S, asymmetrical excurrent crown. Senescent specimen.																	

Tree No.	***Genus & Species*** **Common Name**	**Age** Y = Young M = Mature O = Overmature	**Vigour** GV = Good Vigour LV = Low Vigour	**Condition** G = Good F = Fair P = Poor D = Dead	**1. SRIV** Age, Vigour, Condition / Index Rating www.iaca.org.au / **2. Estimated Life Expectancy** 1. Long 2. Medium 3. Short	**Crown Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Ht.** Approx. metres	**Crown Spread** approx. metres / **Orientation** N= north S= South E= East W=West				**Crown Cover** % / **Crown Density** % / D = dormant	**DBH** in mm @ 1.4m, or other, as indicated / **Trunk Orientation** other than R = radial, e.g., N/S g = ground	**Trunk Lean** 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / **Orientation** / ST = Static P = Progressive Sc = Self-correcting	**Roots Evident at Root Crown** 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	**Pests, Diseases & Damage** No or Yes If Yes see comments	**Branch Bark Included** No or Yes or N/A	**Form** G = Good Form F = Fair Form P = Poor Form	**Significance scale** 1=High 2=Medium 3=Low / **Retention Value** 1=High 2=Medium 3=Low 4=Remove
71	*Eucalyptus paniculata*	M	GV	F	MGVF - 9 1	C	15	4 N	4 S	4 E	4 W	70 70	800 R	1/R ST	1	NO	NO	F	2 2
	Grey Ironbark	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
72	*Pittosporum undulatum*	M	GV	F	MGVF - 9 2	C	15	3 N	3 S	3 E	3 W	60 60	600 R	1/R ST	1	NO	NO	F	2 3
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
73	*Ligustrum lucidum*																		
	Broad-Leaf Privet	Comments: *Noxious weed species*																	
74	*Angophora costata*	M	GV	F	MGVF - 9 1	C	10	3 N	3 S	3 E	3 W	60 60	400 R	1/R ST	1	NO	NO	F	2 2
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
75	*Angophora costata*	M	GV	F	MGVF - 9 1	C	20	7 N	7 S	7 E	7 W	60 60	500 R	1/R ST	1	NO	NO	F	2 2
	Sydney Red Gum	Comments: Moderate lean to north into wetlands area.																	
76	*Pittosporum undulatum*	M	GV	F	MGVF - 9 2	C	8	3 N	3 S	3 E	3 W	60 60	400 R	1/R ST	1	NO	NO	F	2 2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
77	*Glochidion ferdinandi*	M	GV	F	MGVF - 9 2	C	15	4 N	4 S	4 E	4 W	60 60	500@g R	5/R ST	1	NO	NO	F	2 2
	Cheese Tree	Comments: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.																	
78	*Angophora costata*	M	GV	F	MGVF - 9 1	C	18	6 N	6 S	6 E	6 W	60 70	700 R	1/R ST	1	NO	NO	F	2 2
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
79	*Pittosporum undulatum*	M	GV	F	MGVF - 9 2	C	15	4 N	4 S	4 E	4 W	60 60	300 R	1/R ST	1	NO	NO	F	2 2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
80	*Pittosporum undulatum*	M	GV	F	MGVF - 9 2	C	10	3 N	3 S	3 E	3 W	60 60	400 R	1/R ST	1	NO	NO	F	2 2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	

Tree No.	***Genus & Species*** **Common Name**	**Age** Y = Young M = Mature O = Overmature	**Vigour** GV = Good Vigour LV = Low Vigour	**Condition** G = Good F = Fair P = Poor D = Dead	**1. SRIV** Age, Vigour, Condition / Index Rating www.iaca.org.au / **2. Estimated Life Expectancy** 1. Long 2. Medium 3. Short	**Crown Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Ht.** Approx. metres	**Crown Spread** approx. metres / **Orientation** N= north S= South E= East W=West				**Crown Cover** % / **Crown Density** % / D = dormant	**DBH** in mm @ 1.4m, or other, as indicated / **Trunk Orientation** other than R = radial, e.g., N/S g = ground	**Trunk Lean** 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / **Orientation** / ST = Static P = Progressive Sc = Self-correcting	**Roots Evident at Root Crown** 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	**Pests, Diseases & Damage** No or Yes If Yes see comments	**Branch Bark Included** No or Yes or N/A	**Form** G = Good Form F = Fair Form P = Poor Form	**Significance scale** 1=High 2=Medium 3=Low / **Retention Value** 1=High 2=Medium 3=Low 4=Remove
81	*Glochidion ferdinandi*	M	LV	F	MLVF - 4	C	12	5	5	2	2	40	300	1/R	1	YES	NO	F	2
					2			N	S	E	W	40	R	ST					3
	Cheese Tree	Comments: Trunk erect, straight, gradually tapering & continuous, orientation N/S, asymmetrical excurrent crown. Senescent specimen.																	
82	*Eucalyptus piperita*	M	GV	F	MGVF - 9	C	16	6	6	6	6	70	800	2/N	1	NO	NO	G	1
					1			N	S	E	W	70	R	ST					1
	Sydney Peppermint	Comments: Moderate lean-to north correcting.																	
83	*Pittosporum undulatum*	M	GV	F	MGVF - 9	C	7	3	3	3	3	60	200	1/R	1	NO	NO	F	2
					1			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
84	*Eucalyptus piperita*	M	GV	G	MGVG - 10	C	20	7	7	7	7	70	900	1/R	1	NO	NO	G	1
					1			N	S	E	W	70	R	ST					1
	Sydney Peppermint	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
85	*Pittosporum undulatum*	M	GV	F	MGVF - 9	C	15	4	4	4	4	60	400	1/R	1	NO	NO	F	2
					1			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
86	*Eucalyptus piperita*	M	GV	G	MGVG - 10	C	18	6	6	6	6	70	700	1/R	1	NO	NO	G	1
					1			N	S	E	W	70	R	ST					1
	Sydney Peppermint	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
87	*Pittosporum undulatum*	M	GV	F	MGVF - 9	C	15	5	5	2	2	70	500	1/R	1	NO	NO	F	2
					1			N	S	E	W	70	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, orientation N/S, asymmetrical excurrent crown.																	
88	*Pittosporum undulatum*	M	GV	F	MGVF - 9	C	15	5	5	2	2	70	600	1/R	1	NO	NO	F	2
					1			N	S	E	W	70	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, orientation N/S, asymmetrical excurrent crown.																	
89	*Eucalyptus piperita*	M	GV	F	MGVF - 9	C	20	5	5	5	5	70	900	1/R	1	NO	NO	G	1
					1			N	S	E	W	70	R	ST					1
	Sydney Peppermint	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
90	*Eucalyptus piperita*	M	GV	G	MGVG - 10	C	20	10	10	10	10	70	1300	1/R	1	NO	NO	G	1
					1			N	S	E	W	70	R	ST					1
	Sydney Peppermint	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	

Tree No.	***Genus & Species*** **Common Name**	**Age** Y = Young M = Mature O = Overmature	**Vigour** GV = Good Vigour LV = Low Vigour	**Condition** G = Good F = Fair P = Poor D = Dead	**1. SRIV** Age, Vigour, Condition / Index Rating www.iaca.org.au / **2. Estimated Life Expectancy** 1. Long 2. Medium 3. Short	**Crown Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Ht.** Approx. metres	**Crown Spread** approx. metres / **Orientation** N= north S= South E= East W=West				**Crown Cover** % / **Crown Density** % / D = dormant	**DBH** in mm @ 1.4m, or other, as indicated / **Trunk Orientation** other than R = radial, e.g., N/S g = ground	**Trunk Lean** 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / **Orientation** / ST = Static P = Progressive Sc = Self-correcting	**Roots Evident at Root Crown** 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	**Pests, Diseases & Damage** No or Yes If Yes see comments	**Branch Bark Included** No or Yes or N/A	**Form** G = Good Form F = Fair Form P = Poor Form	**Significance scale** 1=High 2=Medium 3=Low / **Retention Value** 1=High 2=Medium 3=Low 4=Remove
91	*Pittosporum undulatum*	M	GV	F	MGVF - 9	C	7	3	3	3	3	60	200	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
92	*Pittosporum undulatum*	M	GV	F	MGVF - 9	C	7	3	3	3	3	60	200	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
93	*Pinus radiata*	M	GV	F	MGVF - 9	C	10	5	5	5	5	60	600	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					1
	Radiata Pine	Comments:																	
94	*Pinus radiata*	M	GV	F	MGVF - 9	D	25	10	10	10	10	70	1300	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					1
	Radiata Pine	Comments:																	
95	*Pittosporum undulatum*	M	GV	F	MGVF - 9	C	6	3	3	3	3	60	300	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
96	*Glochidion ferdinandi*	M	GV	F	MGVF - 9	C	5	2	2	2	2	60	100	5/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Cheese Tree	Comments: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.																	
97	*Glochidion ferdinandi*	M	GV	F	MGVF - 9	C	5	2	2	2	2	60	100	5/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Cheese Tree	Comments: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.																	
98	*Pittosporum undulatum*	M	GV	F	MGVF - 9	C	5	2	2	2	2	60	200	1/R	1	NO	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
99	*Cedrus deodara*	M	GV	F	MGVF - 9	C	16	5	5	5	5	70	800	1/R	1	NO	NO	G	2
					2			N	S	E	W	60	R	ST					1
	Himalayan Cedar	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
100	*Pinus radiata*	M	GV	F	MGVF - 9	C	16	7	7	7	7	70	1000	1/R	1	NO	NO	G	2
					2			N	S	E	W	70	R	ST					1
	Radiata Pine	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	

Tree No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation N= north S= South E= East W=West				Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk Orientation other than R = radial, e.g., N/S g = ground	Trunk Lean 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / ST = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form F = Fair Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
101	*Dead*																		
		Comments:																	
102	*Pittosporum undulatum*	M	GV	F	MGVF - 9 2	C	7	2.5 N	2.5 S	2.5 E	2.5 W	60 60	200 R	1/R ST	1	NO	NO	F	2 2
	Native Daphne	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
103	*Eucalyptus piperita*	M	GV	F	MGVF - 9 2	C	15	7 N	7 S	7 E	7 W	60 70	600 R	1/R ST	1	NO	NO	F	2 1
	Sydney Peppermint	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
104	*Eucalyptus piperita*	M	GV	F	MGVF - 9 2	C	12	6 N	6 S	6 E	6 W	60 70	1000 R	1/R ST	1	YES	NO	F	2 1
	Sydney Peppermint	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Termites evident in upper crown.																	
105	*Pittosporum undulatum*	M	GV	F	MGVF - 9 2	C	15	4 N	4 S	4 E	4 W	60 60	500 R	5/R ST					2 2
	Native Daphne	Comments: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.																	
106	*Eucalyptus oblonga*	M	GV	F	MGVF - 9 1	C	20	7 N	7 S	7 E	7 W	60 60	700 R	1/R ST	1	YES	NO	F	2 1
	White Stringybark	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
107	*Pittosporum undulatum*	M	GV	F	MGVF - 9 2	C	15	4 N	4 S	4 E	4 W	60 60	400 R	5/R ST	1	YES	NO	F	2 2
	Native Daphne	Comments: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.																	
108	*Corymbia gummifera*	M	GV	F	MGVF - 9 1	C	20	7 N	7 S	7 E	7 W	60 60	1000 R	1/R ST	1	YES	NO	F	2 1
	Red Bloodwood	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
109	*Eucalyptus fibrosa*	M	GV	F	MGVF - 9 1	C	20	7 N	7 S	7 E	7 W	60 60	1100 R	1/R ST	1	YES	NO	F	2 1
	Broad-leaved Ironbark	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
110	*Eucalyptus fibrosa*	M	GV	F	MGVF - 9 1	C	10	5 N	5 S	5 E	5 W	60 60	500 R	1/R ST	1	NO	NO	F	2 2
	Broad-leaved Ironbark	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	

Tree No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation N= north S= South E= East W=West				Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk Orientation other than R = radial, e.g., N/S g = ground	Trunk Lean 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / ST = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form F = Fair Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
111	*Eucalyptus oblonga*	M	GV	F	MGVF - 9	C	20	7	7	7	7	60	1000	1/R	1	YES	NO	F	2
					1			N	S	E	W	60	R	ST					1
	White Stringybark	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
112	*Eucalyptus oblonga*	M	GV	F	MGVF - 9	C	20	7	7	7	7	60	800	1/R	1	YES	NO	F	2
					1			N	S	E	W	60	R	ST					1
	White Stringybark	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
113	*Dead*																		
		Comments:																	
114	*Corymbia maculata*	Y	GV	F	YGVF - 8	C	8	3	3	3	3	60	400	1/R	1	YES	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Spotted Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
115	*Allocasuarina torulosa*	M	GV	F	MGVF - 9	C	15	4	4	4	4	60	400	1/R	1	YES	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Forest She Oak	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
116	*Angophora costata*	M	GV	F	MGVF - 9	C	15	5	5	5	5	70	1100	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					2
	Spotted Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. *Lopped for line clearance*																	
117	*Dead*																		
		Comments:																	
118	*Collapsed*																		
		Comments:																	
119	*Eucalyptus oblonga*	M	GV	F	MGVF - 9	C	15	4	4	4	4	60	800	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					1
	White Stringybark	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Lopped for line clearance. Competing for elements.																	
120	*Missing*																		
		Comments: Missing at time of inspection.																	

Tree No.	***Genus & Species*** **Common Name**	**Age** Y = Young M = Mature O = Overmature	**Vigour** GV = Good Vigour LV = Low Vigour	**Condition** G = Good F = Fair P = Poor D = Dead	**1. SRIV** Age, Vigour, Condition / Index Rating www.iaca.org.au / **2. Estimated Life Expectancy** 1. Long 2. Medium 3. Short	**Crown Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Ht.** Approx. metres	**Crown Spread** approx. metres / **Orientation** N= north S= South E= East W=West				**Crown Cover** % / **Crown Density** % / D = dormant	**DBH** in mm @ 1.4m, or other, as indicated / **Trunk Orientation** other than R = radial, e.g., N/S g = ground	**Trunk Lean** 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / **Orientation** / ST = Static P = Progressive Sc = Self-correcting	**Roots Evident at Root Crown** 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	**Pests, Diseases & Damage** No or Yes If Yes see comments	**Branch Bark Included** No or Yes or N/A	**Form** G = Good Form F = Fair Form P = Poor Form	**Significance scale** 1=High 2=Medium 3=Low / **Retention Value** 1=High 2=Medium 3=Low 4=Remove
121	*Corymbia eximia*	M	GV	F	MGVF - 9	F	20	5	5	5	5	70	700	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					1
	Yellow Bloodwood	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
122	*Angophora costata*	M	GV	F	MGVF - 9	F	20	5	5	5	5	70	500	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
123	*Glochidion ferdinandi*	M	GV	F	MGVF - 9	F	5	2	2	2	2	50	200	1/R	1	YES	NO	F	2
					2			N	S	E	W	50	R	ST					2
	Cheese Tree	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
124	*Angophora costata*	M	GV	F	MGVF - 9	F	15	4	4	4	4	60	600	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
125	*Angophora costata*	M	GV	F	MGVF - 9	F	8	3	3	3	3	60	200	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
126	*Angophora costata*	M	GV	F	MGVF - 9	F	10	4	4	4	4	60	300	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Lopped for line clearance. Competing for elements.																	
127	*Angophora costata*	M	GV	F	MGVF - 9	F	15	5	5	5	5	60	700	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Lopped for line clearance. Competing for elements.																	
128	*Angophora costata*	M	GV	F	MGVF - 9	F	15	4	4	4	4	60	500	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent																	
129	*Angophora costata*	M	GV	F	MGVF - 9	F	15	4	4	4	4	60	200	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Lopped for line clearance. Competing for elements.																	
130	*Corymbia eximia*	M	GV	F	MGVF - 9	F	15	4	4	4	4	60	500	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					1
	Yellow Bloodwood	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Lopped for line clearance. Competing for elements.																	

Tree No.	***Genus & Species*** **Common Name**	**Age** Y = Young M = Mature O = Overmature	**Vigour** GV = Good Vigour LV = Low Vigour	**Condition** G = Good F = Fair P = Poor D = Dead	**1. SRIV** Age, Vigour, Condition / Index Rating www.iaca.org.au / **2. Estimated Life Expectancy** 1. Long 2. Medium 3. Short	**Crown Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Ht.** Approx. metres	**Crown Spread** approx. metres / **Orientation** N= north S= South E= East W=West				**Crown Cover** % / **Crown Density** % / D = dormant	**DBH** in mm @ 1.4m, or other, as indicated / **Trunk Orientation** other than R = radial, e.g., N/S g = ground	**Trunk Lean** 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / **Orientation** / ST = Static P = Progressive Sc = Self-correcting	**Roots Evident at Root Crown** 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	**Pests, Diseases & Damage** No or Yes If Yes see comments	**Branch Bark Included** No or Yes or N/A	**Form** G = Good Form F = Fair Form P = Poor Form	**Significance scale** 1=High 2=Medium 3=Low / **Retention Value** 1=High 2=Medium 3=Low 4=Remove
131	*Eucalyptus oblonga*	M	GV	F	MGVF - 9	F	15	4	4	4	4	70	500	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	White Stringybark	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
132	*Eucalyptus piperita*	M	GV	F	MGVF - 9	F	15	4	4	4	4	70	500	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Sydney Peppermint	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
133	*Angophora costata*	M	GV	F	MGVF - 9	F	18	4	4	4	4	70	600	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
134	*Corymbia gummifera*	M	GV	F	MGVF - 9	F	16	4	4	4	4	70	600	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Red Bloodwood	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
135	*Eucalyptus piperita*	M	GV	F	MGVF - 9	F	18	5	5	5	5	70	500	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Sydney Peppermint	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
136	*Angophora costata*	M	GV	F	MGVF - 9	F	12	4	4	4	4	70	300	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
137	*Angophora costata*	M	GV	F	MGVF - 9	F	10	4	4	4	4	70	#600 (300x4)	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.																	
138	*Angophora costata*	M	GV	F	MGVF - 9	F	15	4	4	4	4	70	400	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
139	*Eucalyptus piperita*	M	GV	F	MGVF - 9	F	14	5	5	5	5	70	800	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Sydney Peppermint	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
140	*Angophora costata*	M	GV	F	MGVF - 9	F	10	3	3	3	3	70	300	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	

Tree No.	***Genus & Species*** **Common Name**	**Age** Y = Young M = Mature O = Overmature	**Vigour** GV = Good Vigour LV = Low Vigour	**Condition** G = Good F = Fair P = Poor D = Dead	**1. SRIV** Age, Vigour, Condition / Index Rating www.iaca.org.au / **2. Estimated Life Expectancy** 1. Long 2. Medium 3. Short	**Crown Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Ht.** Approx. metres	**Crown Spread** approx. metres / **Orientation** N= north S= South E= East W=West				**Crown Cover** % / **Crown Density** % / D = dormant	**DBH** in mm @ 1.4m, or other, as indicated / **Trunk Orientation** other than R = radial, e.g., N/S g = ground	**Trunk Lean** 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / **Orientation** / ST = Static P = Progressive Sc = Self-correcting	**Roots Evident at Root Crown** 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	**Pests, Diseases & Damage** No or Yes If Yes see comments	**Branch Bark Included** No or Yes or N/A	**Form** G = Good Form F = Fair Form P = Poor Form	**Significance scale** 1=High 2=Medium 3=Low / **Retention Value** 1=High 2=Medium 3=Low 4=Remove
141	*Corymbia gummifera*	M	GV	F	MGVF - 9	F	12	4	4	4	4	70	600	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					2
	Red Bloodwood	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
142	*Angophora costata*	M	GV	F	MGVF - 9	F	15	4	4	4	4	70	600	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					2
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
143	*Corymbia gummifera*	M	GV	F	MGVF - 9	F	16	3	3	3	3	60	400	1/R	1	YES	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Red Bloodwood	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
144	*Corymbia eximia*	M	GV	F	MGVF - 9	F	20	6	6	6	6	60	500	1/R	1	YES	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Yellow Bloodwood	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
145	*Angophora costata*	M	GV	F	MGVF - 9	F	18	4	4	4	4	70	500	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					2
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
146	*Eucalyptus piperita*	M	GV	F	MGVF - 9	F	18	4	4	4	4	70	600	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					2
	Sydney Peppermint	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
147	*Angophora costata*	M	GV	F	MGVF - 9	F	20	5	5	5	5	60	500	1/R	1	YES	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
148	*Corymbia gummifera*	M	GV	F	MGVF - 9	F	20	5	5	5	5	60	500	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					2
	Red Bloodwood	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
149	*Allocasuarina torulosa*	M	GV	F	MGVF - 9	F	15	3	3	3	3	60	300	1/R	1	YES	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Forest She Oak	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	
150	*Angophora costata*	M	GV	F	MGVF - 9	F	20	6	6	6	6	70	700	1/R	1	YES	NO	F	2
					2			N	S	E	W	70	R	ST					2
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent.																	

Tree No.	***Genus & Species*** **Common Name**	**Age** Y = Young M = Mature O = Overmature	**Vigour** GV = Good Vigour LV = Low Vigour	**Condition** G = Good F = Fair P = Poor D = Dead	**1. SRIV** Age, Vigour, Condition / Index Rating www.iaca.org.au / **2. Estimated Life Expectancy** 1. Long 2. Medium 3. Short	**Crown Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Ht.** Approx. metres	**Crown Spread** approx. metres / **Orientation** N= north S= South E= East W=West				**Crown Cover** % / **Crown Density** % / D = dormant	**DBH** in mm @ 1.4m, or other, as indicated / **Trunk Orientation** other than R = radial, e.g., N/S g = ground	**Trunk Lean** 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / **Orientation** / ST = Static P = Progressive Sc = Self-correcting	**Roots Evident at Root Crown** 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	**Pests, Diseases & Damage** No or Yes If Yes see comments	**Branch Bark Included** No or Yes or N/A	**Form** G = Good Form F = Fair Form P = Poor Form	**Significance scale** 1=High 2=Medium 3=Low / **Retention Value** 1=High 2=Medium 3=Low 4=Remove
151	*Allocasuarina torulosa*	M	GV	F	MGVF - 9	F	10	3	3	3	3	60	400	1/R	1	YES	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Forest She Oak	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
152	*Angophora costata*	M	GV	F	MGVF - 9	F	18	5	5	5	5	70	600	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
153	*Corymbia gummifera*	M	GV	F	MGVF - 9	F	17	5	5	5	5	70	500	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Red Bloodwood	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
154	*Allocasuarina torulosa*	M	GV	F	MGVF - 9	F	15	5	5	5	5	60	500	1/R	1	YES	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Forest She Oak	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
155	*Allocasuarina torulosa*	M	GV	F	MGVF - 9	F	15	5	5	5	5	60	500	1/R	1	YES	NO	F	2
					2			N	S	E	W	60	R	ST					2
	Forest She Oak	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
156	*Angophora costata*	M	GV	F	MGVF - 9	F	15	4	4	4	4	70	600	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
157	*Eucalyptus oblonga*	M	GV	F	MGVF - 9	F	20	5	5	5	5	70	600	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	White Stringybark	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
158	*Corymbia eximia*	M	GV	F	MGVF - 9	F	20	7	7	7	7	70	700	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Yellow Bloodwood	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
159	*Angophora costata*	M	GV	F	MGVF - 9	F	15	4	4	4	4	70	400	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
160	*Angophora costata*	M	GV	F	MGVF - 9	F	20	6	6	6	6	70	600	1/R	1	YES	NO	F	1
					2			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	

Tree No.	***Genus & Species*** **Common Name**	**Age** Y = Young M = Mature O = Overmature	**Vigour** GV = Good Vigour LV = Low Vigour	**Condition** G = Good F = Fair P = Poor D = Dead	**1. SRIV** Age, Vigour, Condition / Index Rating www.iaca.org.au / **2. Estimated Life Expectancy** 1. Long 2. Medium 3. Short	**Crown Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Ht.** Approx. metres	**Crown Spread** approx. metres / **Orientation** N= north S= South E= East W=West				**Crown Cover** % / **Crown Density** % / D = dormant	**DBH** in mm @ 1.4m, or other, as indicated / **Trunk Orientation** other than R = radial, e.g., N/S g = ground	**Trunk Lean** 1 = Upright Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / **Orientation** / ST = Static P = Progressive Sc = Self-correcting	**Roots Evident at Root Crown** 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g., R = radial, or one each to N, S, E and W	**Pests, Diseases & Damage** No or Yes If Yes see comments	**Branch Bark Included** No or Yes or N/A	**Form** G = Good Form F = Fair Form P = Poor Form	**Significance scale** 1=High 2=Medium 3=Low / **Retention Value** 1=High 2=Medium 3=Low 4=Remove
161	*Eucalyptus sp.*	M	GV	F	MGVF - 9	F	16	5	5	5	5	70	400	1/R	1	YES	NO	F	1
					1			N	S	E	W	70	R	ST					1
	Eucalypt	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
162	*Angophora costata*	M	GV	F	MGVF - 9	F	15	4	4	4	4	70	500	1/R	1	YES	NO	F	1
					1			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
163	*Angophora costata*	M	GV	F	MGVF - 9	F	16	5	5	5	5	70	500	1/R	1	YES	NO	F	1
					1			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
164	*Angophora costata*	M	GV	F	MGVF - 9	F	16	4	4	4	4	70	400	1/R	1	YES	NO	F	1
					1			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
165	*Angophora costata*	M	GV	F	MGVF - 9	F	20	5	5	5	5	70	500	1/R	1	YES	NO	F	1
					1			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
166	*Angophora costata*	M	GV	F	MGVF - 9	F	20	6	6	6	6	70	700	1/R	1	YES	NO	F	1
					1			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
167	*Angophora costata*	M	GV	F	MGVF - 9	F	20	6	6	6	6	70	700	1/R	1	YES	NO	F	1
					1			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
168	*Angophora costata*	M	GV	F	MGVF - 9	F	18	4	4	4	4	70	400	1/R	1	YES	NO	F	1
					1			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
169	*Angophora costata*	M	GV	F	MGVF - 9	F	20	5	5	5	5	70	400	1/R	1	YES	NO	F	1
					1			N	S	E	W	70	R	ST					1
	Sydney Red Gum	Comments: Trunk erect, straight, gradually tapering & continuous, crown excurrent. Competing for elements.																	
170	*Angophora costata*	M	GV	F	MGVF - 9	D	20	6	6	3	5	70	1200	2/S	1	YES	YES	P	2
					2			N	S	E	W	70	R	ST					2
	Sydney Red Gum	Comments: Trunk to 5 meters then asymmetrical to south due to Apical snapped out years ago exposing heartwood to the elements.																	

Observations

7.2 The site has a stand of young, mature or senescent, remnant or progeny and planted or self-sown endemic and non-locally indigenous and exotic evergreen taxa within the current proposal. The proposed design requires the retention and protection of T.B.A. specimens within the site as they are considered significant for their contribution as landscape elements to the property and the retention of these trees allows them as components of the current curtilage to be transferred to the new proposal, maintaining elements of a continuous landscape, providing a more harmonious integration and transition of the use of the land.

Tree Significance

7.3 Significant Trees as established by the Rating System for Tree Significance – IACA Stars (2010), Appendix A.

Significance Scale
1 – High
2 – Medium
3 – Low

Significance Scale	Redgum Tree No.
1	1, 2, 4, 7, 8, 9, 11, 13, 14, 15, 16, 27, 38, 39, 40, 82, 84, 86, 89, 90, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 152, 153, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169
2	3, 5, 6, 10, 12, 18, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 37, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 55, 56, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 74, 75, 76, 77, 78, 79, 80, 81, 83, 85, 87, 88, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 114, 115, 116, 119, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130,141, 142, 144, 145, 146, 147, 148, 149, 150, 151, 154, 155, 170
3	58, 59, 81

Tree Retention Value

7.4 See Appendix A for Retention Value Matrix.

Retention Value
High – Priority for Retention
Medium – Consider for Retention
Low – Consider for Removal
Remove - Priority for Removal

Retention Value	Redgum Tree No.
High Priority for Retention	1, 2, 4, 7, 8, 9, 27, 38, 39, 40, 82, 84, 86, 89, 90, 93, 94, 99, 100, 103, 104, 106, 108, 109, 111, 112, 119, 121, 122, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 152, 153, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169
Medium Consider for Retention	10, 12, 19, 21, 23, 25, 28, 37, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 71, 74, 75, 76, 77, 78, 79, 80, 83, 85, 87, 88, 91, 92, 95, 96, 97, 98, 102, 105, 107, 110, 114, 115, 116, 123, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 154, 155, 170
Low Consider for Removal	3, 5, 6, 18, 20, 22, 24, 26, 29, 55, 56, 70, 72, 81
Remove Priority for Removal	17, 30, 31, 32, 33, 34, 35, 36, 54, 57, 58, 59, 73, 101, 113, 117, 118

7.5 AS4970 (2009) section 3, 3.3.3 requires the Project Arborist to demonstrate that where a retained tree is subject to a major encroachment (>10% of area of TPZ) it can be protected to remain viable

7.6 WORK IN PROGRESS –
TO BE COMPLETED

Demolition and Tree Removal/s

7.7 Trees 18, 55, 56, 58, 59, 70 & 81are to be removed as they are not worthy of retention or located within the site in a position where they cannot be retained due to the proposed building footprints and associated infrastructure where encroachment will have an adverse impact on its roots and crown for viability and stability.

- Tree 17, 30, 31, 32, 33, 34, 35, 36, 54, 57 & 73: *Ligustrum lucidum* - Broad-Leaf Privet; these noxious weed specimens are located within the site and recommended for removal independent to any development works.
- Tree 18, 55, 56, 70 & 81: *Eucalyptus nicholii* - Narrow leafed Black Peppermint *& Glochidion ferdinandi* – Cheese Tree; located these senescent specimens are located within the stie and recommended to be removed and replaced as part of the landscape works for the proposed redevelopment of the site.
- Tree 58 & 59: *Pinus radiata* – Radiata Pine; these senescent specimens are located within the site and are recommended to be removed and replaced as part of the proposed landscape works.
- Tree 101, 113 & 117; these specimens are dead or have collapsed and are recommended to be removed independent to the proposed development works.

7.8 Removal of a tree within 6 m of a tree to be retained should be undertaken only by cutting down such a tree without damaging the trees to be retained, and by grinding out its stump. Where possible the structural roots of 20 mm diameter or greater of the tree to be cut down should not be removed, to minimise soil disturbance and to reduce the impact on the roots of any tree to be retained nearby. Where structural roots are to be removed, this should be undertaken manually by the use of non-motorised hand tools after the stump has been ground out when such roots are often easier to locate from the site of the stump from which they have been severed.

Specific - Tree works – Post Construction

7.9 Trees to be removed are to be replaced with advanced specimens being mindful of the space limitations of the new use of the site. The advanced trees should be situated in areas along the boundaries of the site. The planting in these locations will provide the maximum benefit to the surrounding properties by screening views to and from the site and the plantings included in the proposed landscape plan. The replacement trees will be situated in positions where they may grow to maturity unhindered and will not conflict with built structures or utility services and in greater numbers than the trees removed should provide a net increase in the local amenity.

8.0 CONCLUSION

Seven (7) trees are nominated for removal and replacement with species in accordance with the associated Landscape documentation for the development with a further fifteen (15) weed, dead or collapsed specimens recommended for removal independent to the proposed development. The T.B.A trees to be preserved will be retained and protected through the implementation of adequate measures for their integration into the development by the application of appropriate technology as detailed in this report. Where appropriate, the Landscape Plan will include planting with new trees including street tree/s.

The recommendations made in this report are subject to approval by the consent authority.

9.0 RECOMMENDATIONS

9.1 Trees T.B.A. are to be retained in situ within the site and are to be protected as detailed in 7.5 – 7.6 and Section 14 of part B of this report. Tree protection fences, or works, to be situated in accordance with *Site Plan B - Trees to be Retained and Tree Protection Zones* (Appendix F). *See Tree Protection Plan for additional protection measures for the management of retained specimens.*

9.2 Trees 18, 55, 56, 58, 59, 70 & 81 are recommended for removal as part of the proposed development, subject to approval from the consent authority, with trees 17, 30, 3,1 3,2 33, 34, 35, 36, 54, 57, 73, 101, 113, 117 & 118 recommended to be removed independent to the proposed development with works to be undertaken in accordance with 7.7 - 7.8 and Section 13 of Part B of this report.

9.3 Each of the replacement are to be a vigorous specimen with a straight trunk, gradually tapering and continuous, crown excurrent, symmetrical, with roots established but not pot bound in a volume container or approved similar and be maintained by an appropriately qualified and experienced landscape contractor for up to one (1) year after planting, or as appropriate.

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Arboriculture Australia (AA) 2005 - 2011 & 2015
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DISCLAIMER
The author and Redgum Horticultural take no responsibility for actions taken and their consequences, contrary to those expert and professional instructions given as recommendations pertaining to safety by way of exercising our responsibility to our client and the public as our duty of care commitment, to mitigate or prevent hazards from arising, from a failure moment in full or part, from a structurally deficient or unsound tree or a tree likely to be rendered thus by its retention and subsequent modification/s to its growing environment either above or below ground contrary to our advice.

REFERENCES

1. Draper BD and Richards PA 2009, *Dictionary for Managing Trees in Urban Environments*, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.
2. IACA 2005, Sustainable Retention Index Value, *Institute of Australian Consulting Arboriculturists*, Australia, www.iaca.org.au .
3. Standards Australia 2007, *Australian Standard 4373 Pruning of amenity trees*, Standards Australia, Sydney, Australia.
4. Standards Australia 2009, *Australian Standard 4970 Protection of trees on development sites*, Standards Australia, Sydney, Australia.
5. Safe Work Australia, *Guide to Managing Risk from Tree Trimming and Removal Works.*

Appendix A

IACA Significance of a Tree, Assessment Rating System (STARS) © (IACA 2010) ©

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009.

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of *High*, *Medium* and *Low* significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined.

Tree Significance - Assessment Criteria

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1. High Significance in landscape

- The tree is in good condition and good vigour.
- The tree has a form typical for the species.
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age.
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered Ecological Community or listed on Councils Significant Tree Register.
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity.
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values.
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa *in situ* - tree is appropriate to the site conditions.

2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour.
- The tree has form typical or atypical of the species.
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa *in situ*.

3. Low Significance in landscape

- The tree is in fair-poor condition and good or low vigour.
- The tree has form atypical of the species.
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa *in situ* - tree is inappropriate to the site conditions,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.

Environmental Pest / Noxious Weed Species

- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.

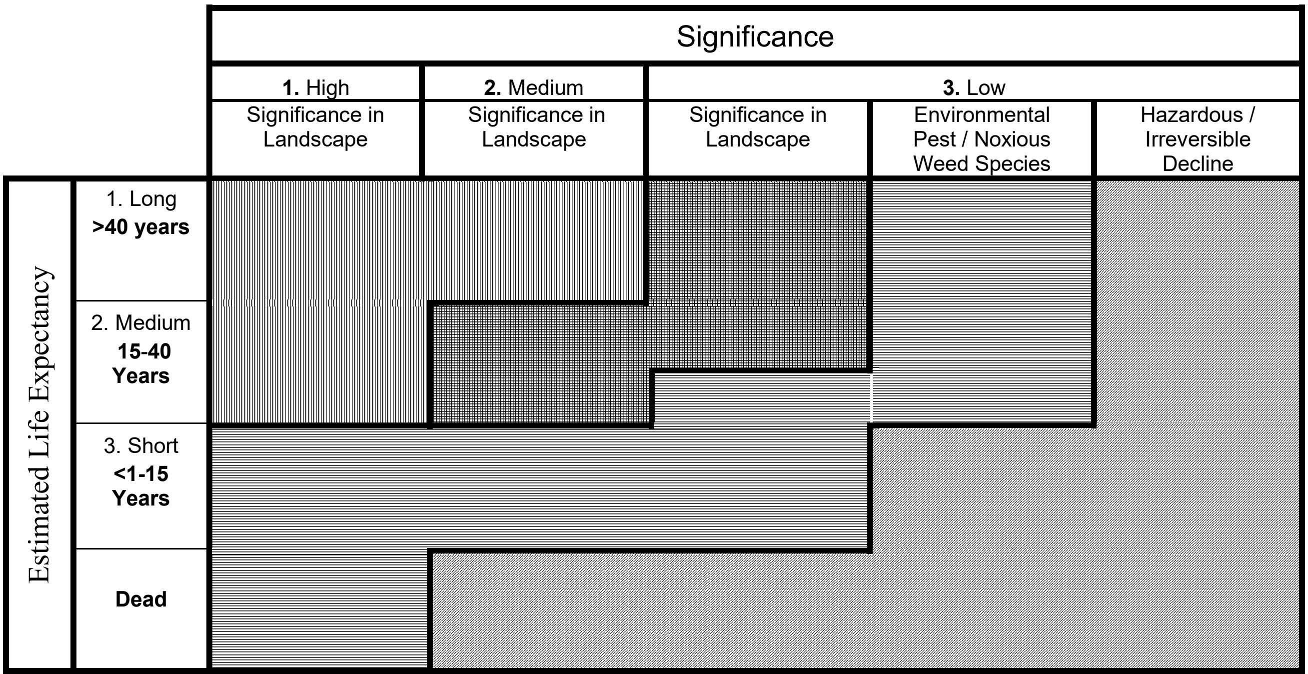
Hazardous/Irreversible Decline

- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

The tree is to have a minimum of three (3) criteria in a category to be classified in that group.

Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g., hedge.

Table 1.0 Tree Retention Value - Priority Matrix.



Legend for Matrix Assessment

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Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 *Protection of trees on development sites*. Tree sensitive construction measures must be implemented e.g., pier and beam etc if works are to proceed within the Tree Protection Zone.

Consider for Retention (Medium) - These trees may be retained and protected. These are considered less critical; however, their retention should remain priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.

Consider for Removal (Low) - These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.

Priority for Removal - These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

REFERENCES

Australia ICOMOS Inc. 1999, *The Burra Charter – The Australian ICOMOS Charter for Places of Cultural Significance*, International Council of Monuments and Sites, www.icomos.org/australia

Draper BD and Richards PA 2009, *Dictionary for Managing Trees in Urban Environments*, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Footprint Green Pty Ltd 2001, *Footprint Green Tree Significance & Retention Value Matrix*, Avalon, NSW Australia, www.footprintgreen.com.au

Appendix B

Matrix - Sustainable Retention Index Value (S.R.I.V.) ©

Version 4, 2010

Developed by IACA – Institute of Australian Consulting Arboriculturists www.iaca.org.au

The matrix is to be used with the value classes defined in the Glossary for Age / Vigour / Condition.
An index value is given to each category where ten (10) is the highest value.

Age Class	Vigour Class and Condition Class					
	Good Vigour & Good Condition (GVG)	Good Vigour & Fair Condition (GVF)	Good Vigour & Poor Condition (GVP)	Low Vigour & Good Condition (LVG)	Low Vigour & Fair Condition (LVF)	Low Vigour & Poor Condition (LVP)
	Able to be retained if sufficient space available above and below ground for future growth. No remedial work or improvement to growing environment required. May be subject to high vigour. Retention potential - Medium – Long Term.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work may be required or improvement to growing environment may assist. Retention potential - Medium Term. Potential for longer with remediation or favourable environmental conditions.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work unlikely to assist condition, improvement to growing environment may assist. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. No remedial work required, but improvement to growing environment may assist vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment may assist condition and vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	Unlikely to be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment unlikely to assist condition or vigour. Retention potential - Likely to be removed immediately or retained for Short Term. Potential for longer with remediation or favourable environmental conditions.
(Y) Young	YGVG - 9 Index Value 9 Retention potential - Long Term. Likely to provide minimal contribution to local amenity if height <5 m. High potential for future growth and adaptability. Retain, move or replace.	YGVF - 8 Index Value 8 Retention potential - Short – Medium Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Medium-high potential for future growth and adaptability. Retain, move or replace.	YGVP - 5 Index Value 5 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Low-medium potential for future growth and adaptability. Retain, move or replace.	YLVG - 4 Index Value 4 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Medium potential for future growth and adaptability. Retain, move or replace.	YLVF - 3 Index Value 3 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Low-medium potential for future growth and adaptability. Retain, move or replace.	YLVP - 1 Index Value 1 Retention potential - Likely to be removed immediately or retained for Short Term. Likely to provide minimal contribution to local amenity if height <5 m. Low potential for future growth and adaptability.
(M) Mature	MGVG - 10 Index Value 10 Retention potential -Medium - Long Term.	MGVF - 9 Index Value 9 Retention potential - Medium Term. Potential for longer with improved growing conditions.	MGVP - 6 Index Value 6 Retention potential - Short Term. Potential for longer with improved growing conditions.	MLVG - 5 Index Value 5 Retention potential - Short Term. Potential for longer with improved growing conditions.	MLVF - 4 Index Value 4 Retention potential - Short Term. Potential for longer with improved growing conditions.	MLVP - 2 Index Value 2 Retention potential - Likely to be removed immediately or retained for Short Term.
(O) Over-mature	OGVG - 6 Index Value 6 Retention potential - Medium - Long Term.	OGVF - 5 Index Value 5 Retention potential - Medium Term.	OGVP - 4 Index Value 4 Retention potential - Short Term.	OLVG - 3 Index Value 3 Retention potential - Short Term. Potential for longer with improved growing conditions.	OLVF - 2 Index Value 2 Retention potential - Short Term.	OLVP - 0 Index Value 0 Retention potential - Likely to be removed immediately or retained for Short Term.

Appendix C

Survey of Subject Tree/s

Trees the subject of this report are marked on the plans in the following appendices and are numbered as listed below.

Tree No. / Point No. (from survey)	*Genus and species*	Common name	Recommendation (work in progress)
1 / 117	*Lophostemon confertus*	Queensland Brush Box	
2 / 232	*Eucalyptus saligna*	Sydney Blue Gum	
3 / 5064	*Angophora costata*	Sydney Red Gum	
4 / 119	*Lophostemon confertus*	Queensland Brush Box	
5 / 5065	*Eucalyptus paniculata*	Grey Ironbark	
6 / 233	*Eucalyptus saligna*	Sydney Blue Gum	
7 / 234	*Eucalyptus saligna*	Sydney Blue Gum	
8 / 235	*Eucalyptus saligna*	Sydney Blue Gum	
9 / 236	*Eucalyptus saligna*	Sydney Blue Gum	
10 / 237	*Eucalyptus saligna*	Sydney Blue Gum	
11 / 239	*Eucalyptus saligna*	Sydney Blue Gum	
12 / 238	*Lophostemon confertus*	Queensland Brush Box	
13 / 182	*Syncarpia glomulifera*	Turpentine	
14 / 183	*Syncarpia glomulifera*	Turpentine	
15 / 184	*Syncarpia glomulifera*	Turpentine	
16 / 185	*Syncarpia glomulifera*	Turpentine	
17 / 5069	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
18 / 120	*Eucalyptus nicholii*	Narrow leafed Black Peppermint	Remove and replace
19 / 121	*Lophostemon confertus*	Queensland Brush Box	
20 / 5066	*Eucalyptus saligna*	Sydney Blue Gum	
21 / 123	*Eucalyptus paniculata*	Grey Ironbark	
22 / 124	*Eucalyptus punctata*	Grey Gum	
23 / 187	*Brachychiton rupestris*	Bottle Tree	
24 / 186	*Eucalyptus sp.*	Eucalypt	
25 / 5078	*Brachychiton discolor*	Lace Bark Tree	
26 / 5076	*Ceratonia siliqua*	Carob Tree	
27 / 122	*Eucalyptus saligna*	Sydney Blue Gum	
28 / 5067	*Brachychiton acerifolius*	Illawarra Flame Tree	
29 / 181	*Eucalyptus sp.*	Eucalypt	
30 / 5001	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
31 / 5002	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
32 / 5003	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
33 / 611	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
34 / 612	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
35 / 613	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
36 / 614	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
37 / 5000	*Eucalyptus paniculata*	Grey Ironbark	
38 / 338	*Eucalyptus saligna*	Sydney Blue Gum	
39 / 339	*Eucalyptus saligna*	Sydney Blue Gum	
40 / 340	*Eucalyptus saligna*	Sydney Blue Gum	
41 / 5088	*Pittosporum undulatum*	Native Daphne	
42 / 5086	*Pittosporum undulatum*	Native Daphne	
43 / 5085	*Pittosporum undulatum*	Native Daphne	
44 / 5079	*Pittosporum undulatum*	Native Daphne	
45 / 5080	*Pittosporum undulatum*	Native Daphne	
46 / 317	*Pittosporum undulatum*	Native Daphne	
47 / 5081	*Pittosporum undulatum*	Native Daphne	
48 / 5082	*Pittosporum undulatum*	Native Daphne	
49 / 318	*Pittosporum undulatum*	Native Daphne	
50 / 319	*Pittosporum undulatum*	Native Daphne	

Tree No. / Point No. (from survey)	*Genus and species*	Common name	Recommendation (work in progress)
51 / 321	*Pittosporum undulatum*	Native Daphne	
52 / 322	*Pittosporum undulatum*	Native Daphne	
53 / 323	*Pittosporum undulatum*	Native Daphne	
54 / 324	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
55 / 325	*Glochidion ferdinandi*	Cheese Tree	Remove and replace
56 / 326	*Glochidion ferdinandi*	Cheese Tree	Remove and replace
57 / 311	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
58 / 352	*Pinus radiata*	Radiata Pine	Remove and replace
59 / 361	*Pinus radiata*	Radiata Pine	Remove and replace
60 / 320	*Pittosporum undulatum*	Native Daphne	
61 / 395	*Acacia glaucescens*	Coastal Myall Wattle	
62 / 395	*Acacia glaucescens*	Coastal Myall Wattle	
63 / 396	*Acacia glaucescens*	Coastal Myall Wattle	
64 / 388	*Acacia floribunda*	Gossamer Wattle	
65 / 387	*Acacia floribunda*	Gossamer Wattle	
66 / 385	*Acacia floribunda*	Gossamer Wattle	
67 / 386	*Acacia glaucescens*	Coastal Myall Wattle	
68 / 384	*Acacia glaucescens*	Coastal Myall Wattle	
69 / 383	*Acacia floribunda*	Gossamer Wattle	
70 / 363	*Glochidion ferdinandi*	Cheese Tree	Remove and replace
71 / 228	*Eucalyptus paniculata*	Grey Ironbark	
72 / 229	*Pittosporum undulatum*	Native Daphne	
73 / 230	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
74 / 231	*Angophora costata*	Sydney Red Gum	
75 / 456	*Angophora costata*	Sydney Red Gum	
76 / 457	*Pittosporum undulatum*	Native Daphne	
77 / 458	*Glochidion ferdinandi*	Cheese Tree	
78 / 459	*Angophora costata*	Sydney Red Gum	
79 / 460	*Pittosporum undulatum*	Native Daphne	
80 / 461	*Pittosporum undulatum*	Native Daphne	
81 / 362	*Glochidion ferdinandi*	Cheese Tree	Remove and replace
82 / 370	*Eucalyptus piperita*	Sydney Peppermint	
83 / 5129	*Pittosporum undulatum*	Native Daphne	
84 / 373	*Eucalyptus piperita*	Sydney Peppermint	
85 / 378	*Pittosporum undulatum*	Native Daphne	
86 / 5119	*Eucalyptus piperita*	Sydney Peppermint	
87 / 371	*Pittosporum undulatum*	Native Daphne	
88 / 372	*Pittosporum undulatum*	Native Daphne	
89 / 402	*Eucalyptus piperita*	Sydney Peppermint	
90 / 397	*Eucalyptus piperita*	Sydney Peppermint	
91 / 5106	*Pittosporum undulatum*	Native Daphne	
92 / 5107	*Pittosporum undulatum*	Native Daphne	
93 / 465	*Pinus radiata*	Radiata Pine	
94 / 464	*Pinus radiata*	Radiata Pine	
95 / 463	*Pittosporum undulatum*	Native Daphne	
96 / 5108	*Glochidion ferdinandi*	Cheese Tree	
97 / 5109	*Glochidion ferdinandi*	Cheese Tree	
98 / 477	*Pittosporum undulatum*	Native Daphne	

Tree No. / Point No. (from survey)	*Genus and species*	Common name	Recommendation (work in progress)
99 / 478	*Cedrus deodara*	Himalayan Cedar	
100 / 479	*Pinus radiata*	Radiata Pine	
101 / 474	*Dead*		Remove – dead specimen
102 / 5120	*Pittosporum undulatum*	Native Daphne	
103 / 398	*Eucalyptus piperita*	Sydney Peppermint	
104 / 399	*Eucalyptus piperita*	Sydney Peppermint	
105 / 400	*Pittosporum undulatum*	Native Daphne	
106 / 401	*Eucalyptus oblonga*	White Stringybark	
107 / 407	*Pittosporum undulatum*	Native Daphne	
108 / 409	*Corymbia gummifera*	Red Bloodwood	
109 / 415	*Eucalyptus fibrosa*	Broad-leaved Ironbark	
110 / 418	*Eucalyptus fibrosa*	Broad-leaved Ironbark	
111 / 416	*Eucalyptus oblonga*	White Stringybark	
112 / 417	*Eucalyptus oblonga*	White Stringybark	
113 / 434	*Dead*		Remove – dead specimen
114 / 419	*Angophora costata*	Sydney Red Gum	
115 / 420	*Allocasuarina torulosa*	Forest She Oak	
116 / 421	*Angophora costata*	Sydney Red Gum	
117 / 432	*Dead*		Remove – dead specimen
118 / 433	*Collapsed*		Remove – collapsed specimen
119 / 424	*Eucalyptus oblonga*	White Stringybark	
120 / 544	*Missing*		Missing at time of inspection
121 / 429	*Corymbia eximia*	Yellow Bloodwood	
122 / 428	*Angophora costata*	Sydney Red Gum	
123 / 5093	*Glochidion ferdinandi*	Cheese Tree	
124 / 527	*Angophora costata*	Sydney Red Gum	
125 / 528	*Angophora costata*	Sydney Red Gum	
126 / 529	*Angophora costata*	Sydney Red Gum	
127 / 530	*Angophora costata*	Sydney Red Gum	
128 / 531	*Angophora costata*	Sydney Red Gum	
129 / 532	*Angophora costata*	Sydney Red Gum	
130 / 533	*Corymbia eximia*	Yellow Bloodwood	
131 / 534	*Eucalyptus oblonga*	White Stringybark	
132 / 535	*Eucalyptus piperita*	Sydney Peppermint	
133 / 536	*Angophora costata*	Sydney Red Gum	
134 / 537	*Corymbia gummifera*	Red Bloodwood	
135 / 538	*Eucalyptus piperita*	Sydney Peppermint	
136 / 549	*Angophora costata*	Sydney Red Gum	
137 / 550	*Angophora costata*	Sydney Red Gum	
138 / 551	*Angophora costata*	Sydney Red Gum	
139 / 553	*Eucalyptus piperita*	Sydney Peppermint	
140 / 546	*Angophora costata*	Sydney Red Gum	
141 / 547	*Corymbia gummifera*	Red Bloodwood	
142 / 554	*Angophora costata*	Sydney Red Gum	
143 / 559	*Corymbia gummifera*	Red Bloodwood	
144 / 557	*Corymbia eximia*	Yellow Bloodwood	
145 / 556	*Angophora costata*	Sydney Red Gum	

Tree No. / Point No. (from survey)	*Genus and species*	Common name	Recommendation (work in progress)
146 / 573	*Eucalyptus piperita*	Sydney Peppermint	
147 / 578	*Angophora costata*	Sydney Red Gum	
148 / 574	*Corymbia gummifera*	Red Bloodwood	
149 / 563	*Allocasuarina torulosa*	Forest She Oak	
150 / 575	*Angophora costata*	Sydney Red Gum	
151 / 564	*Allocasuarina torulosa*	Forest She Oak	
152 / 565	*Angophora costata*	Sydney Red Gum	
153 / 566	*Corymbia gummifera*	Red Bloodwood	
154 / 567	*Allocasuarina torulosa*	Forest She Oak	
155 / 568	*Allocasuarina torulosa*	Forest She Oak	
156 / 577	*Angophora costata*	Sydney Red Gum	
157 / 579	*Eucalyptus oblonga*	White Stringybark	
158 / 589	*Corymbia eximia*	Yellow Bloodwood	
159 / 586	*Angophora costata*	Sydney Red Gum	
160 / 585	*Angophora costata*	Sydney Red Gum	
161 / 422	*Eucalyptus sp.*	*Eucalypt*	
162 / 569	*Angophora costata*	Sydney Red Gum	
163 / 581	*Angophora costata*	Sydney Red Gum	
164 / 580	*Angophora costata*	Sydney Red Gum	
166 / 571	*Angophora costata*	Sydney Red Gum	
167 / 572	*Angophora costata*	Sydney Red Gum	
168 / 582	*Angophora costata*	Sydney Red Gum	
169 / 584	*Angophora costata*	Sydney Red Gum	
170 / 583	*Angophora costata*	Sydney Red Gum	

Appendix C

Site Plan A - Survey of Subject Trees (Sheet 1 of 2)

This report has relied upon the following plan/s and documents which have been reproduced from electronic transmission and no longer to original scale.

Appendix C

Site Plan A - Survey of Subject Trees (Sheet 2 of 2)

This report has relied upon the following plan/s and documents which have been reproduced from electronic transmission and no longer to original scale.

Redgum Legend

- Trees numbered in orange are recommended for retention.
- Trees numbered in **blue** are recommended for removal.
- Trees numbered in **black** were found to be removed or dead at inspection or shrubs, or trees of species, of dimensions, or condition class not protected by the Tree Preservation Order or trees not affected by the proposed works or missing at time of inspection.

Part B:
TREE PROTECTION PLAN
(Trees to be retained and protected)

for

Brick Pit Reserve, Bantry Road, Frenchs Forest NSW

Prepared 07 November 2022
Our Ref: 7877

10.0 PREFACE

Retention of Significant Tree/s within the continual landscape of a development is recommended to minimise the impact of the built landscape within the overall local amenity. This section of the report highlights the required specifications within the Tree Protection Plan (Tree Management Plan) and is to be read in conjunction with Part A: Arboricultural Impact Assessment of this report.

11.0 INTRODUCTION

11.1 This section of the report provides the specification/s for all tree/s to be retained (on subject site) as detailed in Part A – Arboricultural Impact Assessment.

11.2 The trees to be retained are indicated on the Site Plan - Survey of Subject Trees to be retained & Tree Protection Zones. The minimum setback for protective fencing from development works per tree to be retained is summarised in Table 1.0. Tree Protection Specifications including - Site maintenance, Site Arboricultural service, Periodic inspections, Mulching, Irrigation, Weed control / suppression, Provision of services.

11.3 Tree maintenance works including pruning, removal or transplantation are detailed in section 2.0. Works for Tree Protection on Construction Sites are detailed in section 3.0 and Tree Protection Zones a Standard Procedure as detailed in section 13.0 to be applied, or further detailed, or additional or alternative works added where appropriate.

12.0 METHODOLOGY

This Methodology where utilised is applied to both Part A – Arboricultural Impact Assessment and B – Tree Protection Plan.

12.1 The method of assessment of tree/s applied is adapted from the principles of visual tree assessment undertaken from the ground, which considers:

- Tree health and subsequent stability, both long and short term
- Sustainable Retention Index Value (SRIV) Version 4 (IACA 2010) ©
- Hazard potential to people and property
- Amenity values
- Habitat values
- Significance

12.2 This assessment is undertaken using standard tree assessment criteria for each tree based on the values above and is implemented as a result of at least one comprehensive and detailed site inspection to undertake a visual tree assessment from the ground of each individual tree, or stand of trees, or a representative population sample. Any dimensions recorded as averages, or by approximation are noted accordingly.

13.0 PRUNING STANDARDS

13.1 Any pruning recommended in this report is to be to the Australian Standard® AS4373 *Pruning of amenity trees* and conducted in accordance with the NSW Work Cover Authority Code of Practice, Tree Work, 2007.

13.2 All pruning or removal works are to be in accordance with the appropriate Tree Management Policy where applicable, or Tree Management Order (TMO), or Tree Preservation Order (TPO).

13.3 Tree maintenance work is specialised and in order to be undertaken safely to ensure the works carried out are not detrimental to the survival of a tree being retained, and to assist in the safe removal of any tree, should be undertaken by a qualified arboriculturist with appropriate competencies recognised within the Australian Qualification Framework, with a minimum of 5 years of continual experience within the industry of operational amenity arboriculture, and covered by appropriate and current types of insurance to undertake such works.

14.0 SUMMARY: Tree Management Plan

WORK IN PROGRESS –
TO BE COMPLETED

Discussion

14.1 *AS4970 (2009) section 3, 3.3.3 requires the Project Arborist to demonstrate that where a retained tree is subject to a major encroachment (>10% of area of TPZ) it can be protected to remain viable*

14.2

WORK IN PROGRESS –
TO BE COMPLETED

14.3

14.4

WORK IN PROGRESS –
TO BE COMPLETED

14.5

14.6

Where fences within the tree protection zone of the retained specimens are to be replaced, they are to be constructed using tree sensitive excavation and construction techniques such as post and rail construction with suspended panels to reduce any impact on their stability, with piers to be dug by hand using non-motorised machinery to further assist in the protection of the trees.

If associated infrastructure (pipe works) is to be installed within the Tree Protection Zone of any retained specimen, they are to be installed by hand with non-motorised machinery. If structural roots are found within the trench, they are to be left intact and dug around retaining this specimen's structural integrity with works to be undertaken in consultation with the project arborist.

WORK IN PROGRESS –
TO BE COMPLETED

General – Tree Protection works – Prior to Demolition (comments to be modified if no demolition required)

14.7 *Milestone* – Prior to demolition works, a site arborist shall be appointed to supervise all tree protection procedures detailed in this specification. The Site Arborist shall have a minimum level 5 AQF qualification in Arboriculture. Milestones are to be adhered to throughout the duration of this development and all relevant documentation is to be submitted to the local authority.

14.8 The Tree Protection Zone for each tree/s is to be incorporated into the construction works for the site and the protection fencing or works to be situated as indicated on the Appendix F – Tree Protection Plan. The setbacks from building works on the side closest to each tree are to be carried out as indicated in Table 2.0, and Tree Protection Zones be constructed as described here and detailed in Appendix D. The trees will be sustained within the constraints of the modifications to the site by the proposed development works.

14.9 Trees T.B.A. are to be retained and protected and incorporated into the landscape works for the site, and Tree Protection Zone fencing to be marked accordingly on the Landscape Plan, where appropriate and installed prior to any demolition or construction.

14.10 Ground protection - If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards. These measures may be applied to root zones beyond the TPZ.

14.11 Where applicable, any excavation for the establishment of a batter slope or benching for reasons of safety and to comply with Work Cover Authority safety regulations should be restricted as far as is safely possible near to trees to be retained to prevent root damage. If the excavations cannot be undertaken near to vertical the stability of these trees and their long-term viability may be compromised and their retention in a safe and healthy condition jeopardized and they may need to be revised and possibly removed.

Specific - Tree Protection Works - Prior to Demolition and Tree Removal

14.12 All other trees/shrubs; prior to demolition and tree removal works these tree/s are to be placed within a Tree Protection Zone with protective fencing and maintained and retained until the completion of all building works. Protective fencing is to be installed as shown in Appendix F - Tree Protection Plan.

- *The Protective fencing where required may delineate the **Tree Protection Zone (TPZ)** and should be situated as determined by the project arborist in accordance with AS4970 Protection of trees on development sites, Section 4, 4.3. "Fencing should be erected before any machinery or materials are brought onto the site and before the commencement of works including demolition. Once erected, protective fencing must not be removed or altered without approval by the project arborist. The TPZ must be secured to restrict access. AS4687 Temporary fencing and hoardings specifies applicable fencing requirements. Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area. Fence posts and supports should have a diameter greater than 20 mm and be located clear of roots. Existing perimeter fencing and other structures may be suitable as part of the protective fencing" or similar.*

- *Tree Protection signage is to be attached to each **TPZ** and displayed from within the development site in accordance with AS4970 2009 Protection of trees on development sites*

- *The area of the Tree Protection Zone to be mulched to a depth of 100 mm with organic material being 75% leaf litter and 25% wood, and this being composted material preferably from the same genus and species of tree as that to where the mulch is to be applied, i.e., species-specific mulch where possible. The depth of mulch and type as indicated, to be maintained for the duration of the project. Where deep excavation will expose the soil profile to drying out the root plate is to be protected by pegging jute matting across the ground surface 2 m back from the edge of the profile and 2 m down the face of the profile and is to be in one continuous sheet or layers up to 5 mm thick and overlapped 300 mm and pegged. Pegs are to be a minimum length of 200 mm and spaced at 500 mm increments in a grid pattern. Once installed mulch is to be placed on top of the jute matting previously described.*

14.13 There is to be no storage of materials, rubbish, soil, equipment, structures or goods of any type to be kept or placed within 5 metres from the trunk or within the dripline of any tree for the duration of the development. This will ensure protection of the tree/s to be retained on or adjacent to site.

14.14 *Milestone* - Project/Site arborist is to inspect/assess all retained specimens prior to demolition to inspect tree protection measures to monitor that they have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection

Demolition and Tree Removal/s

14.15 Removal of a tree within 6 m of a tree to be retained should be undertaken only by cutting down such a tree without damaging the trees to be retained, and by grinding out its stump. Where possible the structural roots of 20 mm diameter or greater of the tree to be cut down should not be removed, to minimise soil disturbance and to reduce the impact on the roots of any tree to be retained nearby. Where structural roots are to be removed this should be undertaken manually by the use of non-motorised hand tools after the stump has been ground out when such roots are often easier to locate from the site of the stump from which they have been severed.

14.16 Ground protection in accordance with AS4970 section 4, 4.5.3 may require steel plates to protect the ground surface from compaction to protect roots between the stages of demolition and construction.

Specific - Tree Protection works – Post Demolition and Prior to Construction

14.17 *Milestone* - Project/Site arborist is to inspect/assess all retained specimens prior to construction in relation to tree protection measures to monitor that they have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection

14.18 Location of underground utilities within a Tree Protection Zone of a retained specimen.
Any utility services to be situated underground within the TPZ are to be undertaken utilising excavation techniques that prevent or minimise damage to structural roots (roots greater than >20 mm diameter). To prevent soil compaction and root damage these works should be conducted with non-motorised hand tools, air knife or directional drilling.

14.19 Re-grading of site near retained trees; Grading &/or re-grading of sites/slopes within Tree Protection Zones or near retained specimens is to be undertaken **only** if at all, after consultation with the Project Arborist. This is to protect all structural roots systems from damage or compaction from machinery.

14.20 Placement of relocatable buildings; consideration should be given to tree sensitivity such as the buildings being placed on pier and beam or skids construction as they are to be positioned on their driplines within the Tree Protection Zone (TPZ). The area of the Tree Protection Zone under the buildings is to be mulched to a depth of 200 mm (*if installed on skids*) with organic material to further reduce compaction. The mulch is to be composted material, i.e., species-specific mulch. Alternatively, if installed on a pier & beam construction, piers are to be undertaken manually by using non-motorised hand tools to determine the location of first order and lower order structural roots with a diameter of 20 mm (*structural woody roots*) or greater, without damaging them.

Specific - Tree Protection works – During Construction

14.21 *Milestone* - Project/Site arborist is to inspect/assess all retained specimens during construction in relation to tree protection measures to monitor that they have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

14.22 Where any structural roots (roots with a diameter of greater than >20 mm) encountered by excavation are to be pruned and it is to be undertaken with clean sharp pruning tools, with a final cut to undamaged wood to prevent infestation by pathogens and assist continued root growth and undertaken in consultation with the Consulting Arboriculturist. Tree Protection Zone fences are to be maintained during these works. Ground protection in accordance with AS4970 section 4, 4.5.3 may require steel plates to protect the ground surface from compaction to protect roots between the stages of demolition and construction.

14.23 All Tree Protection Zones of retained trees are to be monitored for the duration of the construction phase of the development. The three main areas requiring monitoring are *mulching* - mulch must be maintained to a depth of 50–100 mm using material that complies with AS 4454. Where the existing landscape within the TPZ is to remain unaltered (e.g., garden beds or turf) mulch may not be required, *watering* - soil moisture levels should be regularly monitored by the project arborist. Temporary irrigation or watering may be required within the TPZ. An above-ground irrigation system could be installed and maintained by a competent individual and *weeding* - weeds should be removed by hand without disturbing soil or should be controlled with weedicide.

14.24 Trees to be removed are to be replaced with advanced specimens being mindful of the space limitations of the new use of the site. The advanced trees should be situated in areas along the boundaries of the site. The planting in these locations will provide the maximum benefit to the surrounding properties by screening views to and from the site and the plantings included in the proposed landscape plan. The replacement trees will be situated in positions where they may grow to maturity unhindered and will not conflict with built structures or utility services and in greater numbers than the trees removed should provide a net increase in the local amenity.

Specific - Tree Protection works – Post Construction

14.25 *Milestone* - At completion of construction work the Site/Project Arborist should carry out an assessment of all trees retained &/or affected by works. This assessment is to document any required on-going remedial care needed to ensure viable retention of trees affected. Documentation is to be submitted to the consenting authority.

15.0 CONCLUSION

Seven (7) trees are nominated for removal and replacement with species in accordance with the associated Landscape documentation for the development with a further fifteen (15) weed, dead or collapsed specimens recommended for removal independent to the proposed development. The T.B.A. trees to be preserved will be retained and protected through the implementation of adequate measures for their integration into the development by the application of appropriate technology as detailed in this report. Where appropriate, the Landscape Plan will include planting with new trees including street tree/s.

It is often a consequence of redevelopment, and subject to the nature of the proposed land use that some or all the trees present on the site prior to that redevelopment may be required to be removed and replaced with new tree plantings in different locations. This may be dependent upon the type of development and its design constraints and the requirements of the local planning instruments and any Landscape Design Codes if existing. Where tree removal is required for this development, it is considered that those trees identified within this report are not sustainable within the context of the proposed development. Where tree retention has been considered, those trees are expected to survive the redevelopment process and remain stable and viable. The retention and protection of existing trees on site is a significant aspect of the development process, allowing those trees as components of the current curtilage to be transferred to the new development for incorporation into the landscaping works for the site. The retention of some or all the existing trees contributes to the preservation of local amenity, screening of views to and from the site, and a balance to the scale and bulk of buildings, while maintaining elements of a continuous landscape, providing a more harmonious integration and transition of the use of the land.

If all the recommendations and procedures detailed herein are adhered to, some or all the trees the subject of this report will continue or will be replaced with more appropriate plantings in suitable locations, or enhanced by additional new plantings, and will grow to develop as important landscape components providing elements of long-term amenity for the property and its owners or occupants, and the local community.

<u>The recommendations made in this report are subject to approval by the consent authority.</u>

As a renewable and dynamic natural resource, the urban tree and the growing environment essential for its survival must be understood and carefully managed to balance its needs with those of people. It is crucial that as required: this resource be planned for, planted, nurtured, protected, maintained and replaced, to ensure appropriateness and suitability of new plantings and trees retained, for safety and viability, so that it remains vital, and is sustainable in continuity.

16.0 RECOMMENDATIONS – Retention.

16.1 Trees T.B.A. are to be retained in situ within the site and are to be protected as detailed in 14.2 - 14.25 of Part B of this report. Tree protection fences, or works, to be located in accordance with *Site Plan B – Trees to be Retained and Tree Protection Zones* (Appendix F).

16.2 Where Tree Protection Zone fences are to be moved or relocated this must be undertaken in consultation with the Consultant Arboriculturist for the project to ensure that tree protection is maintained. If the fences are relocated areas are to be mulched in accordance with 14.12 of this report to reduce compaction to the root system of the retained specimens.

16.3 To minimise damage to retained crowns, all Tree Protection Zones are to be adhered to. This must be undertaken in consultation with the Consultant Arboriculturist for the project to ensure that tree protection is maintained. Minor pruning may be required if damage occurs, work to undertaken in accordance with section 4 of this report.

16.4 *Milestones* - Project/Site arborist is to inspect/assess all retained specimens prior to Demolition and Tree Removal, Post Demolition, Prior to Construction during Construction and on completion in relation to trees protected and the protection measures have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

16.5 Any work to be undertaken within Tree Protection Zones is to be undertaken in accordance with 16.2 of this report.

16.6 Tree removal near retained specimens is to be undertaken in accordance with 14.15 of this report.

16.7 There is to be no storage of materials, rubbish, soil, equipment, structures or goods of any type to be kept or placed within 5 metres from the trunk or within the dripline of any tree for the duration of the development. This will ensure protection of the tree/s to be retained on or adjacent to site.

16.8 Each of the replacement are to be a vigorous specimen with a straight trunk, gradually tapering and continuous, crown excurrent, symmetrical, with roots established but not pot bound in a volume container or approved similar and be maintained by an appropriately qualified and experienced landscape contractor for up to one (1) year after planting, or as appropriate.

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Appendix D

Extract from Australian Standard AS4970 2009 Protection of trees on development sites

Section 3, Determining the tree protection zones of the selected trees

3.1 Tree protection zone (TPZ)

"The tree protection zone (TPZ) is the principal means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.

The TPZ incorporates the structural root zone (SRZ) (refer to Clause 3.3.5)."

3.2 Determining the TPZ

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

TPZ = DBH x 12

were

DBH = trunk diameter measured at 1.4 m above ground

Radius is measured from the centre of the stem at ground level.

3.3.5 Structural root zone (SRZ)

"The SRZ is the area required for street stability. A larger area is required to maintain a viable tree. The SRZ only needs to be calculated when a major encroachment into a TPZ is proposed. Root investigation may provide more information on the extent of these roots."

Determining the SRZ

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

SRZ radius = $(D \times 50)^{0.42} \times 0.64$

were

D = trunk diameter, in metres, measured above the root buttress.

Note: The SRZ for trees with trunk diameters less than 0.15 m will be 1.5 m.

Appendix E
Glossary

From

Dictionary for Managing Trees in Urban Environments by Draper BD and Richards PA 2009,
Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Age of Trees

Age Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown and can be categorized as *Young*, *Mature* and *Over-mature* (British Standards 1991, p. 13, Harris *et al*, 2004, p. 262).

Young Tree aged less than <20% of life expectancy, *in situ*.

Mature Tree aged 20-80% of life expectancy, *in situ*.

Over-mature Tree aged greater than >80% of life expectancy, *in situ,* or *senescent* with or without reduced *vigour*, and declining gradually or rapidly but irreversibly to death.

Condition of Trees

Condition A tree's *crown form* and growth habit, as modified by its *environment* (aspect, suppression by other trees, soils), the *stability* and *viability* of the *root plate*, trunk and structural branches (first (1st) and possibly second (2nd) order branches), including structural defects such as wounds, cavities or hollows, *crooked* trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with *vigour,* and it is possible for a tree to be of *normal vigour* but in *poor condition*. Condition can be categorized as *Good Condition*, *Fair Condition*, *Poor Condition* and *Dead*.

Good Condition Tree is of good habit, with *crown form* not severely restricted for space and light, physically free from the adverse effects of *predation* by pests and diseases, obvious instability or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent from or contributed to by vigour.

Fair Condition Tree is of good habit or *misshapen*, a form not severely restricted for space and light, has some physical indication of *decline* due to the early effects of *predation* by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the *environment* essential for its basic survival. Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over time, or in response to the implementation of beneficial changes to its local environment. This may be independent from or contributed to by vigour.

Poor Condition Tree is of good habit or *misshapen*, a form that may be severely restricted for space and light, exhibits symptoms of advanced and *irreversible decline* such as fungal, or bacterial infestation, major die-back in the branch and *foliage crown*, *structural deterioration* from insect damage e.g. termite infestation, or storm damage or lightning strike, ring barking from borer activity in the trunk, root damage or instability of the tree, or damage from physical wounding impacts or abrasion, or from altered local environmental conditions and has been unable to adapt to such changes and may decline further to death regardless of remedial works or other modifications to the local *environment* that would normally be sufficient to provide for its basic survival if in *good* to *fair* condition. Deterioration physically, often characterised by a gradual and continuous reduction in vigour but may be independent of a change in vigour, but characterised by a proportionate increase in susceptibility to, and *predation* by pests and diseases against which the tree cannot be sustained. Such conditions may also be evident in trees of advanced senescence due to normal phenological processes, without modifications to the growing environment or physical damage having been inflicted upon the tree. This may be independent from or contributed to by vigour.

Senescent / Moribund Advanced state of decline, dying or nearly dead.

Dead Tree is no longer capable of performing any of the following processes or is exhibiting any of the following symptoms.
Processes
Photosynthesis via its foliage crown (as indicated by the presence of moist, green or other coloured leaves).
Osmosis (the ability of the root system to take up water).
Turgidity (the ability of the plant to sustain moisture pressure in its cells).
Epicormic shoots or *epicormic strands* in Eucalypts (the production of new shoots as a response to stress, generated from latent or adventitious buds or from a *lignotuber*).
Symptoms
Permanent leaf loss.
Permanent wilting (the loss of turgidity which is marked by desiccation of stems leaves and roots).
Abscission of the *epidermis* (bark desiccates and peels off to the beginning of the sapwood).

Removed No longer present, or tree not able to be located or having been cut down and retained on a site or having been taken away from a site prior to site inspection.

Branch

Branch An elongated woody structure arising initially from the trunk to support leaves, flowers, fruit and the development of other branches. A branch may itself fork and continue to divide many times as successive *orders of branches* with the length and taper decreasing incrementally to the *outer extremity* of the *crown*. These may develop initially as a gradually tapering continuation of the *trunk* with minimal division as in a *young* tree or a tree of *excurrent habit*, or in a *sapling*, or may arise where the trunk terminates at or some distance from the *root crown*, dividing into *first order branches* to form and support the *foliage crown*. In an *acaulescent* tree, branches arise at or near the *root crown*. Similarly, branches may arise from a *sprout mass* from damaged *roots*, *branches* or *trunk*.

Orders of branches the marked divisions between successively smaller branches (James 2003, p. 168) commencing at the initial division where the trunk terminates on a *deliquescent* tree or from *lateral* branches on an *excurrent* tree. Successive branching is generally characterised by a gradual reduction in branch diameters at each division, and each gradation from the trunk can be categorised numerically, e.g., first order, second order, third order etc. (See Figure 21.)

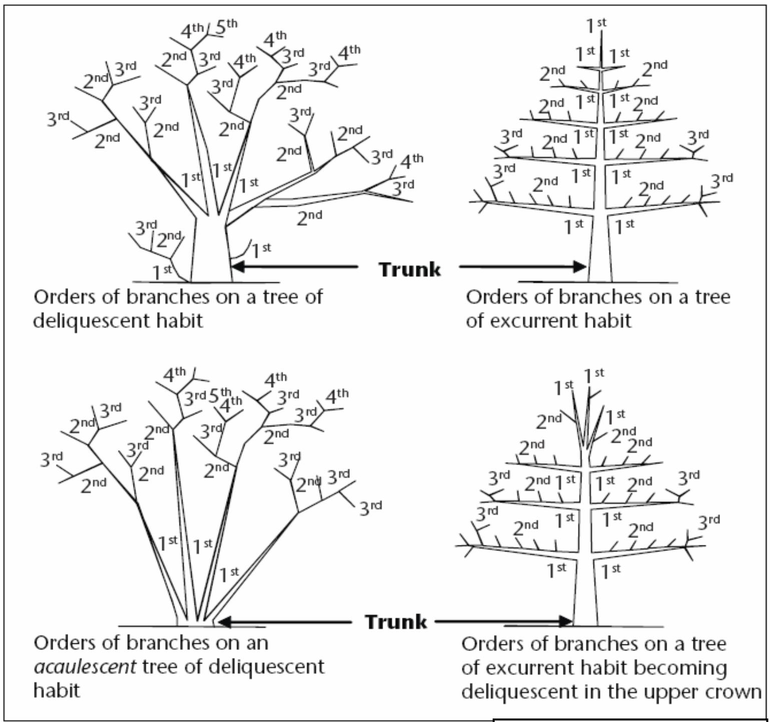


Figure 21 Orders of branches

Crown

Canopy 1. Of multiple trees, the convergence, or merging in full or part, of the crowns of two or more trees due to their proximity, or where competition for light and space available in a forest environment is limited as each tree develops forming a continuous layer of foliage. 2. Used as a plural for crown. 3. Sometimes synonymously used for crown (USA).

Crown Of an individual tree all the parts arising above the trunk where it terminates by its division forming branches, e.g., the branches, leaves, flowers and fruit; or the total amount of foliage supported by the branches. The crown of any tree can be divided vertically into three sections and can be categorised as *lower crown*, *mid crown* and *upper crown* (Figure 8). For a *leaning* tree these can be divided evenly into crown sections of one-third from the *base* to *apex*. The volume of a crown can be categorised as the *inner crown*, *outer crown* and *outer extremity of crown*.

Lower crown the *proximal* or lowest section of a crown when divided vertically into one-third (⅓) increments. See also *Crown*, *Mid crown* and *Upper crown*.

Mid crown the middle section of a crown when divided vertically into one-third (⅓) increments. See also *Crown*, *Lower crown* and *Upper crown*.

Upper crown the *distal* or highest section of a crown when divided vertically into one-third (⅓) increments. See also *Crown*, *Mid crown* and *Lower crown*.

Crown Projection (CP) Area within the *dripline* or beneath the lateral extent of the *crown* (Geiger 2004, p. 2). See also *Crown spread* and *Dripline*.

Dripline A line formed around the edge of a tree by the lateral extent of the *crown*. Such a line may be evident on the ground with some trees when exposed soil is displaced by rain shed from the crown. See also *Crown Projection*.

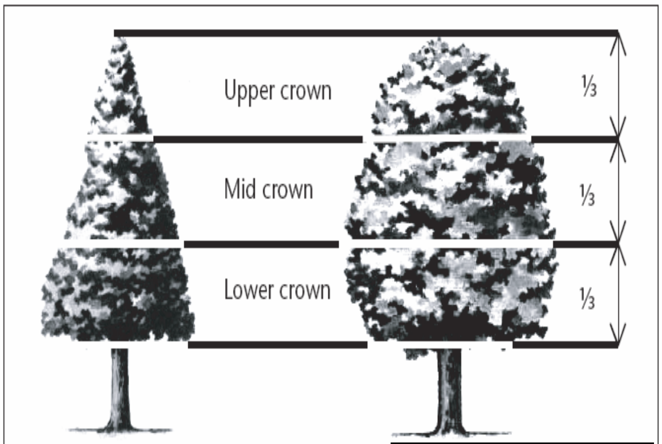


Figure 8 Sections of crown.

Crown Form of Trees

Crown Form The shape of the crown of a tree as influenced by the availability or restriction of space and light, or other contributing factors within its growing environment. Crown Form may be determined for tree shape and habit generally as *Dominant*, *Codominant*, *Intermediate*, *Emergent*, *Forest* and *Suppressed*. The habit and shape of a *crown* may also be considered qualitatively and can be categorized as *Good Form* or *Poor Form*.

Good Form Tree of *typical* crown shape and habit with proportions representative of the taxa considering constraints such as origin e.g., indigenous or exotic, but does not appear to have been adversely influenced in its development by environmental factors in situ such as *soil water* availability, prevailing wind, or cultural practices such as lopping and competition for space and light.

Poor Form Tree of *atypical* crown shape and habit with proportions not representative of the species considering constraints and appears to have been adversely influenced in its development by environmental factors in situ such as *soil water* availability, prevailing wind, cultural practices such as lopping and competition for space and light; causing it to be *misshapen* or disfigured by disease or vandalism.

Crown Form Codominant Crowns of trees restricted for space and light on one or more sides and receiving light primarily from above e.g., constrained by another tree/s or a building.

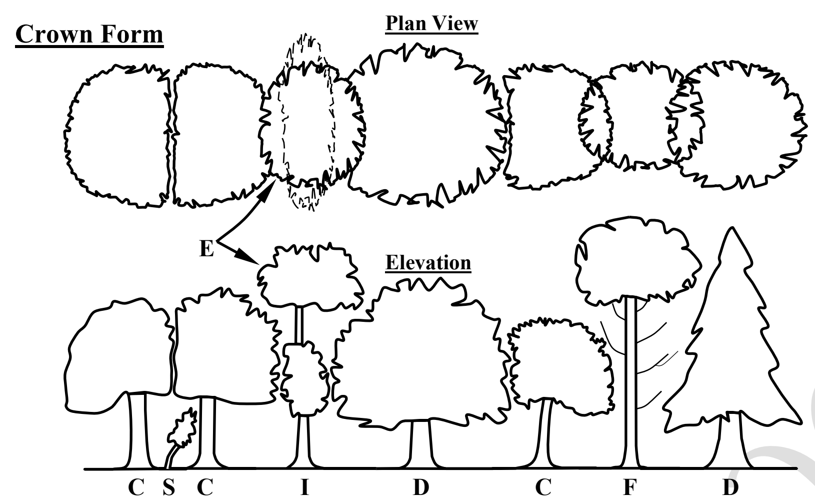
Crown Form Dominant Crowns of trees generally not restricted for space and light receiving light from above and all sides.

Crown Form Emergent Crowns of trees restricted for space on most sides receiving most light from above until the *upper crown* grows to protrude above the canopy in a stand or forest environment. Such trees may be *crown form dominant* or transitional from *crown form intermediate* to *crown form forest* asserting both *apical dominance* and *axillary dominance* once free of constraints for space and light.

Crown Form Forest Crowns of trees restricted for space and light except from above forming tall trees with narrow spreading crowns with foliage restricted generally to the top of the tree. The trunk is usually erect, straight and continuous, tapering gradually, crown often excurrent, with first order branches becoming structural, supporting the live crown concentrated towards the top of the tree, and below this point other first order branches arising radially with each *inferior* and usually temporary, divergent and ranging from horizontal to ascending, often with internodes exaggerated due to competition for space and light in the *lower crown*.

Crown Form Intermediate Crowns of trees restricted for space on most sides with light primarily from above and on some sides only.

Crown Form Suppressed Crowns of trees generally not restricted for space but restricted for light by being *overtopped* by other trees and occupying an understorey position in the canopy and growing slowly.



(Source: **D**, **C**, **I** and **S**, and Elevation, Matheny and Clark 1998, **E**, **F** and Plan View,

Deadwood

Deadwood Dead branches within a tree's crown and considered quantitatively as separate to *crown cover* and can be categorised as *Small Deadwood* and *Large Deadwood* according to diameter, length and subsequent *risk* potential. The number of dead branches on a tree can be categorized as *Low Volume Deadwood*, *Medium Volume Deadwood* and *High-Volume Deadwood*. See also *Dieback.*

Deadwooding Removing of dead branches by *pruning*. Such pruning may assist in the prevention of the spread of *decay* from *dieback* or for reasons of safety near an identifiable target.

Small Deadwood A dead branch up to 10mm diameter and usually <2 metres long, generally considered of low-risk potential.
Large Deadwood A dead branch >10mm diameter and usually >2 metres long, generally considered of high-risk potential.
High Volume Deadwood High Volume Deadwood Where >10 dead branches occur that may require *removal*.
Medium Volume Deadwood Where 5-10 dead branches occur that may require *removal*.
Low Volume Deadwood Where <5 dead branches occur that may require *removal*.

Dieback

Dieback The death of some areas of the *crown*. Symptoms are leaf drop, bare twigs, dead branches and tree death, respectively. This can be caused by root damage, root disease, bacterial or fungal canker, severe bark damage, intensive grazing by insects, *abrupt changes* in growth conditions, drought, water-logging or over-maturity. Dieback often implies reduced *resistance, stress* or *decline* which may be temporary. Dieback can be categorized as *Low Volume Dieback*, *Medium Volume Dieback* and *High-Volume Dieback*.

High Volume Dieback Where >50% of the *crown cover* has died.
Medium Volume Dieback Where 10-50% of the *crown cover* has died.
Low Volume Dieback Where <10% of the *crown cover* has died. See also *Dieback*, *High Volume Dieback* and *Medium Volume Dieback*.

Epicormic shoots

Epicormic Shoots Juvenile shoots produced at branches or trunk from *epicormic strands* in some Eucalypts (Burrows 2002, pp. 111-131) or sprouts produced from dormant or latent buds concealed beneath the bark in some trees. Production can be triggered by fire, pruning, wounding, or root damage but may also be as a result of *stress* or *decline*. Epicormic shoots can be categorized as *Low Volume Epicormic Shoots*, *Medium Volume Epicormic Shoots* and *High Volume Epicormic Shoots*.

High Volume Epicormic Shoots Where >50% of the *crown cover* is comprised of live *epicormic shoots*.
Medium Volume Epicormic Shoots Where 10-50% of the *crown cover* is comprised of live *epicormic shoots*.
Low Volume Epicormic Shoots Where <10% of the c*rown cover* is comprised of live *epicormic shoots*.

General Terms

Cavity A usually shallow void often localized initiated by a *wound* and subsequent *decay* within the trunk, branches or roots, or beneath bark, and may be enclosed or have one or more opening.

Decay Process of degradation of wood by microorganisms (Australian Standard 2007, p. 6) and fungus.

Hazard The threat of danger to people or property from a tree or tree part resulting from changes in the physical condition, growing environment, or existing physical attributes of the tree, e.g., included bark, soil erosion, or thorns or poisonous parts, respectively.

Included bark 1. The bark on the inner side of the *branch union* or is within a concave *crotch* that is unable to be lost from the tree and accumulates or is trapped by *acutely divergent* branches forming a *compression fork*. 2. Growth of bark at the interface of two or more branches on the inner side of a branch union or in the crotch where each branch forms a branch collar, and the collars roll past one another without forming a graft where no one collar is able to subsume the other. Risk of failure is worsened in some taxa where branching is *acutely divergent* or *acutely convergent* and ascending or erect.

Hollow A large void initiated by a *wound* forming a *cavity* in the trunk, branches or roots and usually increased over time by *decay* or other contributing factors, e.g., fire, or fauna such as birds or insects e.g., ants or termites. A hollow can be categorized as an *Ascending Hollow* or a *Descending Hollow*.

Risk The random or potentially foreseeable possibility of an episode causing harm or damage.

Significant Important, weighty or more than ordinary.

Significant Tree A tree considered important, weighty or more than ordinary. Example: due to prominence of location, or *in situ*, or contribution as a component of the overall landscape for *amenity* or aesthetic qualities, or *curtilage* to structures, or importance due to uniqueness of taxa for species, subspecies, variety, *crown form*, or as an historical or cultural planting, or for age, or substantial dimensions, or habit, or as *remnant vegetation*, or habitat potential, or a rare or threatened species, or uncommon in cultivation, or of aboriginal cultural importance, or is a commemorative planting.

Substantial A tree with large dimensions or proportions in relation to its place in the landscape.

Sustainable Retention Index Value (SRIV) A visual tree assessment method to determine a qualitative and numerical rating for the viability of urban trees for development sites and management purposes, based on general tree and landscape assessment criteria using classes of *age*, *condition* and *vigour*. SRIV is for the professional manager of urban trees to consider the tree *in situ* with an assumed knowledge of the *taxon* and its growing environment. It is based on the physical attributes of the tree and its response to its environment considering its position in a matrix for age class, vigour class, condition class and its sustainable retention with regard to the safety of people or damage to property. This also factors the ability to retain the tree with remedial work or beneficial modifications to its growing environment or removal and replacement. SRIV is supplementary to the decision made by a tree management professional as to whether a tree is retained or removed (IACA - Institute of Australian Consulting Arboriculturists 2005).

Visual Tree Assessment (VTA) A visual inspection of a tree from the ground based on the principle that, when a tree exhibits apparently superfluous material in its shape, this represents repair structures to rectify *defects* or to reinforce weak areas in accordance with the *Axiom of Uniform Stress* (Mattheck & Breloer 1994, pp. 12-13, 145). Such assessments should only be undertaken by suitably competent practitioners.

Leaning Trees

Leaning A tree where the *trunk* grows or moves away from upright. A lean may occur anywhere along the *trunk* influenced by a number of contributing factors e.g., genetically predetermined characteristics, competition for space or light, prevailing winds, aspect, slope, or other factors. A *leaning* tree may maintain a *static lean* or display an increasingly *progressive lean* over time and may be hazardous and prone to *failure* and *collapse*. The degrees of leaning can be categorized as *Slightly Leaning*, *Moderately Leaning*, *Severely Leaning* and *Critically Leaning*.

Slightly Leaning A leaning tree where the trunk is growing at an angle within 0°-15° from upright.
Moderately Leaning A leaning tree where the trunk is growing at an angle within 15°-30° from upright.
Severely Leaning A leaning tree where the trunk is growing at an angle within 30°-45° from upright.
Critically Leaning A leaning tree where the trunk is growing at an angle greater than >45° from upright.
Progressively Leaning A tree where the degree of *leaning* appears to be increasing over time.
Static Leaning A leaning tree whose lean appears to have stabilized over time.

Periods of Time

Periods of Time The life span of a tree in the urban environment may often be reduced by the influences of encroachment and the dynamics of the environment and can be categorized as *Immediate*, *Short Term*, *Medium Term* and *Long Term*.

Immediate An *episode* or occurrence, likely to happen within a twenty-four (24) hour period, e.g., tree failure or collapse in full or part posing an imminent danger.
Short Term A period of time less than <1 – 15 years.
Medium Term A period of time 15 – 40 years.
Long Term A period of time greater than >40 years.

Roots

First Order Roots (FOR) Initial woody roots arising from the *root crown* at the base of the *trunk*, or as an *adventitious root mass* for structural support and *stability*. Woody roots may be buttressed and divided as a marked gradation, gradually tapering and continuous or tapering rapidly at a short distance from the root crown. Depending on soil type these roots may descend initially and not be evident at the root crown or become buried by changes in soil levels. Trees may develop 4-11 (Perry 1982, pp. 197-221), or more first order roots which may radiate from the trunk with a relatively even distribution, or be prominent on a particular aspect, dependent upon physical characteristics e.g. leaning trunk, *asymmetrical* crown; and constraints within the growing *environment* from topography e.g. slope, soil depth, rocky outcrops, exposure to predominant wind, soil moisture, depth of *water table* etc.

Orders of Roots The marked divisions between woody roots, commencing at the initial division from the base of the trunk, at the *root crown* where successive branching is generally characterised by a gradual reduction in root diameters and each gradation from the trunk and can be categorized numerically, e.g., *first order roots*, second order roots, third order roots etc. Roots may not always be evident at the *root crown,* and this may be dependent on species, age class and the growing environment. Palms at maturity may form an adventitious root mass.

Root Plate The entire root system of a tree generally occupying the top 300-600mm of soil including roots at or above ground and may extend laterally for distances exceedingly twice the height of the tree (Perry 1982, pp. 197-221). Development and extent are dependent on water availability, soil type, *soil depth* and the physical characteristics of the surrounding landscape.

Root Crown Roots arising at the base of a trunk.

Zone of Rapid Taper The area in the *root plate* where the diameter of *structural roots* reduces substantially over a short distance from the *trunk*. Considered to be the minimum radial distance to provide structural support and *root plate* stability. See also *Structural Root Zone (SRZ)*.

Structural Roots Roots supporting the infrastructure of the *root plate* providing strength and *stability* to the tree. Such roots may taper rapidly at short distances from the *root crown* or become large and woody as with gymnosperms and dicotyledonous angiosperms and are usually 1st and 2nd order roots or form an *adventitious root mass* in monocotyledonous angiosperms (palms). Such roots may be crossed and grafted and are usually contained within the area of *crown projection* or extend just beyond the *dripline*.

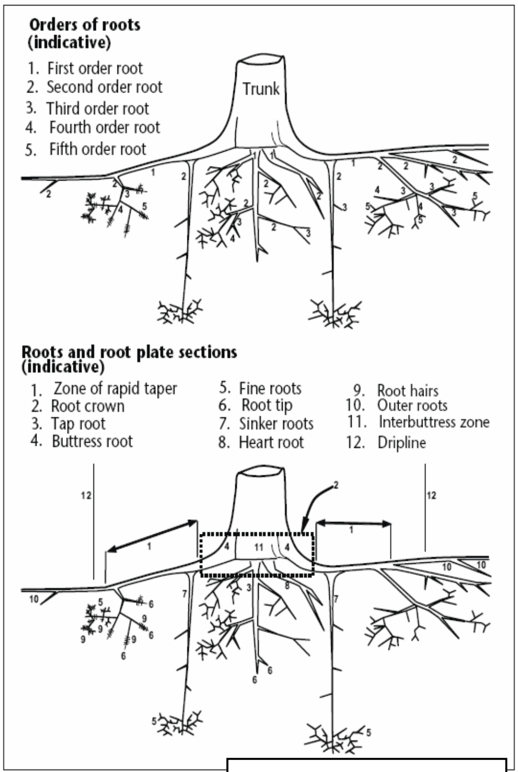


Figure 22 Orders of Roots.

Symmetry

Symmetry Balance within a *crown,* or *root plate,* above or below the *axis* of the trunk of branch and foliage, and root distribution respectively and can be categorized as *Asymmetrical* and *Symmetrical*.

Asymmetrical Imbalance within a crown, where there is an uneven distribution of branches and the foliage *crown* or *root plate* around the vertical *axis* of the trunk. This may be due to *Crown Form Codominant* or *Crown Form Suppressed* as a result of natural restrictions e.g., from buildings, or from competition for space and light with other trees, or from exposure to wind, or artificially caused by pruning for clearance of roads, buildings or power lines. An example of an expression of this may be, crown asymmetrical, bias to west.

Symmetrical Balance within a crown, where there is an even distribution of branches and the *foliage crown* around the vertical *axis* of the trunk. This usually applies to trees of *Crown Form Dominant* or *Crown Form Forest*. An example of an expression of this may be crown symmetrical.

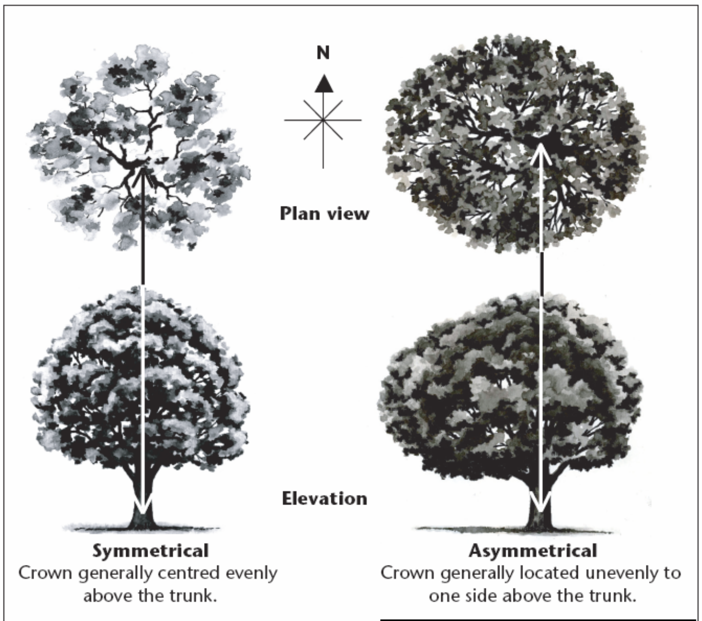


Figure 27 Symmetry within crown

Trunk

Trunk A single stem extending from the *root crown* to support or elevate the *crown*, terminating where it divides into separate *stems* forming *first order branches*. A trunk may be evident at or near ground or be absent in *acaulescent* trees of *deliquescent* habit or may be continuous in trees of *excurrent* habit. The trunk of any *caulescent* tree can be divided vertically into three (3) sections and can be categorized as *Lower Trunk*, *Mid Trunk* and *Upper Trunk*. For a *leaning* tree these may be divided evenly into sections of one third along the trunk.

Acaulescent A *trunkless* tree or tree growth forming a very short *trunk*. See also *Caulescent.* (See Fig. 21)

Caulescent Tree grows to form a *trunk*. See also *Acaulescent*. (See Fig. 21)

Lower trunk Lowest, or *proximal* section of a trunk when divided into one-third (⅓) increments along its *axis*. See also *Trunk*, *Mid trunk* and *Upper trunk*.

Mid trunk A middle section of a trunk when divided into one-third (⅓) increments along its *axis*. See also *Trunk*, *Lower trunk* and *Upper trunk*.

Upper trunk Highest, or *distal* section of a trunk when divided into one-third (⅓) increments along its *axis*. See also *Trunk*, *Lower trunk* and *Mid trunk*.

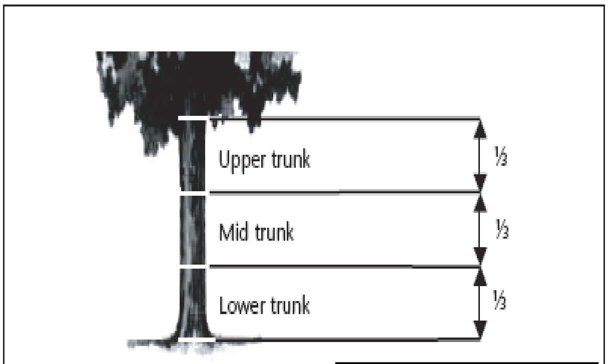


Figure 28 Trunk sections.

Diameter at Breast Height (DBH) Measurement of trunk width calculated at a given distance above ground from the base of the tree often measured at 1.4 m. The trunk of a tree is usually not a circle when viewed in cross section, due to the presence of *reaction wood* or *adaptive wood*, therefore an average diameter is determined with a *diameter tape* or by recording the trunk along its narrowest and widest axes, adding the two dimensions together and dividing them by 2 to record an average and allowing the orientation of the longest axis of the trunk to also be recorded. Where a tree is growing on a lean the distance along the top of the trunk is measured to 1.4m and the diameter then recorded from that point perpendicular to the edge of the trunk. Where a *leaning* trunk is *crooked* a vertical distance of 1.4m is measured from the ground. Where a tree branches from a trunk that is less than 1.4m above ground, the trunk diameter is recorded perpendicular to the length of the *trunk* from the point immediately below the base of the flange of the *branch collar* extending the furthest down the trunk, and the distance of this point above ground recorded as *trunk* length. Where a tree is located on sloping ground the DBH should be measured at halfway along the side of the tree to average out the angle of slope. Where a tree is *acaulescent* or *trunkless* branching at or near ground an average diameter is determined by recording the radial extent of the trunk at or near ground and noting where the measurement was recorded e.g., at ground.

Vigour

Vigour Ability of a tree to sustain its life processes. This is independent of the *condition* of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g., *dormant*, deciduous or semi-deciduous trees. Vigour can be categorized as *Normal Vigour, High Vigour*, *Low Vigour* and *Dormant Tree Vigour*.

Normal Vigour Ability of a tree to maintain and sustain its life processes. This may be evident by the *typical* growth of leaves, *crown cover* and *crown density*, branches, roots and trunk and *resistance* to *predation*. This is independent of the *condition* of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

High Vigour *Accelerated growth* of a tree due to incidental or deliberate artificial changes to its growing *environment* that are seemingly beneficial, but may result in *premature aging* or failure if the favourable conditions cease, or promote *prolonged senescence* if the favourable conditions remain, e.g. water from a leaking pipe; water and nutrients from a leaking or disrupted sewer pipe; nutrients from animal waste, a tree growing next to a chicken coop, or a stock feed lot, or a regularly used stockyard; a tree subject to a stringent watering and fertilising program; or some trees may achieve an extended lifespan from continuous *pollarding* practices over the life of the tree.

Low Vigour Reduced ability of a tree to sustain its life processes. This may be evident by the *atypical* growth of leaves, reduced *crown cover* and reduced *crown density*, branches, roots and trunk, and a deterioration of their functions with reduced *resistance* to *predation*. This is independent of the *condition* of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

Appendix F

Survey of Subject Tree/s

Trees the subject of this report are marked on the plans in the following appendices and are numbered as listed below.

Tree No. / Point No. (from survey)	*Genus and species*	Common name	Recommendation (work in progress)
1 / 117	*Lophostemon confertus*	Queensland Brush Box	
2 / 232	*Eucalyptus saligna*	Sydney Blue Gum	
3 / 5064	*Angophora costata*	Sydney Red Gum	
4 / 119	*Lophostemon confertus*	Queensland Brush Box	
5 / 5065	*Eucalyptus paniculata*	Grey Ironbark	
6 / 233	*Eucalyptus saligna*	Sydney Blue Gum	
7 / 234	*Eucalyptus saligna*	Sydney Blue Gum	
8 / 235	*Eucalyptus saligna*	Sydney Blue Gum	
9 / 236	*Eucalyptus saligna*	Sydney Blue Gum	
10 / 237	*Eucalyptus saligna*	Sydney Blue Gum	
11 / 239	*Eucalyptus saligna*	Sydney Blue Gum	
12 / 238	*Lophostemon confertus*	Queensland Brush Box	
13 / 182	*Syncarpia glomulifera*	Turpentine	
14 / 183	*Syncarpia glomulifera*	Turpentine	
15 / 184	*Syncarpia glomulifera*	Turpentine	
16 / 185	*Syncarpia glomulifera*	Turpentine	
17 / 5069	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
18 / 120	*Eucalyptus nicholii*	Narrow leafed Black Peppermint	Remove and replace
19 / 121	*Lophostemon confertus*	Queensland Brush Box	
20 / 5066	*Eucalyptus saligna*	Sydney Blue Gum	
21 / 123	*Eucalyptus paniculata*	Grey Ironbark	
22 / 124	*Eucalyptus punctata*	Grey Gum	
23 / 187	*Brachychiton rupestris*	Bottle Tree	
24 / 186	*Eucalyptus sp.*	Eucalypt	
25 / 5078	*Brachychiton discolor*	Lace Bark Tree	
26 / 5076	*Ceratonia siliqua*	Carob Tree	
27 / 122	*Eucalyptus saligna*	Sydney Blue Gum	
28 / 5067	*Brachychiton acerifolius*	Illawarra Flame Tree	
29 / 181	*Eucalyptus sp.*	Eucalypt	
30 / 5001	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
31 / 5002	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
32 / 5003	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
33 / 611	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
34 / 612	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
35 / 613	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
36 / 614	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
37 / 5000	*Eucalyptus paniculata*	Grey Ironbark	
38 / 338	*Eucalyptus saligna*	Sydney Blue Gum	
39 / 339	*Eucalyptus saligna*	Sydney Blue Gum	
40 / 340	*Eucalyptus saligna*	Sydney Blue Gum	
41 / 5088	*Pittosporum undulatum*	Native Daphne	
42 / 5086	*Pittosporum undulatum*	Native Daphne	
43 / 5085	*Pittosporum undulatum*	Native Daphne	
44 / 5079	*Pittosporum undulatum*	Native Daphne	
45 / 5080	*Pittosporum undulatum*	Native Daphne	
46 / 317	*Pittosporum undulatum*	Native Daphne	
47 / 5081	*Pittosporum undulatum*	Native Daphne	
48 / 5082	*Pittosporum undulatum*	Native Daphne	
49 / 318	*Pittosporum undulatum*	Native Daphne	
50 / 319	*Pittosporum undulatum*	Native Daphne	

Tree No. / Point No. (from survey)	*Genus and species*	Common name	Recommendation (work in progress)
51 / 321	*Pittosporum undulatum*	Native Daphne	
52 / 322	*Pittosporum undulatum*	Native Daphne	
53 / 323	*Pittosporum undulatum*	Native Daphne	
54 / 324	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
55 / 325	*Glochidion ferdinandi*	Cheese Tree	Remove and replace
56 / 326	*Glochidion ferdinandi*	Cheese Tree	Remove and replace
57 / 311	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
58 / 352	*Pinus radiata*	Radiata Pine	Remove and replace
59 / 361	*Pinus radiata*	Radiata Pine	Remove and replace
60 / 320	*Pittosporum undulatum*	Native Daphne	
61 / 395	*Acacia glaucescens*	Coastal Myall Wattle	
62 / 395	*Acacia glaucescens*	Coastal Myall Wattle	
63 / 396	*Acacia glaucescens*	Coastal Myall Wattle	
64 / 388	*Acacia floribunda*	Gossamer Wattle	
65 / 387	*Acacia floribunda*	Gossamer Wattle	
66 / 385	*Acacia floribunda*	Gossamer Wattle	
67 / 386	*Acacia glaucescens*	Coastal Myall Wattle	
68 / 384	*Acacia glaucescens*	Coastal Myall Wattle	
69 / 383	*Acacia floribunda*	Gossamer Wattle	
70 / 363	*Glochidion ferdinandi*	Cheese Tree	Remove and replace
71 / 228	*Eucalyptus paniculata*	Grey Ironbark	
72 / 229	*Pittosporum undulatum*	Native Daphne	
73 / 230	*Ligustrum lucidum*	Broad-Leaf Privet	Remove – *Noxious weed species*
74 / 231	*Angophora costata*	Sydney Red Gum	
75 / 456	*Angophora costata*	Sydney Red Gum	
76 / 457	*Pittosporum undulatum*	Native Daphne	
77 / 458	*Glochidion ferdinandi*	Cheese Tree	
78 / 459	*Angophora costata*	Sydney Red Gum	
79 / 460	*Pittosporum undulatum*	Native Daphne	
80 / 461	*Pittosporum undulatum*	Native Daphne	
81 / 362	*Glochidion ferdinandi*	Cheese Tree	Remove and replace
82 / 370	*Eucalyptus piperita*	Sydney Peppermint	
83 / 5129	*Pittosporum undulatum*	Native Daphne	
84 / 373	*Eucalyptus piperita*	Sydney Peppermint	
85 / 378	*Pittosporum undulatum*	Native Daphne	
86 / 5119	*Eucalyptus piperita*	Sydney Peppermint	
87 / 371	*Pittosporum undulatum*	Native Daphne	
88 / 372	*Pittosporum undulatum*	Native Daphne	
89 / 402	*Eucalyptus piperita*	Sydney Peppermint	
90 / 397	*Eucalyptus piperita*	Sydney Peppermint	
91 / 5106	*Pittosporum undulatum*	Native Daphne	
92 / 5107	*Pittosporum undulatum*	Native Daphne	
93 / 465	*Pinus radiata*	Radiata Pine	
94 / 464	*Pinus radiata*	Radiata Pine	
95 / 463	*Pittosporum undulatum*	Native Daphne	
96 / 5108	*Glochidion ferdinandi*	Cheese Tree	
97 / 5109	*Glochidion ferdinandi*	Cheese Tree	
98 / 477	*Pittosporum undulatum*	Native Daphne	

Tree No. / Point No. (from survey)	*Genus and species*	Common name	Recommendation (work in progress)
99 / 478	*Cedrus deodara*	Himalayan Cedar	
100 / 479	*Pinus radiata*	Radiata Pine	
101 / 474	*Dead*		Remove – dead specimen
102 / 5120	*Pittosporum undulatum*	Native Daphne	
103 / 398	*Eucalyptus piperita*	Sydney Peppermint	
104 / 399	*Eucalyptus piperita*	Sydney Peppermint	
105 / 400	*Pittosporum undulatum*	Native Daphne	
106 / 401	*Eucalyptus oblonga*	White Stringybark	
107 / 407	*Pittosporum undulatum*	Native Daphne	
108 / 409	*Corymbia gummifera*	Red Bloodwood	
109 / 415	*Eucalyptus fibrosa*	Broad-leaved Ironbark	
110 / 418	*Eucalyptus fibrosa*	Broad-leaved Ironbark	
111 / 416	*Eucalyptus oblonga*	White Stringybark	
112 / 417	*Eucalyptus oblonga*	White Stringybark	
113 / 434	*Dead*		Remove – dead specimen
114 / 419	*Angophora costata*	Sydney Red Gum	
115 / 420	*Allocasuarina torulosa*	Forest She Oak	
116 / 421	*Angophora costata*	Sydney Red Gum	
117 / 432	*Dead*		Remove – dead specimen
118 / 433	*Collapsed*		Remove – collapsed specimen
119 / 424	*Eucalyptus oblonga*	White Stringybark	
120 / 544	*Missing*		Missing at time of inspection
121 / 429	*Corymbia eximia*	Yellow Bloodwood	
122 / 428	*Angophora costata*	Sydney Red Gum	
123 / 5093	*Glochidion ferdinandi*	Cheese Tree	
124 / 527	*Angophora costata*	Sydney Red Gum	
125 / 528	*Angophora costata*	Sydney Red Gum	
126 / 529	*Angophora costata*	Sydney Red Gum	
127 / 530	*Angophora costata*	Sydney Red Gum	
128 / 531	*Angophora costata*	Sydney Red Gum	
129 / 532	*Angophora costata*	Sydney Red Gum	
130 / 533	*Corymbia eximia*	Yellow Bloodwood	
131 / 534	*Eucalyptus oblonga*	White Stringybark	
132 / 535	*Eucalyptus piperita*	Sydney Peppermint	
133 / 536	*Angophora costata*	Sydney Red Gum	
134 / 537	*Corymbia gummifera*	Red Bloodwood	
135 / 538	*Eucalyptus piperita*	Sydney Peppermint	
136 / 549	*Angophora costata*	Sydney Red Gum	
137 / 550	*Angophora costata*	Sydney Red Gum	
138 / 551	*Angophora costata*	Sydney Red Gum	
139 / 553	*Eucalyptus piperita*	Sydney Peppermint	
140 / 546	*Angophora costata*	Sydney Red Gum	
141 / 547	*Corymbia gummifera*	Red Bloodwood	
142 / 554	*Angophora costata*	Sydney Red Gum	
143 / 559	*Corymbia gummifera*	Red Bloodwood	
144 / 557	*Corymbia eximia*	Yellow Bloodwood	
145 / 556	*Angophora costata*	Sydney Red Gum	

Tree No. / Point No. (from survey)	*Genus and species*	Common name	Recommendation (work in progress)
146 / 573	*Eucalyptus piperita*	Sydney Peppermint	
147 / 578	*Angophora costata*	Sydney Red Gum	
148 / 574	*Corymbia gummifera*	Red Bloodwood	
149 / 563	*Allocasuarina torulosa*	Forest She Oak	
150 / 575	*Angophora costata*	Sydney Red Gum	
151 / 564	*Allocasuarina torulosa*	Forest She Oak	
152 / 565	*Angophora costata*	Sydney Red Gum	
153 / 566	*Corymbia gummifera*	Red Bloodwood	
154 / 567	*Allocasuarina torulosa*	Forest She Oak	
155 / 568	*Allocasuarina torulosa*	Forest She Oak	
156 / 577	*Angophora costata*	Sydney Red Gum	
157 / 579	*Eucalyptus oblonga*	White Stringybark	
158 / 589	*Corymbia eximia*	Yellow Bloodwood	
159 / 586	*Angophora costata*	Sydney Red Gum	
160 / 585	*Angophora costata*	Sydney Red Gum	
161 / 422	*Eucalyptus sp.*	*Eucalypt*	
162 / 569	*Angophora costata*	Sydney Red Gum	
163 / 581	*Angophora costata*	Sydney Red Gum	
164 / 580	*Angophora costata*	Sydney Red Gum	
166 / 571	*Angophora costata*	Sydney Red Gum	
167 / 572	*Angophora costata*	Sydney Red Gum	
168 / 582	*Angophora costata*	Sydney Red Gum	
169 / 584	*Angophora costata*	Sydney Red Gum	
170 / 583	*Angophora costata*	Sydney Red Gum	

Table 2.0 This table only applies to trees being retained. Tree Protection Zone fencing locations as measured from the centre of each tree and the recommended distances for the side closest to the building construction works e.g., excavation (see explanatory notes below). Tree Protection Zone fences and setbacks where applicable are indicated in Appendix F.

1. Redgum Tree No.	2. Structural Root Zone **SRZ (DARB)** From centre of trunk (COT) Diameter Above Root Buttress AS4970 2009 Section 3, 3.3.5 (see Appendix D) where applicable (Minimum 1.5 metres)	3. Trunk Diameter at Breast Height **DBH** 1.4m above ground, AS4970 2009, or mm or m above ground where indicated. # = average. g = ground	4. Tree Protection Zone (TPZ) = **12 x DBH** From centre of trunk (COT) in metres AS4970 2009Section 3 (See Appendix D) (Minimum 2.0 metres)	5. Proposed distance of tree protection fence/works on the side closest to building construction[2], in metres by Redgum Horticultural. **(work in progress)**
1	2.9 (750 DARB)	700	8.4	
2	2.5 (520 DARB)	500	6.0	
3	1.5 #25 (110 DARB)	100	2.0 #22	
4	3.1 (840 DARB)	800	9.6	
5	1.5 #25 (150 DARB)	100	2.0 #22	
6	3.2 (940 DARB)	920	11.0	
7	2.3 (420 DARB)	400	4.8	
8	3.7 (1340 DARB)	1300	15 #23	
9	2.8 (550 DARB)	500	6.0	
10	2.3 (410 DARB)	400	4.8	
11	2.6 (540 DARB)	500	6.0	
12	2.1 (340 DARB)	300	3.6	
13	2.3	400	4.8	
14	2.3	400	4.8	
15	2.3	400	4.8	
16	3.0	800	9.6	
18	2.5 (520 DARB)	500	6.0	
19	2.1 (330 DARB)	300	3.6	
20	1.7	200	2.4	
21	2.0	300	3.6	
22	2.5	500	6.0	
23	2.3	400	4.8	
24	1.8	250	3.0	
25	1.5 #25	100	2.0 #22	
26	1.8	250@g	3.0	
27	3.7 (1300 DARB)	1200	14.4	
28	1.8 (240 DARB)	200	2.4	
29	2.5	500	6.0	
37	2.3	400	4.8	
38	2.5	500	6.0	
39	3.0	800	9.6	
40	2.8	700	8.4	
41	1.7	200	2.4	
42	1.5 #25	100	2.0 #22	
43	1.5 #25	100	2.0 #22	
44	1.7	200	2.4	
45	1.7	200	2.4	
46	1.7	200	2.4	
47	1.7	200	2.4	
48	1.7	200	2.4	
49	2.0	300	3.6	
50	2.3	400	4.8	
51	2.3	400	4.8	
52	2.3	400	4.8	
53	2.5	500	6.0	
60	2.0	300	3.6	
61	2.3	400	4.8	
62	2.3	400	4.8	
63	2.3	400	4.8	
64	2.3	400	4.8	
65	2.3	400	4.8	

1. Redgum Tree No.	2. Structural Root Zone **SRZ (DARB)** From centre of trunk (COT) Diameter Above Root Buttress AS4970 2009 Section 3, 3.3.5 (see Appendix D) where applicable (Minimum 1.5 metres)	3. Trunk Diameter at Breast Height **DBH** 1.4m above ground, AS4970 2009, or mm or m above ground where indicated. # = average. g = ground	4. Tree Protection Zone (TPZ) = **12 x DBH** From centre of trunk (COT) in metres AS4970 2009Section 3 (See Appendix D) (Minimum 2.0 metres)	5. Proposed distance of tree protection fence/works on the side closest to building construction[2], in metres by Redgum Horticultural. **(work in progress)**
66	2.0	300	3.6	
67	2.0	300	3.6	
68	2.0	300	3.6	
69	2.0	300	3.6	
71	3.0	800	9.6	
72	2.7	600	7.2	
74	2.3	400	4.8	
75	2.5	500	6.0	
76	2.3	400	4.8	
77	2.5	500@g	6.0	
78	2.8	700	8.4	
79	2.0	300	3.6	
80	2.3	400	4.8	
82	3.0	800	9.6	
83	1.7	200	2.4	
84	3.2	900	10.8	
85	2.3	400	4.8	
86	2.8	700	8.4	
87	2.5	500	6.0	
88	2.7	600	7.2	
89	3.2	900	10.8	
90	3.7	1300	15 [#23]	
91	1.7	200	2.4	
92	1.7	200	2.4	
93	2.7	600	7.2	
94	3.7	1300	15 [#23]	
95	2.0	300	3.6	
96	1.5 [#25]	100	2.0 [#22]	
97	1.5 [#25]	100	2.0 [#22]	
98	1.7	200	2.4	
99	3.0	800	9.6	
100	3.3	1000	12.0	
102	1.7	200	2.4	
103	2.7	600	7.2	
104	3.3	1000	12.0	
105	2.5	500	6.0	
106	2.8	700	8.4	
107	2.3	400	4.8	
108	3.3	1000	12.0	
109	3.4	1100	13.2	
110	2.5	500	6.0	
111	3.3	1000	12.0	
112	3.0	800	9.6	
114	2.3	400	4.8	
115	2.3	400	4.8	
116	3.4	1100	13.2	

1. Redgum Tree No.	2. Structural Root Zone **SRZ (DARB)** From centre of trunk (COT) **D**iameter **A**bove **R**oot **B**uttress AS4970 2009 Section 3, 3.3.5 (see Appendix D) where applicable (Minimum 1.5 metres)	3. Trunk Diameter at Breast Height **DBH** 1.4m above ground, AS4970 2009, or mm or m above ground where indicated. # = average. g = ground	4. Tree Protection Zone (**TPZ**) = **12 x DBH** From centre of trunk (COT) in metres AS4970 2009Section 3 (See Appendix D) (Minimum 2.0 metres)	5. Proposed distance of tree protection fence/works on the side closest to building construction[2], in metres by Redgum Horticultural. **(work in progress)**
119	3.0	800	9.6	
121	2.8	700	8.4	
122	2.5	500	6.0	
123	1.7	200	2.4	
124	2.7	600	7.2	
125	1.7	200	2.4	
126	2.0	300	3.6	
127	2.8	700	8.4	
128	2.5	500	6.0	
129	1.7	200	2.4	
130	2.5	500	6.0	
131	2.5	500	6.0	
132	2.5	500	6.0	
133	2.7	600	7.2	
134	2.7	600	7.2	
135	2.5	500	6.0	
136	2.0	300	3.6	
137	2.7	#600 (300x4)	7.2	
138	2.3	400	4.8	
139	3.0	800	9.6	
140	2.0	300	3.6	
141	2.7	600	7.2	
142	2.7	600	7.2	
143	2.3	400	4.8	
144	2.5	500	6.0	
145	2.5	500	6.0	
146	2.7	600	7.2	
147	2.5	500	6.0	
148	2.5	500	6.0	
149	2.0	300	3.6	
150	2.8	700	8.4	
151	2.3	400	4.8	
152	2.7	600	7.2	
153	2.5	500	6.0	
154	2.5	500	6.0	
155	2.5	500	6.0	
156	2.7	600	7.2	
157	2.7	600	7.2	
158	2.8	700	8.4	
159	2.3	400	4.8	
160	2.7	600	7.2	
161	2.3	400	4.8	
162	2.5	500	6.0	
163	2.5	500	6.0	
164	2.3	400	4.8	
165	2.5	500	6.0	

1. Redgum Tree No.	2. **S**tructural **R**oot **Z**one **SRZ (DARB)** From centre of trunk (COT) **D**iameter **A**bove **R**oot **B**uttress AS4970 2009 Section 3, 3.3.5 (see Appendix D) where applicable (Minimum 1.5 metres)	3. **T**runk **D**iameter at **B**reast **H**eight **DBH** 1.4m above ground, AS4970 2009, or mm or m above ground where indicated. # = average. g = ground	4. **T**ree **P**rotection **Z**one (**TPZ**) = **12 x DBH** From centre of trunk (COT) in metres AS4970 2009Section 3 (See Appendix D) (Minimum 2.0 metres)	5. Proposed distance of tree protection fence/works on the side closest to building construction[2], in metres by Redgum Horticultural. **(work in progress)**
166	2.8	700	8.4	
167	2.8	700	8.4	
168	2.3	400	4.8	
169	2.3	400	4.8	
170	3.6	1200	14.4	

Descriptors for modified setbacks as per above table.

1 Special condition apply to protect the roots of trees generally.
2 Additional protective fencing information is detailed in attached plans.
3 Acceptable due to the good relative tolerance of the species to development impacts.
4 Range of setbacks for the trees at each end of a linear stand are to be calculated if required.
5 Acceptable as fence located at a substantial distance beyond dripline or may also include the location of a smaller tree in proximity to a larger tree to be retained and the smaller tree being protected well within the protective fencing for that larger tree.
6 Acceptable due to additional special protection works, see Section 5.0 for this tree.
7 Acceptable as pre-existing site conditions were conducive to having restricted the development of root growth in this direction.
8 Street tree with protective fencing of minimal width to allow for pedestrian access along road reserve.
9 Acceptable as tree transplanted reducing the area of the root zone.
10 Acceptable as not effected by development works.
11 Young trees not expected to have established a substantially expansive root system and able to re-establish or modify growth to be sustainable due to age and good vigour.
12 Set back prescribed by the consent authority.
13 Acceptable as tree growing on a lean and encroachment on compression wood side where root growth is of reduced structural importance.
14 Acceptable as root mapping has indicated extent of structural woody roots with a diameter of 20 mm or more.
15 Acceptable as a specimen of palm taxa tolerant of encroachment.
16 Acceptable as excavation on down slope or across slope side of tree.
17 Acceptable as encroachment into growing area below ground minor, with one corner of building or excavation works extending to within the radius of the dripline.
18 Acceptable as encroachment by pier, including screw piles, with minimal disturbance.
19 Acceptable as encroachment above grade without excavation or sub-base compaction.
20 Acceptable as located within 0.5 m from edge of dripline.
21 Acceptable as encroachment with gap graded fill that can accommodate gaseous exchange between roots/soil and the atmosphere and ongoing root growth.
22 Minimum setback 2 m, AS4970 (2009) section 3, 3.2.
23 Maximum setback 15 m, AS4970 (2009) section 3, 3.2.
24 Tree is a palm, other monocot, cycad or tree fern TPZ is to be 1 m outside crown projection AS4970 (2009) section 3, 3.2.
25 Minimum Structural Root Zone (SRZ) for trees less than 0.15 m diameter is 1.5 m, AS4970 (2009) section 3, 3.5.

Explanatory notes for Table 2.0.

This table is based upon Australian Standard AS4970 2009 *Protection of trees on development sites*, Section 3 Determining the protection zone of the selected trees (see Appendix D), where the approved building works should be no closer, including excavation, than the dimensions stated above.

"3.3 Variations to the TPZ

3.3.2 Minor Encroachment - *If the proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ, detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ.*

3.3.3 Major Encroachment

If the proposed encroachment is greater than 10% of the area of the TPZ or inside the SRZ the project arborist must demonstrate that the tree(s) would remain viable. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ."

Appendix F

Site Plan B - Survey of Trees to be Retained and Tree Protection Plan

Plan reproduced by email and further reduced by electronic scanning and no longer to original scale. For other tree protection measures see sections 5.0 and 7.0.

All Tree Protection Zones are to be measured on site.

WORK IN PROGRESS –
TO BE COMPLETED
Plan for proposed development

Redgum Legend	
Tree Protection Zone (TPZ), fencing with setbacks as indicated, or other protection measures or works as indicated. ***Tree Protection Zone,*** area of special protection measures or works outside of fenced area. Relocated ***Tree Protection Zone,*** area of special protection measures or works outside of fenced area once construction commences. XX Tree numbers – trees to be retained only. Subject trees represented by the approximate location of the trunk.	Indicative location of Tree Protection fencing which is to be measured on site and positioned along the Tree Protection Zone, excavation zone or proposed building footprint and to remain installed for the duration of the development. Installation of boundary fences within rootzone to be of pier and beam construction. Red dotted Tree Protection around trees relates to relocation of fencing when construction is to be undertaken within these areas. All works to be carried out within the blue Tree Protection area after works commences is to be undertaken in consultation with site arboriculturist.

Appendix E

Detailed Site Investigation

REPORT TO

COMPLETE URBAN

ON

DETAILED SITE INVESTIGATION

FOR

PROPOSED PUBLIC PARK UPGRADE

AT

BRICK PIT RESERVE, BANTRY BAY ROAD, FRENCHS FOREST, NSW

Date: 16 August 2023

Ref: E35432Prpt2

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DOCUMENT REVISION RECORD

Report Reference	Report Status	Report Date
E35432Prpt2 DRAFT	Draft Report	18 July 2023
E35432Prpt2	Final Report	16 August 2023

This Report (which includes all attachments and annexures) has been prepared by JKE for the Client, and is intended for the use only by that Client.

This Report has been prepared pursuant to a contract between JKE and the Client and is therefore subject to:

a) JKE's proposal in respect of the work covered by the Report;
b) The limitations defined in the client's brief to JKE; and
c) The terms of contract between JKE and the Client, including terms limiting the liability of JKE.

If the Client, or any person, provides a copy of this Report to any third party, such third party must not rely on this Report, except with the express written consent of JKE which, if given, will be deemed to be upon the same terms, conditions, restrictions and limitations as apply by virtue of (a), (b), and (c) above.

Any third party who seeks to rely on this Report without the express written consent of JKE does so entirely at their own risk and to the fullest extent permitted by law, JKE accepts no liability whatsoever, in respect of any loss or damage suffered by any such third party.

Executive Summary

Complete Urban ('the client') commissioned JK Environments (JKE) to undertake a Detailed Site Investigation (DSI) for the proposed public park upgrade at Brick Pit Reserve, Bantry Bay Road, Frenchs Forest, NSW ('the site'). The purpose of the investigation is to make an assessment of the site contamination conditions to establish whether remediation is required. The primary aims of the investigation were to characterise the soil, sediment, groundwater and surface water contamination conditions in accessible areas in order to assess site risks in relation to contamination and establish whether remediation is required.

The DSI included a review of a previous Preliminary Site Investigation (PSI), soil sampling from 27 boreholes/test pits across the site and five selected soil mounds in the north-east section, sediment sampling from four locations, groundwater sampling from three monitoring wells and surface water sampling from four locations.

The PSI identified the following potential contamination sources:

- Fill material;
- Historical quarrying/extractive activities;
- Use of pesticides; and
- Hazardous building materials.

The site has historically been used for quarrying/extractive activities, primarily for clay mining associated with a brickworks prior to 1930, then as a public reserve thereafter.

At the time of the inspection, the majority of the site was vacant, vegetated and used as a public reserve. Indicators of former extractive activities (i.e. quarrying) were suspected based on ponds/depressions and craters observed within the site. Unpaved bike tracks and forest walking tracks were present through the site. A 'creek' extended through the site that acted as an un-lined stormwater channel.

Fill was encountered at the surface in all boreholes and test pits and extended to depths of approximately 0.1m to 0.8m. The fill typically comprised silty clay or silty sandy clay with inclusions of ironstone, igneous and sandstone gravel, slag and building rubble (plastic, glass, brick and metal fragments). Natural silty clay was encountered beneath the fill at all locations, except BH105, BH107, BH109, TP119 and TP123 and extended to depths of approximately 0.3m to 3.2m. Sandstone and/or siltstone bedrock was encountered directly beneath the fill in BH109 and beneath natural soil in BH101, BH103, BH117, and BH124, and extended to the termination of the boreholes at a maximum depth of approximately 5.7m. We note that refusal was encountered on inferred bedrock in TP119, TP121 and TP123 at depths of approximately 0.8m to 1m.

The sediment samples generally included fill, similar to that encountered across the site. A borehole log was not generated for these sampling locations.

Groundwater seepage was encountered at soil profile interfaces in some locations, however, this seepage was not considered to be associated with any aquifer. All boreholes and test pits remained dry on completion of drilling and a short time after. Groundwater monitoring wells were installed in BH101 (MW101), BH117 (MW117) and BH124 (MW124). Standing Water Levels (SWLs) measured in the monitoring wells installed at the site ranged from 2.98m to 4.66m. Based on the ground surface contours, groundwater is expected to flow generally to the south-east, with localised flows to the on-site creeks.

We note that the Sampling, Analysis and Quality Plan (SAQP) was developed based on conditions that were encountered at the site during the 2022 site inspection. Upon subsequent inspection, the on-site water bodies were generally dry during the 2023 inspection. The 'creek' is considered to be ephemeral and acts more as an unlined stormwater channel than a permanent creek. Similarly, the ponds were generally dry in 2023 and are considered to be non-permanent water bodies. On this basis, the soils within these areas are not considered to be true sediments that are beneath water. Therefore, sediment samples were primarily assessed as soil, with a screening comparing results to the guidelines for sediment quality also completed as a conservative measure.

Total Recoverable Hydrocarbon (TRH) F3 was encountered in the surface sample from BH111 at a concentration that exceeded the ecological Site Assessment Criteria (SAC). We note that TRH F2 to F4 was detected in several surface and near surface samples across the site. Leaf litter was apparent across the site that is likely to include material from eucalypt trees. The source of the TRH is considered most likely to be organic material and, in particular, eucalyptus oils rather than fuel or motor oils and is not considered to represent a risk to ecological receptors.

Concentrations of nickel and/or zinc in the sediment samples SS1 and SS2 exceeded the ecological SAC. Stormwater flows appeared to have deposited material along the creek and in on-site depressions. The source of the heavy metals is considered likely to be the imported fill and /or stormwater flows across the site which import soil material that has run off roads and nearby areas. No indicators of plant stress or dieback were observed at the site and, therefore, the presence of these heavy metals is not considered to represent an unacceptable risk to ecological receptors given that the stormwater system is expected to continue to function the same way that it currently does.

Concentrations of lead, nickel, zinc and total TRHs were encountered in some sediment samples at concentrations that exceeded the guideline values for sediment quality. However, these samples are not considered to represent true sediment as the water bodies they have been obtained from are considered to be ephemeral and what has been sampled as ‘sediment’ is essentially soil deposits associated with stormwater flows and runoff. Based on this, these exceedances are not considered to represent an unacceptable risk.

We note that no asbestos was encountered at the site, however, demolition material was encountered across the site and there is a potential for asbestos to be identified during future earthworks. We have made recommendations to address these potential risks.

Groundwater and surface water results were all less than the SAC, with the exception of the zinc results in all groundwater samples, and zinc, copper and lead in surface water samples, which exceeded the ecological SAC. The heavy metals are considered likely to be associated with regional conditions rather than indicative of site contamination. Based on this, the risk posed by groundwater and surface water is considered to be low.

Surface water contamination conditions are expected to be transitory and would be expected to change over time due to rain events and sediment load within runoff which discharges onto the site via the stormwater system. The results reported during the DSI are not considered to be indicative of risks that warrant remediation. However, conditions may change over time.

The primary data gap is considered to include the limited site access and the inability to visually inspect the ground surfaces in all areas due to vegetation cover etc. Sampling was limited in some areas due to access constraints or underground services. These data gaps have been considered in drawing conclusions and making recommendations for the site.

Contaminant concentrations in soil, sediment, groundwater and surface water were generally low and were assessed not to pose an unacceptable risk in the context of the proposed development/land use scenario. The DSI did not identify any triggers for remediation.

Based on the findings of the investigation, JKE is of the opinion that the site is suitable for the proposed development. Due to the data gaps identified, we recommend that a robust unexpected finds protocol (UFP) be developed by a suitably qualified contaminated land consultant, and implemented during the construction phase of the project. As a minimum, the UFP must include:

- An outline of roles and responsibilities;
- A timeframe for which the UFP applies (i.e. from the commencement of any development-related works and for the duration of construction);
- A program for regular inspections by a contaminated land consultant to inspect the site as the works progress and to confirm (or document otherwise) that the site conditions are as expected based on the findings of the DSI;
- A protocol for managing unexpected finds; and
- A contingency plan for the identification of contamination as an unexpected find that warrants remediation.

We also recommend the following:

- The stockpile of fly-tipped waste in the south-eastern corner of the site should be disposed off-site to a licensed facility in accordance with an assigned waste classification; and
- Any materials imported to site during construction should be assessed to check that the material does not pose a contamination risk in the context of the proposed site use and intended use of the material.

The conclusions and recommendations should be read in conjunction with the limitations presented in the body of this report.

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Abbreviations

Asbestos Fines/Fibrous Asbestos	**AF/FA**
Ambient Background Concentrations	**ABC**
Added Contaminant Limits	**ACL**
Asbestos Containing Material	**ACM**
Australian Drinking Water Guidelines	**ADWG**
Area of Environmental Concern	**AEC**
Australian Height Datum	**AHD**
Acid Sulfate Soil	**ASS**
Above-Ground Storage Tank	**AST**
Before You Dig Australia	**BYDA**
Below Ground Level	**BGL**
Benzo(a)pyrene Toxicity Equivalent Factor	**BaP TEQ**
Bureau of Meteorology	**BOM**
Benzene, Toluene, Ethylbenzene, Xylene	**BTEX**
Cation Exchange Capacity	**CEC**
Contaminated Land Management	**CLM**
Contaminant(s) of Potential Concern	**CoPC**
Chain of Custody	**COC**
Conceptual Site Model	**CSM**
Development Application	**DA**
Data Quality Indicator	**DQI**
Data Quality Objective	**DQO**
Detailed Site Investigation	**DSI**
Ecological Investigation Level	**EIL**
Ecological Screening Level	**ESL**
Environmental Management Plan	**EMP**
Excavated Natural Material	**ENM**
Environment Protection Authority	**EPA**
Environmental Site Assessment	**ESA**
Fibre Cement Fragment(s)	**FCF**
General Approval of Immobilisation	**GAI**
Health Investigation Level	**HILs**
Health Screening Level	**HSL**
Health Screening Level-Site Specific Assessment	**HSL-SSA**
International Organisation of Standardisation	**ISO**
JK Environments	**JKE**
JK Geotechnics	**JKG**
Lab Control Spike	**LCS**
Light Non-Aqueous Phase Liquid	**LNAPL**
Map Grid of Australia	**MGA**
National Association of Testing Authorities	**NATA**
National Environmental Protection Measure	**NEPM**
Organochlorine Pesticides	**OCP**
Organophosphate Pesticides	**OPP**
Polycyclic Aromatic Hydrocarbons	**PAH**
Potential ASS	**PASS**
Polychlorinated Biphenyls	**PCBs**
Per-and Polyfluoroalkyl Substances	**PFAS**
Photo-ionisation Detector	**PID**
Protection of the Environment Operations	**POEO**
Practical Quantitation Limit	**PQL**
Quality Assurance	**QA**
Quality Control	**QC**

Remediation Action Plan	**RAP**
Relative Percentage Difference	**RPD**
Site Assessment Criteria	**SAC**
Sampling, Analysis and Quality Plan	**SAQP**
Site Audit Statement	**SAS**
Site Audit Report	**SAR**
State Environmental Planning Policy	**SEPP**
Site Specific Assessment	**SSA**
Source, Pathway, Receptor	**SPR**
Specific Contamination Concentration	**SCC**
Standard Penetration Test	**SPT**
Standing Water Level	**SWL**
Trip Blank	**TB**
Toxicity Characteristic Leaching Procedure	**TCLP**
Total Recoverable Hydrocarbons	**TRH**
Trip Spike	**TS**
Upper Confidence Limit	**UCL**
United States Environmental Protection Agency	**USEPA**
Underground Storage Tank	**UST**
Virgin Excavated Natural Material	**VENM**
Volatile Organic Compounds	**VOC**
World Health Organisation	**WHO**
Work Health and Safety	**WHS**

Units

Litres	**L**
Metres BGL	**mBGL**
Metres	**m**
Millivolts	**mV**
Millilitres	**ml or mL**
Milliequivalents	**meq**
micro Siemens per Centimetre	**µS/cm**
Micrograms per Litre	**µg/L**
Milligrams per Kilogram	**mg/kg**
Milligrams per Litre	**mg/L**
Parts Per Million	**ppm**
Percentage	**%**
Percentage weight for weight	**%w/w**

1 INTRODUCTION

Complete Urban ('the client') commissioned JK Environments (JKE) to undertake a Detailed Site Investigation (DSI) for the proposed public park upgrade at Brick Pit Reserve, Bantry Bay Road, Frenchs Forest, NSW ('the site'). The purpose of the investigation is to make an assessment of the site contamination conditions to establish whether remediation is required. The site location is shown on Figure 1 and the investigation was confined to the site boundaries as shown on Figure 2.

This report has been prepared with regards to Chapter 4 of the State Environmental Planning Policy (Resilience and Hazards) 2021[1] (formerly known as SEPP55), in order to establish whether remediation of site contamination is required. We understand that the DSI is required for the preparation of a Review of Environmental Factors (REF) and to support the concept design stage of the proposed Brick Pit Reserve upgrade works for Northern Beaches Council.

A geotechnical investigation was undertaken previously to this DSI by JK Geotechnics (JKG) in 2022[2]. The results of the geotechnical investigation are presented in a separate report. This report should be read in conjunction with the JKG report.

JKE has previously undertaken a PSI (desktop) at the site in 2022[3]. A summary of this information has been included in Section 2.

1.1 Proposed Development Details

The proposed development includes the upgrade of the existing Brick Pit Reserve to enable multi-use and enhance public recreational spaces. Based on the concept design plans (Ref: BP-CD-01, dated July 2018) prepared by Thompson Berril Landscape Design, we understand that the concept design includes the construction of a passive public recreation space including a wetland for the enhancement of indigenous flora and fauna. The concept design features include:

- Landscaped gateway features;
- Passive recreational spaces with outdoor seating, shade and grassed areas;
- Regeneration of existing native vegetation;
- Playground with natural play features and local heritage theme and materials;
- New elevated boardwalks over stormwater swale;
- Outdoor furniture in open and sheltered areas throughout the site;
- Retain and enhance existing mountain bike track;
- Rocked and planted stormwater swale;
- Elevated lookout deck over proposed wetland;
- Wetland to improve community amenity, stormwater quality and habitat;
- Concrete pathways of 2m wide;
- Crushed sandstone surfaced access trials across the site;

[1] *State Environmental Planning Policy (Resilience and Hazards) 2021* (NSW) (referred to as SEPP Resilience and Hazards 2021)
[2] JKG, (2022). *Report to Complete Urban on Geotechnical Investigation for Brick Pit Reserve at Frenchs Forest, NSW.* (Ref: 335432Xrpt1Rev1, dated 7 November 2022) (referred to as JKG report)
[3] JKE, (2022). *Report to Complete Urban on Preliminary (Stage 1) Site Investigation (PSI) for Proposed Brick Pit Reserve Upgrade at Brick Pit Reserve, Bantry Road, Frenchs Forest, NSW* (referred to as the PSI)

- Parking upgrades along the western side of the site;
- Shared bridge crossing; and
- Installation of lighting along proposed pathways.

Earthwork details have not yet been finalised, however, we understand that excavation is required for the construction of the proposed wetland, site levelling and new services installation purposes. We expect that excavation to be in the order of approximately 3m (maximum) below ground surface (BGL) for such works.

The preliminary concept development plan issued to JKE is attached in the appendices.

1.2 Aims and Objectives

The primary aims of the investigation were to characterise the soil, sediment, groundwater and surface water contamination conditions in accessible areas in order to assess site risks in relation to contamination and establish whether remediation is required. The objectives were to:

- Supplement the PSI data by completing the DSI, including soil, sediment, groundwater and surface water investigation;
- Assess the potential risks posed by contamination to the receptors identified in the Conceptual Site Model (CSM) via a Tier 1 risk assessment;
- Assess whether the site is suitable or can be made suitable for the proposed development (from a contamination viewpoint); and
- Assess whether further intrusive investigation and/or remediation is required.

1.3 Scope of Work

The investigation was undertaken generally in accordance with a JKE proposal (Ref: EP58368PWRev1) of 29 March 2023 and written acceptance from the client dated 5 May 2023. The scope of work included the following:

- Review of the PSI and preparation of a Sampling, Analysis and Quality Plan (SAQP);
- Preparation of a CSM;
- Design and implementation of a sampling, analysis and quality plan (SAQP);
- Interpretation of the analytical results against the adopted Site Assessment Criteria (SAC);
- Data Quality Assessment; and
- Preparation of a report including a Tier 1 risk assessment.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[4], other guidelines made under or with regards to the Contaminated Land Management Act (1997)[5] and SEPP Resilience and Hazards 2021. A list of reference documents/guidelines is included in the appendices.

[4] National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)

[5] Contaminated Land Management Act 1997 (NSW) (referred to as CLM Act 1997)

2 SITE INFORMATION

2.1 Background

The PSI included a review of historical information, a walkover site inspection and soil sampling from six boreholes (BH1, BH2, BH4, BH5, BH6 and BH8 – as shown on the attached Figure 2). The site has historically been used for quarrying/extractive activities, primarily for clay mining associated with a brickworks prior to 1930, then as a public reserve thereafter.

The site history information and site walkover inspection identified the following potential contamination sources:

- Fill material;
- Historical quarrying/extractive activities;
- Use of pesticides; and
- Hazardous building materials.

The boreholes drilled for the PSI generally encountered fill material to depths of approximately 0.2m to 1m below ground level (BGL), underlain by residual silty clay soils. However, several of the boreholes were terminated in fill, so the fill depths are not known at all borehole locations. The fill typically comprised silty clay, sandy clay, silty sand, gravelly clayey sand and sandy gravel with inclusions of sandstone, ironstone and igneous gravel, brick fragments and root fibres.

A selection of surficial soil samples was analysed for the suite of contaminants identified in the CSM. Total recoverable hydrocarbons (TRHs) F3 was detected in the surface fill sample from BH6 at a concentration that exceeded the ecological-based SAC. The source of the TRHs was unknown and further investigation was required to confirm source and characterise risks.

Asbestos was not detected in the fill samples analysed for the PSI. Although indicators for asbestos (i.e. brick fragments) were encountered in the fill material during fieldwork. Building demolition waste, including brick, concrete, tile fragments were also observed at the ground surface within parts of the site.

The PSI did not identify contamination that would preclude the proposed development/use of the site. However, a DSI was recommended to characterise the risks and establish whether remediation is necessary in the context of the proposed development. The following was recommended:

- Undertaken a DSI to characterise the site contamination conditions and establish whether remediation is required. A SAQP is to be prepared prior to commencement of the DSI; and
- Where required based on the outcome of the DSI, prepare and implement a Remediation Action Plan (RAP) for the proposed development.

JKE subsequently prepared a SAQP[6] for the DSI prior to commencement. Key parts of the SAQP are reproduced in Sections 5 and 6 of this report and a copy of the SAQP is attached in the appendices.

[6] JKE, (2023a). *Report to Complete Urban on Sampling, Analysis and Quality Plan (SAQP) for Detailed Site Investigation (DSI) at Brick Pit Reserve, Bantry Bary Road, Frenches Forest, NSW* (ref: E35432PW-SAQP, dated 13 June 2023) (referred to as SAQP)

2.2 Site Identification

Table 2-1: Site Identification

Current Site Owner (certificate of title):	The Council of The Shire of Warringah
Site Address:	Brick Pit Reserve, Bantry Road, Frenchs Forest, NSW
Lot & Deposited Plan:	Lot 103 in DP 1214166 and Lot 1B in DP 417447
Current Land Use:	Public reserve/vacant
Proposed Land Use:	Continue use as a public reserve with additional wetlands and amenities
Local Government Area:	Northern Beaches Council
Current Zoning:	RE1 – Public Recreation
Site Area (m^2) (approx.):	1.4
RL (AHD in m) (approx.):	141-151
Geographical Location (decimal degrees) (approx.):	Latitude: -33.75334 Longitude: 151.23338
Site Location Plan:	Figure 1
Sample Location Plan:	Figure 2

2.3 Site Location and Regional Setting

The site is located in a predominantly residential area of Frenchs Forest and is bound by Bantry Road to the west and Warringah Road to the north. The site is located approximately 400m to the south-west of Trefoil Creek, although the nearest down-gradient water body is Manly Creek located approximately 800m to the south-east. Northern Beaches Hospital is located approximately 140m to the north of the site.

2.4 Topography

The regional topography is characterised by broad ridgeline the roughly follows Warringah Road in an east-west direction. The regional topography slopes to the south-east. The site generally falls to the east at approximately 1°-2°, with the site levels influenced by historical quarrying operations (which we understand were associated with brick making). A swale was located in the approximate centre of the site and areas fall slightly away from the swale towards the site boundaries. Parts of the site appear to have been cut to form existing ponds/swampy water bodies which consists of steep localised declines along the slope batters. We note that these areas were dry during the 2023 inspection. Some areas of the site appeared to have been filled to accommodate existing walking trials and mound features.

2.5 Site Inspection

A walkover inspection of the site was undertaken by JKE on 27 September 2022 for the PSI and again on 23 June 2023 for the DSI. The inspection was limited to accessible areas of the site and immediate surrounds.

A summary of the inspection findings is outlined in the following subsections:

2.5.1 Current Site Use and/or Indicators of Former Site Use

At the time of the inspection, the majority of the site was vacant, vegetated and used as a public reserve. Suspected indicators of former extractive activities (i.e. quarrying) were suspected based on ponds/depressions and craters observed within the site. Unpaved bike tracks and forest walking tracks were present through the site.

2.5.2 Buildings, Structures and Roads

Apart from an outdoor shelter and seating located within the north-western portion of the site, no other buildings/structures were observed at the site. The shelter and outdoor seating were constructed of metal and timber and appeared in a reasonable condition. An asphaltic concrete paved area extended along the western boundary and was used as a car park.

2.5.3 Boundary Conditions, Soil Stability and Erosion

The site was fenced by metal wire fencing along the northern and eastern boundaries, and was unfenced along the western and southern boundaries. Areas of exposed soil were observed at the ground surface along the walking and bike trails and along the edges of the onsite ponds. No significant areas of soil erosions were observed onsite during the inspection.

2.5.4 Presence of Drums/Chemical Storage and Waste

Chemicals were not observed at the site. A disused drum (presumably empty) was partially buried in the northern area of the site. Some fly-tipped building waste was observed in the south-east portion of the site.

2.5.5 Evidence of Cut and Fill

Numerous mounds were observed within the northern area of the site (see indicative locations on Figure 3). The mounds appeared to consist of fill soil and were exposed. Based on anecdotal information from Northern Beaches Council, the mounds were constructed for use as mountain bike obstacles along the bike track. As discussed in Section 2.4, historical cut earthworks appeared to have undertaken within parts of the site which now form the existing ponds.

2.5.6 Visible or Olfactory Indicators of Contamination (odours, spills etc)

Discarded vinyl, wood, metal, tile, concrete and bricks were observed along the walking trail located within the southern portion of the site and in various other areas. Such building/demolition waste can be a pre-cursor for contamination from fly-tipping or historical filling. The stockpile of building waste in the south-eastern section of the site (see Figure 2) appeared largely to comprise larger materials such as concrete, timber etc.

2.5.7 Drainage and Services

A creek/drainage channel extended southwards from the stormwater discharge point at the north end of the site. The creek was unlined and vegetated, and surface water was observed in the creek during the inspection. The onsite creek is assumed to receive surface water flow from the up-gradient stormwater infrastructure.

2.5.8 Sensitive Environments

At least three large ponds were located onsite. The ponds were unlined, vegetated and contained water at the time of the inspection. It is assumed that the onsite ponds would receive surface water from other areas of the site and from up-gradient areas. Manly Creek is the nearest down-gradient water body and would be expected to receive surface water discharged from the site.

2.5.9 Landscaped Areas and Visible Signs of Plant Stress

The majority of the site was occupied by vegetation. The onsite vegetation included native canopy trees up to 10m in height and native and exotic shrubbery and grass throughout the understory. No dieback or obvious phyto-toxic stress were observed from the onsite vegetation based on a cursory inspection.

2.6 Surrounding Land Use

During the site inspection, JKE observed the following land uses in the immediate surrounds:

- North – Stormwater discharge infrastructure, Warringah Road and Northern Beaches Hospital further to the north;
- South – Single and double storey brick residences and Frenchs Forest Anglican Church further to the south;
- East – Vacant Roads and Maritime Services (RMS) road buffer, Wakehurst Parkway and a commercial precinct including technology companies (Stanfield IT, SkyMax Australia and Honey Gem Computer Repair), gym (Anytime Fitness), childcare centre (Mindchamps Early Learning), coffee supplier (Little Italy Coffee Roasters), medical centre (Northern Beaches Endocrinology) and retail shops (Parke Piano Strings and Materials and Gift Basket Store); and
- West – Bantry Bay Road and residential properties that typically consisted of single and double storey houses of brick construction.

JKE did not observe any land uses in the immediate surrounds that were identified as potential contamination sources for the site.

2.7 Underground Services

The 'Before You Dig Australia' (BYDA) (known as 'Dial Before You Dig' (DBYD) at the time of the PSI) plans were reviewed for the PSI in order to establish whether any major underground services exist at the site or in the immediate vicinity that could act as a preferential pathway for contamination migration. Major services were not identified that would be expected to act as preferential pathways for contamination migration.

2.8 Interview with Site Personnel

There were no onsite personnel, however JKE was able to conduct an interview with representatives from the Northern Beaches Council during preparation of the PSI. The following key points were noted:

- Steep depressions onsite were a result of historical clay mining activities;
- The stormwater from the site is discharged into Manly Reservoir located to the south-east;
- An abandoned vehicle had been found onsite by Northern Beaches Council personnel, however this was not observed during the inspection; and
- Future development of the park is primarily for passive recreational purposes whilst retaining ecological value.

2.9 Local Meteorology

Key meteorological data for Belrose (Evelyn Place) weather station available on the Bureau of Meteorology (BOM)[7] website has been reviewed and JKE note the following:

- The highest mean rainfall occurs in February, with a total of 166.4mm;
- The lowest mean rainfall occurs in September, with a total of 67.8mm; and
- In the two-week period (14 days) leading up to the JKE site inspection, the site surrounds received a total of 62.6mm of rainfall.

[7]http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_display_type=dailyDataFile&p_nccObsCode=136&p_stn_num=066188&p_c=-876314820&p_startYear=2022 visited on 14 October 2022

3 GEOLOGY AND HYDROGEOLOGY

3.1 Regional Geology

Regional geological information was reviewed for the PSI. The information was sourced from a Lotsearch report. The report indicated that the site is underlain by Hawkesbury Sandstone (mudstone), which typically consists of laminated mudstone and siltstone.

3.2 Acid Sulfate Soil (ASS) Risk and Planning

The site is not located in an ASS risk area according to the risk maps prepared by the Department of Land and Water Conservation (1997)[8].

ASS information presented in the Lotsearch report indicated that the site is not located within an ASS risk area.

3.3 Hydrogeology

Hydrogeological information presented in the Lotsearch report indicated that the regional aquifer on-site and in the areas immediately surrounding the site includes porous, extensive aquifers of low to moderate productivity. There was a total of 60 registered bores within the report buffer of 2,000m. In summary:

- The nearest registered bore was located approximately 80m from the site. This was utilised for monitoring purposes;
- The majority of the bores were registered for monitoring purposes;
- There were four nearby bores (i.e. within 1,000m) registered for domestic and water supply purposes. However, these were all over 500m from the site and generally up or cross gradient; and
- The drillers log information from the closest registered bores typically identified fill and/or clay soil to depths of 1mBGL-2mBGL, underlain by siltstone and sandstone bedrock. Standing water levels (SWLs) in the bores ranged from 2mBGL to 30mBGL.

The information reviewed for the PSI indicates that the subsurface conditions at the site are likely to consist of relatively low permeability (residual) soils overlying shallow bedrock. The potential for viable groundwater abstraction and use of groundwater under these conditions is considered to be low. There is a reticulated water supply in the area and consumption of groundwater is not expected to occur. Use of groundwater is not proposed as part of the development and there are no nearby registered groundwater users.

Considering the local topography and surrounding land features, JKE anticipate groundwater to flow towards the south.

3.4 Receiving Water Bodies

The onsite creek is expected to receive stormwater from up-gradient area to the north via the off-site stormwater discharge point.

[8] Department of Land and Water Conservation, (1997). *1:25,000 Acid Sulfate Soil Risk Map (Series 9130N3, Ed 2)*

The nearest down-gradient water body is the Manly Creek located approximately 800m to the south-east of the site. Manly Creek is a tributary of the Manly Reservoir (also known as Manly Dam) which is a freshwater ecosystem and is used for recreational purposes.

4 CONCEPTUAL SITE MODEL

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is presented in the following sub-sections and is based on the site information (including the site inspection information) and the review of site history information. Reference should also be made to the figures attached in the appendices.

A review of the CSM in relation to source, pathway and receptor (SPR) linkages has been undertaken as part of the Tier 1 risk assessment process, as outlined in Section 8.

4.1 Potential Contamination Sources/AEC and CoPC

The potential contamination sources/AEC and CoPC are presented in the following table:

Table 4-1: Potential (and/or known) Contamination Sources/AEC and Contaminants of Potential Concern

Source / AEC	CoPC
material – The site appears to have been historically filled to achieve the existing levels as part of the historical clay mining activities associated with a brickworks. It is possible that the fill was imported and could be contaminated. Building waste, possibly associated with fill or fly-tipping, was also observed in the south-eastern section of the site as shown on Figure 2. During the PSI inspection, a number of mounds were observed within the site as shown on Figure 2. The composition of the mounds were unknown and anthropogenic inclusions including used drums and trollies were observed to be buried within the mounds.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.
Historical Quarry/Extractive Industry – Available internet and site history information suggest that the site had operated as a clay quarry prior to the 1930s. The main sources of contamination from potential quarrying activities are considered to be associated with the operational aspects of mining. These potentially contaminating activities include the use of machinery and plant (i.e. re-fuelling, spills, leaks etc). Potential historical fuel storage/depots could have also existed at the site or in the surrounds.	Heavy metals, TRHs and PAHs.
Use of pesticides – Pesticides may have been used beneath the buildings and/or around the site.	Heavy metals and OCPs.
Hazardous Building Material – Hazardous building materials may be present as a result of former building and demolition activities. These materials may be buried within the sub-surface. Building waste, possibly associated with fill or fly-tipping, was also observed in the south-eastern section of the site as shown on Figure 2.	Asbestos, lead and PCBs.

Source / AEC	CoPC
Historical building demolition activities had occurred within the north-western corner of the site as observed from the aerial photographs between 1943 and 1951.	

The PSI identified a historical motor garage and service station located up-gradient of the site. The property had operated from 1965 until at least 2016 as indicated in the historical business records and aerial photographs reviewed for the PSI. We note that regulations were in place in 2016 regulating the monitoring and clean-up/decommissioning of service stations with underground fuel storage systems. On this basis, and in light of the absence of any EPA records relating to contaminated land in the surrounds, we consider that this historical off-site land use is unlikely to represent an off-site source of contamination for the site.

JKE note that bulk hazardous ground gases (HGG) such as methane and carbon dioxide have not been included as a CoPC associated with the historical filling of the site. This is due to the relatively shallow fill identified within the boreholes drilled across the site during the PSI and the lack of putrescible landfill material (i.e. household waste) or significant organic inclusions in fill. Based on this, the site is unlikely to have been extensively filled that would contribute to the generation of unacceptable levels of HGG.

4.2 Mechanism for Contamination, Affected Media, Receptors and Exposure Pathways

The mechanisms for contamination, affected media, receptors and exposure pathways relevant to the potential contamination sources/AEC are outlined in the following CSM table:

Table 4-2: CSM

Potential mechanism for contamination	The potential mechanisms for contamination are most likely to include 'top-down' impacts and spills. There is a potential for sub-surface releases to have occurred if deep fill (or other buried industrial infrastructure) is present, although this is considered to be the least likely mechanism for contamination. Contamination could also occur via stormwater from off-site areas flowing into the creek located onsite, particularly any stormwater from road run off which can be impacted by oil/fuel from motor vehicles.
Affected media	Soil, sediment, surface water and groundwater have been identified as potentially affected media.
Receptor identification	Human receptors include site occupants/users (including adults and children), construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users and recreational water users within Manly Creek and Manly Reservoir. Ecological receptors include terrestrial organisms and plants within unpaved areas and within accessible surface water within the onsite creek and ponds Off-site receptors include freshwater ecology in Manly Creek and Manly Reservoir.
Potential exposure pathways	Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants) and vapours (volatile TRH, naphthalene and BTEX). The potential for exposure would typically be associated with the construction and excavation works, and future use of the site.

	Potential exposure pathways for ecological receptors include primary/direct contact and ingestion. Exposure during future site use could occur via direct contact with soil in unpaved areas, inhalation of airborne asbestos fibres during soil disturbance, or inhalation of vapours within enclosed spaces such as buildings (construction of any amenity buildings in the future). Enclosed structures are not currently proposed, therefore vapour intrusion into buildings on site is not likely to occur. However, this potential exposure pathway will be considered in the context of the DSI for completeness given the project is still in the early design stages. Exposure to surface water could occur within the onsite creek, ponds and the proposed wetland through direct and ingestion. Surface water is expected to migrate to the site through the off-site stormwater outlet from up-gradient areas. Surface water was observed within the onsite creek and ponds during the PSI inspection. Exposure to groundwater could occur in the Manly Creek and Manly Reservoir through direct migration. Hyporheic exchange between groundwater and surface water within the onsite creek and ponds could occur at the sediment interphase, especially given the onsite water bodies were unlined and vegetated. Direct migration of groundwater to the onsite creek could occur and transported to the down-gradient Manly Creek.
Potential exposure mechanisms	The following have been identified as potential exposure mechanisms for site contamination: • Vapour intrusion into service trenches, excavations or any future proposed buildings (either from soil contamination or volatilisation of contaminants from groundwater); • Contact (dermal, ingestion or inhalation) during construction, or with exposed soils in landscaped areas and/or unpaved areas; and • Migration of surface water and groundwater off-site and into nearby water bodies, including aquatic ecosystems and those being used for recreation.
Presence of preferential pathways for contaminant movement	The discharge of stormwater from up-gradient areas is a preferential pathway for contaminant migration. The onsite water bodies are potential preferential pathway for contaminant migrations. This could occur via groundwater seepage (hyporheic exchange) if present, or via direct migration of stormwater from up-gradient areas. The onsite surface water is expected to be discharged into Manly Creek and ultimately, into Manly Reservoir located to the south-east.

5 SAMPLING, ANALYSIS AND QUALITY PLAN

5.1 Data Quality Objectives (DQO)

Data Quality Objectives (DQOs) were developed as part of the SAQP to define the type and quality of data required to achieve the project objectives outlined in Section 1.2. Reference to the SAQP should be made regarding the seven-step DQO approach for this project.

The DQO process is validated in part by the Data Quality Assurance/Quality Control (QA/QC) Evaluation. The Data (QA/QC) Evaluation is summarised in Section 7.1 and the detailed evaluation is provided in the appendices.

The sampling plan and methodology are outlined in the following sub-sections.

5.2 Soil Sampling Plan and Methodology

The soil sampling plan and methodology adopted for this investigation is outlined in the table below:

Table 5-1: Soil Sampling Plan and Methodology

Aspect	Input
Sampling Density	Samples were collected from 27 locations (BH101 to TP127) as shown on the attached Figure 2. The SAQP nominated two locations (TP126 and TP127) to be located along the site boundaries along the road verge of the existing Bantry Road parking area. These locations were moved further east due to the presence of a buried gas pipeline in the area. Several other sampling locations were moved due to access limitations associated with dense vegetation, ponds and slopes. The number of sampling locations meets the minimum sampling density as outlined in the NSW EPA Sampling Design Part 1 – Application (2022)[9] contaminated land guidelines. However, it is noted that a systematic sampling plan was not possible due to site access constraints. Hence, the requirements for hotspot identification, which is based on a positioning the sampling locations on a square grid-based plan, were not met. Sediment samples were obtained using hand tools from four accessible locations in the eastern area of the site (SS1 to SS4). Three of these were within the base of one of the creeks and one was in the base of a small basin/pond. Soil samples were collected from a selection of five (SM101 to SM105) onsite mounds/stockpiles, all located in the north-east portion of the site. Each sample was collected from approximately 0.5m into or towards the centre of the stockpiles using hand tools.
Sampling Plan	The SAQP plotted sampling locations on a systematic plan with a grid spacing of approximately 24m between sampling locations. As noted above, implementing this plan was not achievable due to access constraints and the final sampling plan was considered to be judgemental. The sampling locations were broadly positioned for site coverage, taking into consideration the identified AEC, and areas that are not easily accessible due to onsite obstructions (either above or below ground).

[9] NSW EPA, (2022). *Sampling design part 1 - application.* (referred to as EPA Sampling Design Guidelines 2022)

Aspect	Input
Set-out and Sampling Equipment	Sampling locations were set out using a tape measure in combination with a hand held GPS unit (with an accuracy of ±5m). In-situ sampling locations were checked for underground services by an external contractor prior to sampling. Samples from test pit locations were collected using were collected using a mechanical excavator. Samples were obtained from the test pit walls or directly from the bucket by hand. Where sampling occurred from the bucket, JKE collected samples from the central portion of large soil clods, or from material that was unlikely to have come into contact with the bucket. Samples from BH101, BH103, BH117 and BH124 were collected using a drill rig equipped with spiral flight augers (150mm diameter). Soil samples were obtained from a Standard Penetration Test (SPT) split-spoon sampler, and/or directly from the auger. Samples from the remaining boreholes, together with sediment and soil mounds/stockpiles were collected using a hand auger.
Sample Collection and Field QA/QC	Soil samples were obtained between 14-16 June 2023 in accordance with our standard field procedures. Soil samples were collected from the fill and natural profiles based on field observations. The sample depths are shown on the logs attached in the appendices. Samples were placed in glass jars with plastic caps and teflon seals with minimal headspace. Samples for asbestos analysis were placed in zip-lock plastic bags. During sampling, soil at selected depths was split into primary and duplicate samples for field QA/QC analysis. The field splitting procedure included alternately filling the sampling containers to obtain a representative split sample.
Field Screening	A portable Photoionisation Detector (PID) fitted with a 10.6mV lamp was used to screen the samples for the presence of volatile organic compounds (VOCs). PID screening for VOCs was undertaken on soil samples using the soil sample headspace method. VOC data was obtained from partly filled zip-lock plastic bags following equilibration of the headspace gases. PID calibration records are maintained on file by JKE. The field screening for asbestos quantification was undertaken from the 27 boreholes/test pits and the five soil mound locations and included the following: • A representative bulk sample (generally 10L) was collected from fill at 1m intervals, or from each distinct fill profile. The quantity of material for each sample varied based on whatever return could be achieved using the auger. The bulk sample intervals are shown on the attached borehole/test pit logs; • Each sample was weighed using an electronic scale; • Each bulk sample was passed through a sieve with a 7.1mm aperture and inspected for the presence of fibre cement; • The condition of fibre cement or any other suspected asbestos materials was noted on the field records; and • If observed, any fragments of fibre cement in the bulk sample were collected, placed in a zip-lock bag and assigned a unique identifier. Calculations for asbestos content were undertaken based on the requirements outlined in Schedule B1 of NEPM (2013), as summarised in Section 6.1.

Aspect	Input
	A calibration/check of the accuracy of the scale used for weighing the fibre cement fragments was undertaken using a set of calibration weights. Calibration/check records are maintained on file by JKE. The scale used to weigh the 10L samples was not calibrated, however this is not considered significant as this method of providing a weight for the bulk sample is considered to be considerably more accurate than applying a nominal soil density conversion.
Decontamination and Sample Preservation	Sampling personnel used disposable nitrile gloves during sampling activities. Re-usable sampling equipment was decontaminated using Decon and potable water. Soil samples were preserved by immediate storage in an insulated sample container with ice. On completion of the fieldwork, the samples were stored temporarily in fridges in the JKE warehouse before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody (COC) procedures.

5.3 Groundwater Sampling Plan and Methodology

The groundwater sampling plan and methodology is outlined in the table below:

Table 5-2: Groundwater Sampling Plan and Methodology

Aspect	Input
Sampling Plan	Groundwater monitoring wells were installed in BH101 (MW101), BH117 (MW117) and BH124 (MW124). The wells were positioned to gain a snap-shot of the groundwater conditions. Considering the topography and the location of the nearest down-gradient water body, MW101 was considered to be in the up-gradient area of the site and would be expected to provide an indication of groundwater flowing onto (beneath) the site from the north. MW117 and MW125 are considered to be in the intermediate to down-gradient area of the site and would be expected to provide an indication of groundwater flowing across (beneath) the site and beyond the down-gradient site boundary. The groundwater monitoring well locations are shown on Figure 2.
Monitoring Well Installation Procedure	The monitoring well construction details are documented on the appropriate borehole logs attached in the appendices. The monitoring wells were installed to depths of approximately 5.6m to 5.7m below ground level. The wells were generally constructed as follows: • 50mm diameter Class 18 PVC (machine slotted screen) was installed in the lower section of the well to intersect groundwater; • 50mm diameter Class 18 PVC casing was installed in the upper section of the well (screw fixed); • A 2mm sand filter pack was used around the screen section for groundwater infiltration; • A hydrated bentonite seal/plug was used on top of the sand pack to seal the well; and • A gatic cover was installed at the surface with a concrete plug to limit the inflow of surface water. The monitoring well installation, including the screen lengths, were considered suitable for assessment of general groundwater quality with regards to Table 5 in Schedule B2 of NEPM 2013.
Monitoring Well Development	The monitoring wells were developed on 19 June 2023 using a submersible electrical pump. Due to the hydrogeological conditions, groundwater inflow into the wells was relatively low, therefore the wells were pumped until they were effectively dry. The field monitoring records and calibration data are attached in the appendices.

Aspect	Input
Groundwater Sampling	The monitoring wells were allowed to recharge for approximately four days after development. Groundwater samples were obtained on 23 June 2023. Prior to sampling, the monitoring wells were checked for the presence of Light Non-Aqueous Phase Liquids (LNAPLs) using an inter-phase probe electronic dip meter. The monitoring well head space was checked for VOCs using a calibrated PID unit. The samples were obtained using a peristaltic pump/disposable plastic bailer. During sampling, the following parameters were monitored using calibrated field instruments: • Standing water level (SWL) using an electronic dip meter; and • pH, temperature, electrical conductivity (EC), dissolved oxygen (DO) and redox potential (Eh) using a YSI Multi-probe water quality meter. Steady state conditions were considered to have been achieved when the difference in the pH measurements was less than 0.2 units, the difference in conductivity was less than 10%, and when the SWL was not in drawdown. Groundwater samples were obtained directly from the single use PVC tubing and placed in the sample containers. Duplicate samples were obtained by alternate filling of sample containers. This technique was adopted to minimise disturbance of the samples and loss of volatile contaminants associated with mixing of liquids in secondary containers, etc. Groundwater removed from the wells during development and sampling was transported to JKE in jerry cans and stored in holding drums prior to collection by a licensed waste water contractor for off-site disposal. The field monitoring record and calibration data are attached in the appendices.
Decontaminant and Sample Preservation	During development, the pump was flushed between monitoring wells with potable water (single-use tubing was used for each well). The pump tubing was discarded after each sampling event and replaced therefore no decontamination procedure was considered necessary. The samples were preserved with reference to the analytical requirements and placed in an insulated container with ice or ice bricks. On completion of the fieldwork, the samples were temporarily stored in a fridge at the JKE office, before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard COC procedures.

5.4 Surface Water Sampling Plan and Methodology

The surface water sampling plan and methodology is outlined in the table below:

Table 5-3: Surface Water Sampling Plan and Methodology

Aspect	Input
Sampling Plan	Surface water samples were collected from four locations (SW1 to SW4 inclusive) within selected onsite water bodies (i.e. within the site boundaries). Three of the locations (SW1 to SW3) were targeted along the length of one of the onsite creeks and one location (SW4) was targeted at the onsite ponds. The proposed surface water sampling locations are shown on Figure 2. The locations are positioned to establish a baseline 'snap-shot' conditions of the surface water quality within the onsite creek and ponds. We acknowledge that the surface water quality will change overtime given the site receives surface water flows, stormwater and runoff from upgradient areas.

Aspect	Input
	Considering the direction of the surface water flow, SW1 is considered to be in the up-gradient of the site, SW2 is considered to be in the intermediate area of the site and SW3 is considered to be in the down-gradient area of the creek on site.
Surface Water Sampling	The water samples were obtained as grab samples from the surface water bodies. We note that surface water was very shallow and, therefore, sample locations were excavated by hand to allow sufficient water depth to obtain samples by filling a 500mL container and using that to directly fill other sample containers. Duplicate samples were obtained by alternate filling of sample containers. This technique was adopted to minimise disturbance of the samples and loss of volatile contaminants associated with mixing liquids in secondary containers, etc. During sampling, one stabilised reading of the pH, temperature, electrical conductivity (EC), dissolved oxygen (DO) and redox potential (Eh) was recorded using a calibrated YSI multi-probe water quality meter. The field monitoring records are attached in the report appendices.
Decontaminant and Sample Preservation	The samples were preserved with reference to the analytical requirements and placed in an insulated container with ice or ice bricks. On completion of the fieldwork, the samples were temporarily stored in a fridge at the JKE office, before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard COC procedures.

5.4.1 Laboratory Analysis

Samples were analysed by an appropriate, NATA Accredited laboratory using the analytical methods detailed in Schedule B(3) of NEPM 2013. Reference should be made to the laboratory reports attached in the appendices for further details.

Table 5-4: Laboratory Details

Samples	Laboratory	Report Reference
All primary samples and field QA/QC samples including (intra-laboratory duplicates, trip blanks, trip spikes and field rinsate samples)	Envirolab Services Pty Ltd NSW, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	326037, 326027-A and 326446
Inter-laboratory duplicates	Envirolab Services Pty Ltd VIC, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	38162

6 SITE ASSESSMENT CRITERIA (SAC)

The SAC were derived from the NEPM 2013 and other guidelines as discussed in the SAQP. Reference should be made to the SAQP for a detailed discussion of the SAC. The guideline values for individual contaminants are presented in the attached report tables and further explanation of the various criteria adopted is provided in the appendices.

6.1 Soil and Sediment

We note that the SAQP was developed based on conditions that were encountered at the site during the 2022 site inspection. Upon subsequent inspection, the on-site water bodies were generally dry during the 2023 inspection. The 'creek' is considered to be ephemeral and acts more as an unlined stormwater channel than a permanent creek. Similarly, the ponds were generally dry in 2023 and are considered to be non-permanent water bodies. On this basis, the soils within these areas are not considered to be true sediments that are beneath water.

Based on the above, soil and sediment data were compared to relevant Tier 1 screening criteria in accordance with NEPM (2013) as outlined below. Data for human health was typically assessed against the criteria for 'public open space' land use, with the exception of assessment of vapour intrusion risk, which adopted a 'commercial/industrial' land use. Management Limits for petroleum hydrocarbons were also considered.

Data for ecological risk were assessed against an 'urban residential and public open space' (URPOS) exposure scenario. Ecological Investigation Levels (EILs) for selected metals were calculated by adding the added contaminant limit (ACL) values presented in Schedule B(1) of NEPM (2013) to the published ambient background concentration (ABC) values presented in the document titled Trace Element Concentrations in Soils from Rural and Urban Areas of Australia (1995)[3]. The ACL for selected metals were calculated using site specific soil parameters for pH, cation exchange capacity (CEC) and clay content for samples from BH108 (0-0.1m), BH116 (0-0.1m), BH118 (0-0.1m), SS1, SS2 and SS4. The average pH, CEC and clay content was calculated based on the data from BH108, BH116 and BH118, and was applied to all soil samples as the soils were relatively consistent and logged as silty clay. The data from the sediment samples was only applied to each respective sample. This method is considered to be adequate for the Tier 1 screening.

Whilst the soil in the creek and ponds is not considered to be true sediment in the context of continually supporting ecological receptors, the guidelines values for sediment quality[10] have been considered as a conservative measure.

6.2 Groundwater and Surface Water

Groundwater and surface water data were compared to relevant Tier 1 screening criteria in accordance with NEPM (2013), following an assessment of environmental values in accordance with the Guidelines for the Assessment and Management of Groundwater Contamination (2007)[11]. Environmental values for this investigation include aquatic ecosystems and human uses (incidental contact and recreational water use).

[10] https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/sediment-quality-toxicants

[11] NSW Department of Environment and Conservation, (2007). *Guidelines for the Assessment and Management of Groundwater Contamination.*

Groundwater data has also been assessed against the NEPM (2013) criteria for vapour intrusion. The criteria have been discussed in detail in the attached SAQP.

7 RESULTS

7.1 Summary of Data (QA/QC) Evaluation

The data evaluation is presented in the appendices. In summary, JKE is of the opinion that the data are adequately precise, accurate, representative, comparable and complete to serve as a basis for interpretation to achieve the investigation objectives.

7.2 Subsurface Conditions

A summary of the subsurface conditions encountered during the investigation is presented in the following table. Reference should be made to the borehole/testpit logs attached in the appendices for further details.

Table 7-1: Summary of Subsurface Conditions

Profile	Description
Fill	Fill was encountered at the surface in all boreholes and test pits and extended to depths of approximately 0.1m to 0.8m. BH105, BH107, TP119 and TP123 were terminated in the fill at a maximum depth of approximately 1m. The fill typically comprised silty clay or silty sandy clay with inclusions of ironstone, igneous and sandstone gravel, slag and building rubble (plastic, glass, brick and metal fragments).
Natural Soil	Silty clay was encountered beneath the fill at all locations, except BH105, BH107, BH109, TP119 and TP123 and extended to depths of approximately 0.3m to 3.2m. TP102, BH104, TP106, BH108, TP110 to BH116, BH118, TP120 to TP122 and TP125 to TP127 were terminated in the natural soil at a maximum depth of approximately 1.2m. The silty clay was typically light grey, red-brown and orange and contained ironstone gravel at some locations.
Bedrock	Sandstone and/or siltstone bedrock was encountered directly beneath the fill in BH109 and beneath natural soil in BH101, BH103, BH117, BH124 and extended to the termination of the boreholes at a maximum depth of approximately 5.7m. The bedrock was typically light grey and red. We note that refusal was encountered on inferred bedrock in TP119, TP121 and TP123 at depths of approximately 0.8m to 1m.
Groundwater	Seepage was encountered at soil profile interfaces in some locations, however, this seepage was not considered to be associated with any aquifer. All boreholes and test pits remained dry on completion of drilling and a short time after. Groundwater monitoring wells were installed in BH101 (MW101), BH117 (MW117) and BH124 (MW124).

The sediment samples generally included fill, similar to that encountered across the site. A borehole log was not generated for these sampling locations.

7.3 Field Screening

A summary of the field screening results is presented in the following table:

Table 7-2: Summary of Field Screening

Aspect	Details
PID Screening of Soil Samples for VOCs	PID soil sample headspace readings are presented in attached report tables and the COC documents attached in the appendices. The results ranged from 0ppm to 4.5ppm isobutylene equivalents which indicates low levels of PID detectable VOCs. Samples with the highest PID readings were analysed for TRH and BTEX.
Bulk Screening for Asbestos	The bulk field screening results are summarised in the attached report Table S5. All results were below the SAC. Visible asbestos material was not encountered in any sample.
Groundwater Depth & Flow	SWLs measured in the monitoring wells installed at the site ranged from 2.98m to 4.66m. Based on the ground surface contours, groundwater is expected to flow generally to the south-east, with localised flows to the on-site creeks.
Groundwater Field Parameters	Field measurements recorded during sampling were as follows: - pH ranged from 4.15 to 5.15; - EC ranged from 420µS/cm to 1037µS/cm; - Eh ranged from -110mV to -144mV; and - DO ranged from 3.2ppm to 4.8ppm. The PID readings in the monitoring well headspace recorded during sampling ranged from 0.5ppm in MW124 to 28.4ppm in MW101.
LNAPLs petroleum hydrocarbons	Phase separated product (i.e. LNAPL) was not detected using the interphase probe during groundwater sampling.

7.4 Soil and Sediment Laboratory Results

The soil and sediment laboratory results were assessed against the SAC presented in Section 6.1. Individual SAC are shown in the report tables attached in the appendices. A summary of the results is presented below:

7.4.1 Human Health and Environmental (Ecological) Assessment

Table 7-3: Summary of Soil and Sediment Laboratory Results – Human Health and Environmental (Ecological)

Analyte	N	Max. (mg/kg)	N> Human Health SAC	N> Ecological SAC	Comments
Arsenic	62	21	0	0	-
Cadmium	62	1	0	NSL	-
Chromium (total)	62	37	0	0	-
Copper	62	140	0	0	-
Lead	62	350	0	0	-

Analyte	N	Max. (mg/kg)	N> Human Health SAC	N> Ecological SAC	Comments
Mercury	62	0.5	0	NSL	-
Nickel	62	64	0	2	The nickel results of 36mg/kg and 64mg/kg in the SS1 and SS2 samples exceeded the ecological SAC of 35mg/kg.
Zinc	62	790	0	2	The zinc results in the SS1 and SS2 samples ranged from 220mg/kg to 790mg/kg and exceeded the ecological SAC.
Total PAHs	62	6.2	0	NSL	-
Benzo(a)pyrene	62	0.68	NSL	0	-
Carcinogenic PAHs (as BaP TEQ)	62	1	0	NSL	-
Naphthalene	62	<1	0	NSL	-
DDT+DDE+DDD	36	<0.1	0	NSL	-
DDT	36	<0.1	NSL	0	-
Aldrin and dieldrin	36	<0.1	0	NSL	-
Chlordane	36	<0.1	0	NSL	-
Heptachlor	36	<0.1	0	NSL	-
Chlorpyrifos (OPP)	36	<0.1	0	NSL	-
PCBs	36	<0.1	0	NSL	-
TRH F1	62	<25	0	0	-
TRH F2	62	120	0	0	-
TRH F3	62	1,700	0	1	The TRH F3 result of 1,700mg/kg in the BH111 (0-0.1m) sample exceeded the ecological SAC of 1,300mg/kg.
TRH F4	62	720	0	0	-
Benzene	62	<0.2	0	0	-
Toluene	62	<2	0	0	-
Ethylbenzene	62	<2	0	0	-

Analyte	N	Max. (mg/kg)	N> Human Health SAC	N> Ecological SAC	Comments
Xylenes	62	<2	0	0	-
Asbestos (in soil) (%w/w)	41	ACM = <0.01% AF/FA = <0.001%	0	NA	-

Notes:
N: Total number (primary samples)
NSL: No set limit
NL: Not limiting

Soil SAC exceedances are shown on Figure 3 in the appendices.

7.4.2 Sediment Quality Assessment

Table 7-4: Summary of Sediment Laboratory Results – Guideline values for Sediment Quality

Analyte	N	Max. (mg/kg)	N> Upper Guideline Value (GV-high)	Comments
Arsenic	4	15	0	-
Cadmium	4	1	0	-
Chromium (total)	4	30	0	-
Copper	4	110	0	-
Lead	4	350	2	The lead results in the SS2 and SS4 samples ranged from 330mg/kg to 350mg/kg and exceeded the GV-high of 220mg/kg.
Mercury	4	0.3	0	-
Nickel	4	64	1	The nickel result of 64mg/kg in the SS2 sample exceeded the GV-high of 52mg/kg.
Zinc	4	790	1	The zinc result of 790mg/kg in the SS2 sample exceeded the GV-high of 410mg/kg.
Total PAHs	4	<0.15	0	-
Total DDT	4	<0.3	0	-
pp-DDE	4	<0.3	0	-
Endrin	4	<0.3	0	-
Dieldrin	4	<0.3	0	-
Chlordane	4	<0.3	0	-

Analyte	N	Max. (mg/kg)	N> Upper Guideline Value (GV-high)	Comments
o,p'- + p,p'-DDD	4	<0.3	0	-
Total PRH (TRH)	4	1,500	1	The total TRH result of 1,500mg/kg in the SS2 sample exceeded the GV-high of 550mg/kg.
Total Organic Carbon (TOC)	4	140,000	NSL	The TOC results in the SS1 to SS4 samples ranged from 18,000mg/kg to 140,000mg/kg.

Notes:
N: Total number (primary samples)

Sediment SAC exceedances are not shown on Figure 3 in the appendices.

7.5 Groundwater and Surface Water Laboratory Results

The groundwater and surface water laboratory results were assessed against the SAC presented in Section 6.2. Individual SAC are shown in the report tables attached in the appendices. A summary of the results is presented below:

Table 7-5: Summary of Groundwater Laboratory Results – Human Health and Environmental (Ecological)

Analyte	N ^	Max. (µg/L)	N> Human Health SAC	N> Ecological SAC	Comments
Arsenic	7	5	0	0	-
Cadmium	7	0.2	0	0	-
Chromium (total)	7	2	0	0	-
Copper	7	7	0	2	The copper results of 7µg/L and 3µg/L in the SW1 and SW4 samples, respectively, exceeded the ecological SAC of 1.4µg/L.
Lead	7	5	0	1	The lead result of 5µg/L in the SW3 sample exceeded the ecological SAC of 3.4µg/L.
Mercury	7	<0.05	0	0	-
Nickel	7	24	0	1	The nickel result of 24µg/L in the SW3 sample exceeded the ecological SAC of 11µg/L.
Zinc	7	140	0	7	The zinc results in all samples ranged from 18µg/L to 140µg/L and exceeded the ecological SAC of 8µg/L.
Total PAHs	7	<0.1	0	0	-

Analyte	N ^	Max. (µg/L)	N> Human Health SAC	N> Ecological SAC	Comments
Benzo(a)pyrene	7	<0.1	0	0	-
Naphthalene	7	<0.2	0	0	-
TRH F1	7	<50	0	NSL	-
TRH F2	7	<50	0	NSL	-
TRH F3	7	200	NSL	NSL	The SW3 sample contained a low concentration of TRH F3. All remaining results were less than the detection limit.
TRH F4	7	<100	NSL	NSL	-
Benzene	7	<1	0	0	-
Toluene	7	<1	0	0	A trace concentration (1µg/L) was detected in the GWDUP1 sample (duplicate of MW101).
Ethylbenzene	7	<1	0	0	-
m+p-Xylene	7	<2	0	0	-
o-Xylene	7	<1	0	0	-
Total Xylenes	7	<2	0	0	-

Notes:
^: Primary samples
N: Total number
NSL: No set limit
NL: Not limiting

Groundwater and surface water SAC exceedances are shown on Figure 3 in the appendices.

8 DISCUSSION

8.1 Contamination Sources/AEC and Potential for Site Contamination

TRH F3 was detected in the surficial fill sample from BH6 at a concentration that exceeded the ecological-based SAC during the PSI. The source of the TRHs was unknown and further investigation was required to confirm source and characterise risks.

The PSI identified the following potential contamination sources:

- Fill material;
- Historical quarrying/extractive activities;
- Use of pesticides; and
- Hazardous building materials.

Considering the above, and based on a qualitative assessment of various lines of evidence as discussed throughout this report, the PSI concluded that there is a potential for site contamination. The soil and surface water data collected for the DSI is discussed further in the following subsection, as part of the Tier 1 risk assessment.

8.2 Tier 1 Risk Assessment and Review of CSM

For a contaminant to represent a risk to a receptor, the following three conditions must be present:

1. Source – The presence of a contaminant;
2. Pathway – A mechanism or action by which a receptor can become exposed to the contaminant; and
3. Receptor – The human or ecological entity which may be adversely impacted following exposure to contamination.

If one of the above components is missing, the potential for adverse risks is relatively low.

8.2.1 Soil

TRH F3 was encountered in the surface sample from BH111 at a concentration that exceeded the ecological SAC. We note that TRH F2 to F4 was detected in several surface and near surface samples across the site. We note that leaf litter was apparent across the site that is likely to include material from eucalypt trees. The source of the TRH is considered most likely to be organic material and, in particular, eucalyptus oils rather than fuel or motor oils.

We note that the TRH results in the underlying sample from BH111 were less than the laboratory detection limits as were results in the majority of sub-surface samples across the site, which aligns with the association of the TRH to surface leaf litter and organic material. Based on this, the TRH F3 is not considered to represent a risk to ecological receptors. This is further supported by the low PID results and absences of hydrocarbon odours and staining within the soils which confirms the source of TRHs is not likely to be petroleum.

Concentrations of nickel and/or zinc in the sediment samples SS1 and SS2 exceeded the ecological SAC. Stormwater flows appeared to have deposited material along the creek and in on-site depressions. The source of the heavy metals is considered likely to be the imported fill and /or stormwater flows across the site which import soil material that has run off roads and nearby areas. No indicators of plant stress or dieback were observed at the site and, therefore, the presence of these heavy metals is not considered to represent an unacceptable risk to ecological receptors given that the stormwater system is expected to continue to function the same way that it currently does.

Concentrations of lead, nickel, zinc and total TRHs were encountered in some sediment samples at concentrations that exceeded the guideline values for sediment quality. However, as discussed in Section 6.1, these samples are not considered to represent true sediment as the water bodies they have been obtained from are considered to be ephemeral and what has been sampled as 'sediment' is essentially soil deposits associated with stormwater flows and runoff. Based on this, these exceedances are not considered to represent an unacceptable risk.

We note that no asbestos was encountered at the site, however, demolition material was encountered across the site and there is a potential for asbestos to be identified during future earthworks. We have made recommendations to address these potential risks.

8.2.2 Groundwater

Groundwater results were all less than the SAC, with the exception of the zinc results in all samples, which exceeded the ecological SAC. Given the relatively low concentrations of zinc (maximum 68µg/L) and consistency of the results across the samples, the zinc is considered likely to be associated with regional conditions rather than indicative of site contamination. Based on this, the risk posed by groundwater is considered to be low.

8.2.3 Surface Water

Surface water results were all less than the SAC, with the exception of the zinc results in all samples, copper in SW1 and SW4 and Lead in SW3, which exceeded the ecological SAC. The heavy metals in surface water are considered to be associated with a combination of regional conditions and stormwater flow across the site.

All results were below the 'recreational' SAC which indicates that risks associated with incidental human contact (primary and secondary) with groundwater and/or surface water on site are expected to be low and acceptable.

Surface water contamination conditions are expected to be transitory and would be expected to change over time due to rain events and sediment load within runoff which discharges onto the site via the stormwater system. The results reported during the DSI are not considered to be indicative of risks that warrant remediation. However, conditions may change over time.

8.3 Decision Statements

The decision statements are addressed below:

Are any results above the SAC?

Yes, TRH F3 and heavy metals were encountered in some soil and sediment samples at concentrations that exceeded the ecological SAC as discussed in Section 8.2.1. Heavy metals (primarily zinc) were encountered in the groundwater and surface water samples at concentrations that exceeded the ecological SAC.

Do potential risks associated with contamination exist, and if so, what are they?

The TRH and heavy metals were encountered at the site are not considered to represent an unacceptable risk to ecological receptors, as discussed in Sections 8.2.1, 8.2.2 and 8.2.3.

Is further investigation/remediation required?

The DSI has not identified any triggers for remediation. Further investigation opportunities are limited due to site access constraints. This has been considered in making recommendations for the site.

Is the site suitable for the proposed development, or can the site be made suitable subject to further characterisation and/or remediation?

The site is considered to be suitable for the proposed development without the need for remediation, however, a robust expected finds protocol must be developed implemented to reduce potential risks associated with unexpected finds.

8.4 Data Gaps

The primary data gap is considered to include the limited site access and the inability to visually inspect the ground surfaces in all areas due to vegetation cover etc. Sampling was limited in some areas due to access constraints or underground services. These data gaps have been considered in drawing conclusions and making recommendations for the site.

9 CONCLUSIONS AND RECOMMENDATIONS

The investigation included a review of the PSI, soil sampling from 27 boreholes/test pits across the site and five selected soil mounds in the north-east section, sediment sampling from four locations, groundwater sampling from three monitoring wells and surface water sampling from four locations. The site has historically been used for quarrying/extractive activities, primarily for clay mining associated with a brickworks prior to 1930, then as a public reserve thereafter.

Contaminant concentrations in soil, sediment, groundwater and surface water were generally low and were assessed not to pose an unacceptable risk in the context of the proposed development/land use scenario. The DSI did not identify any triggers for remediation.

Based on the findings of the investigation, JKE is of the opinion that the site is suitable for the proposed development described in Section 1.1. Due to access constraints and the presence of underground services, soil sampling for the DSI was limited or could not occur in some areas. On this basis, we recommend that a robust unexpected finds protocol (UFP) be developed by a suitably qualified contaminated land consultant, and implemented during the construction phase of the project. As a minimum, the UFP must include:

- An outline of roles and responsibilities;
- A timeframe for which the UFP applies (i.e. from the commencement of any development-related works and for the duration of construction);
- A program for regular inspections by a contaminated land consultant to inspect the site as the works progress and to confirm (or document otherwise) that the site conditions are as expected based on the findings of the DSI;
- A protocol for managing unexpected finds; and
- A contingency plan for the identification of contamination as an unexpected find that warrants remediation.

We also recommend the following:

- The stockpile of fly-tipped waste in the south-eastern corner of the site should be disposed off-site to a licensed facility in accordance with an assigned waste classification; and
- Any materials imported to site during construction should be assessed to check that the material does not pose a contamination risk in the context of the proposed site use and intended use of the material.

At this point JKE consider that there is no requirement to report any contamination to the NSW EPA under the NSW EPA Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997 (2015)[12].

JKE consider that the report objectives outlined in Section 1.2 have been addressed.

[12] NSW EPA, (2015). *Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997* (referred to as Duty to Report Contamination)

10 LIMITATIONS

The report limitations are outlined below:

- JKE accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the JKE proposal; and terms of contract between JKE and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, JKE has not undertaken any verification process, except where specifically stated in the report;
- JKE has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- JKE accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- JKE have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. JKE should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

Important Information About This Report

These notes have been prepared by JKE to assist with the assessment and interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors
This report has been prepared in response to specific project requirements as stated in the JKE proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

JKE will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the investigation. If the subject site is sold, ownership of the investigation report should be transferred by JKE to the new site owners who will be informed of the conditions and limitations under which the investigation was undertaken. No person should apply an investigation for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions
Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an investigation report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is based on Professional Interpretations of Factual Data
Site investigations identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an investigation indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Investigation Limitations
Although information provided by a site investigation can reduce exposure to the risk of the presence of contamination, no environmental site investigation can eliminate the risk. Even a rigorous professional investigation may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Site Investigations by Design Professionals

Costly problems can occur when other design professionals develop plans based on misinterpretation of an investigation report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Investigation Report

Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the investigation. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the investigation. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete investigation should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely

Because an environmental site investigation is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site investigation, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.

Appendix A: Report Figures

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

This plan should be read in conjunction with the Environmental report.

Title:	**SITE LOCATION PLAN**
Location:	BRICK PITT RESERVE, BANTRY BAY ROAD, FRENCHS FOREST, NSW
Project No: E35432P	Figure No: 1

JKEnvironments

PLOT DATE: 5/06/2023 11:38:30 AM DWG FILE: K:\5C EIS JOBS\35000's\E35432P FRENCHS FOREST (BRICK PIT RESERVE)\CAD\E35432P.DWG

LEGEND

(red dashed line)	APPROXIMATE SITE BOUNDARY
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE PSI, 2022)
SW1	SURFACE WATER SAMPLING LOCATION AND NUMBER
BH102	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE DSI, 2023)
BH/MW101	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE DSI, 2023)
TP(Fill Depth)	TEST PIT LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE DSI, 2023)
SS1	SEDIMENT SAMPLING LOCATION AND NUMBER (JKE DSI, 2023)
SM101	SOIL MOUND LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE DSI, 2023)

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 10 20 30 40 50
SCALE 1:1000 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **SAMPLE LOCATION PLAN**

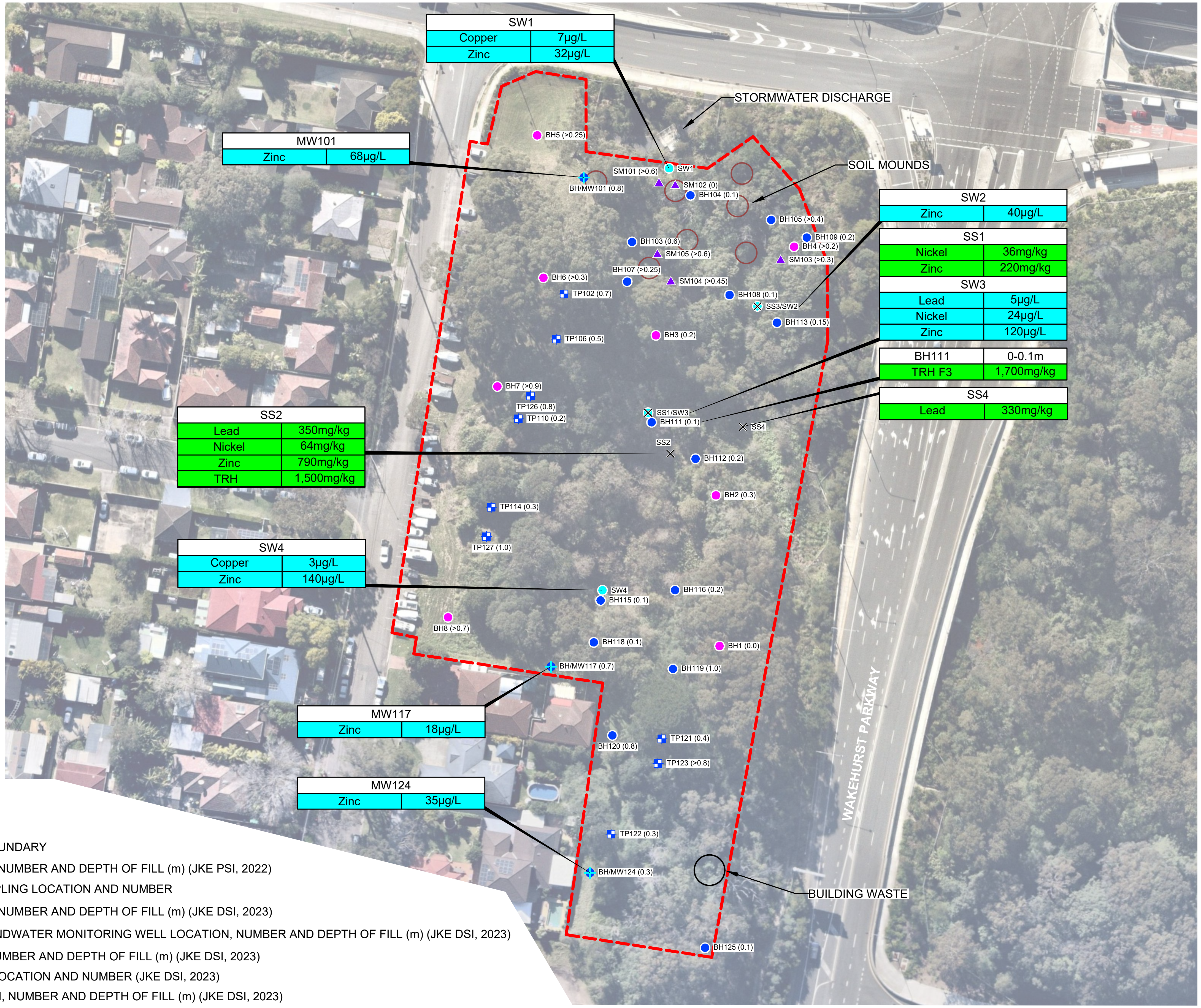
Location: BRICK PITT RESERVE, BANTRY BAY ROAD, FRENCHS FOREST, NSW

Project No: E35432P

Figure No: 2

JKEnvironments

PLOT DATE: 28/06/2023 9:53:28 AM DWG FILE: K:\5C EIS JOBS\35000'S\E35432P FRENCHS FOREST (BRICK PIT RESERVE)\CAD\E35432P.DWG



LEGEND

Symbol	Description
(red dashed line)	APPROXIMATE SITE BOUNDARY
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE PSI, 2022)
SW1	SURFACE WATER SAMPLING LOCATION AND NUMBER
BH102	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE DSI, 2023)
BH/MW101	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE DSI, 2023)
TP(Fill Depth)	TEST PIT LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE DSI, 2023)
SS1	SEDIMENT SAMPLING LOCATION AND NUMBER (JKE DSI, 2023)
SM101	SOIL MOUND LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE DSI, 2023)

SAMPLE ID	DEPTH (metres)
CHEMICAL	CONCENTRATION

SOIL/SURFACE SAMPLE EXCEEDANCE

SAMPLE ID	-
CHEMICAL	CONCENTRATION (µg/L)

GROUNDWATER SAMPLE EXCEEDANCE

(green) SOIL/SURFACE CONTAMINATION ABOVE SAC FOR ECOLOGICAL RISK

(cyan) GROUNDWATER CONTAMINATION ABOVE SAC

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 10 20 30 40 50

SCALE 1:1000 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **SAC EXCEEDANCE PLAN**

Location: BRICK PITT RESERVE, BANTRY BAY ROAD, FRENCHS FOREST, NSW

Project No: E35432P

Figure No: 3

JKEnvironments

PLOT DATE: 12/07/2023 8:30:49 AM DWG FILE: K:\5C EIS JOBS\35000'S\E35432P FRENCHS FOREST (BRICK PIT RESERVE)\CAD\E35432P.DWG

Appendix B: Proposed Development Plans

DESIGN DESCRIPTION

- Create a **landmark public reserve** for Frenchs Forest
- Provide a space for integrated and varied **recreational amenity**
- Create a **valued open space** for local residents, future hospital staff and patients and the broader Northern Beaches community
- Rehabilitate and enhance **indigenous vegetation** to assist the regeneration of local flora and flora.
- Provide **landscape features** that celebrate and interpret the Frenchs Forest area site history

CONCEPT DESIGN FEATURES

1. Landscape gateway feature celebrating and interpreting Frenchs Forests past land uses
2. Passive recreational open space areas with seating, shade and grassed spaces
3. Revegetation and regeneration of existing indigenous vegetation
4. Community playground with natural play features and local heritage themes and materials. Cuttings from original pear trees from Holland's Farm to be incorporated.
5. New boardwalks for elevated passage over stormwater swale
6. Picnic tables and seating in sunny and sheltered areas throughout the reserve
7. Retain and enhance existing mountain bike track
8. Rocked and planted stormwater swale (by RMS)
9. Elevated lookout deck over proposed wetland
10. Lower viewing deck near proposed wetland for immersive experience
11. Colonnade of local tree species along street fronting with feature bricks within pavement
12. Proposed wetland to provide community ammenity, stormwater quality improvements, habitat and a central feature in the reserve
13. All ability access concrete loop path (2m wide) around wetland
14. Enhance existing access trail with (1.5m wide) crushed sandstone surface
15. Concrete shared path (3m wide) linking the reserve and providing access to the reserve features
16. Future shared path bridge crossing
17. P3 level lighting to 3m wide shared path

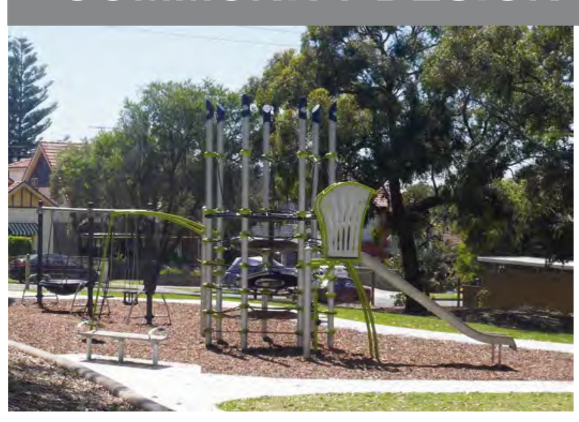
DRAWING KEY

- Existing trees
- Proposed trees
- Proposed wetland and photomontage view point "refer"(BP-CD-03)
- Stormwater swale
- P3 level lighting
- Acoustic wall
- Revegetation and regeneration of existing indiginious vegetation
- Planted wetland edge
- Turf open space
- Boardwalks
- (2m wide) concrete path
- (1.5m wide) crushed sandstone path
- (3m wide) concrete path
- Picnic bench and table
- Outdoor exercise equipment
- Viewing deck
- Community playground
- Property boundaries

HISTORIC SITE IMAGES

Hews brickworks,1905 (reference Warringah Council Libary)

COMMUNITY DESIGN PRECEDENTS



Community playground

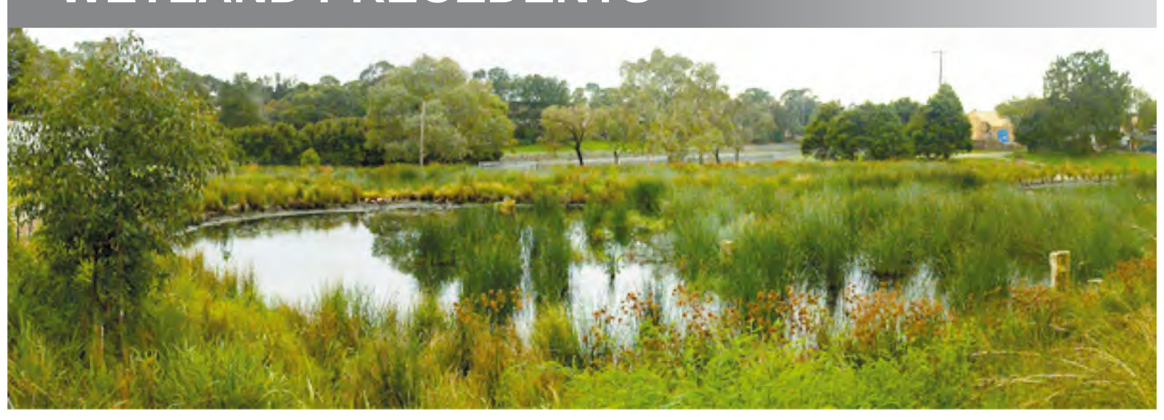
Welcoming community open spaces

DESIGN PRECEDENTS

Landscape gateway feature

Colonnade of local tree species

WETLAND PRECEDENTS



Proposed wetland ecosystem

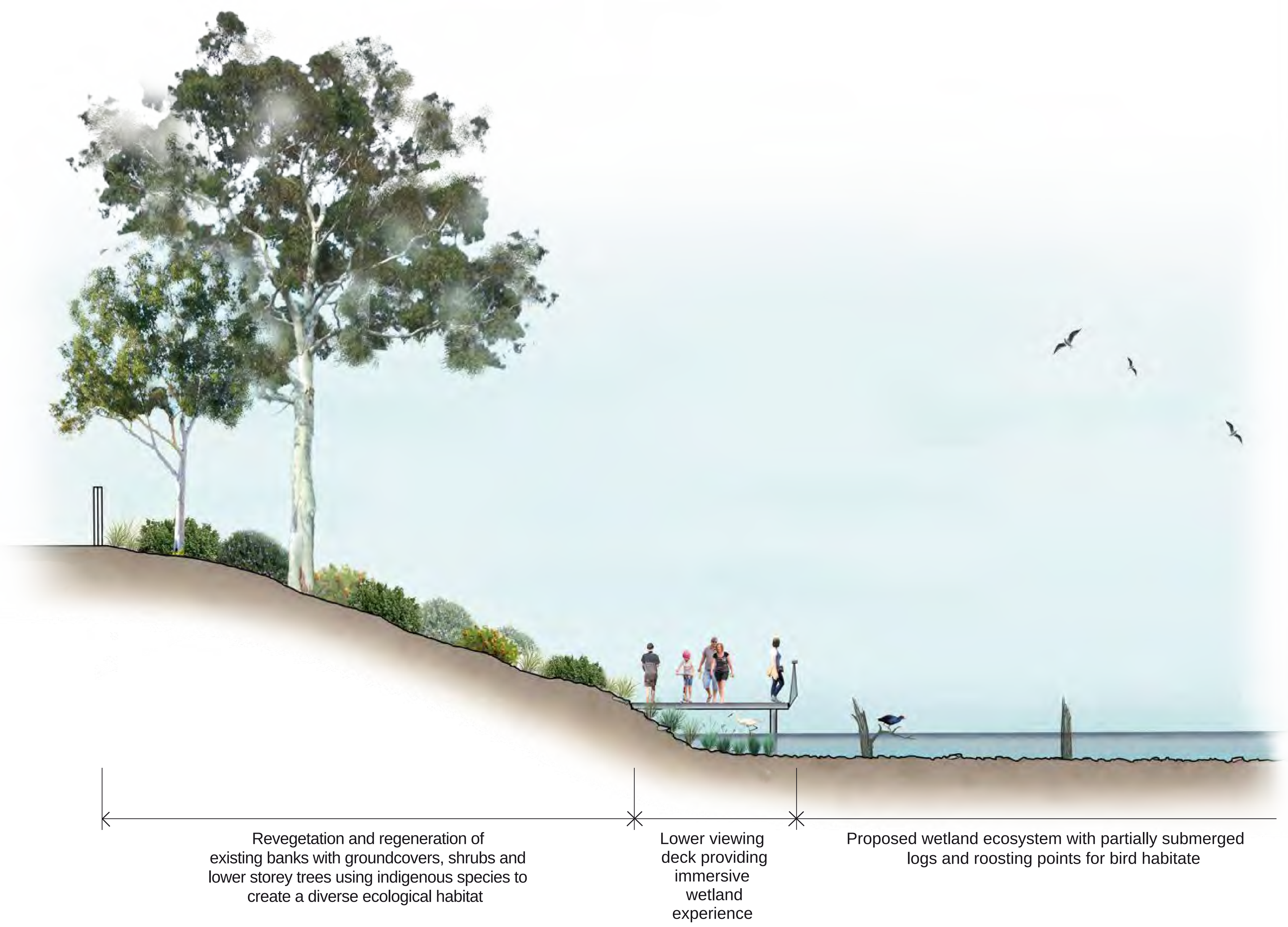
THOMPSON BERRILL LANDSCAPE DESIGN P/L

northern beaches council

CONCEPT DESIGN
BRICK PIT RESERVE

JULY 2018
DWG No. BP-CD-01
SHEET 1
SCALE 1:500 @ A1
0 5 10 15 25m

A-A WETLAND CROSS SECTION SCALE: NTS



B-B LOWER VIEWING DECK CROSS SECTION SCALE: NTS

C-C BANTRY BAY RD STREETSCAPE CROSS SECTION SCALE: NTS

Appendix C: Laboratory Results Summary Tables

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ABC:	Ambient Background Concentration
ACM:	Asbestos Containing Material
ADWG:	AustralianDrinking Water Guidelines
AF:	Asbestos Fines
ANZG	Australian and New Zealand Guidelines
B(a)P:	Benzo(a)pyrene
CEC:	Cation Exchange Capacity
CRC:	Cooperative Research Centre
CT:	Contaminant Threshold
EILs:	Ecological Investigation Levels
ESLs:	Ecological Screening Levels
FA:	Fibrous Asbestos
GIL:	Groundwater Investigation Levels
GSW:	General Solid Waste
HILs:	Health Investigation Levels
HSLs:	Health Screening Levels
HSL-SSA:	Health Screening Level-SiteSpecific Assessment
kg/L	kilograms per litre
NA:	Not Analysed
NC:	Not Calculated
NEPM:	National Environmental Protection Measure
NHMRC:	National Health and Medical Research Council
NL:	Not Limiting
NSL:	No Set Limit
OCP:	Organochlorine Pesticides
OPP:	Organophosphorus Pesticides
PAHs:	Polycyclic Aromatic Hydrocarbons
%w/w:	weight per weight
ppm:	Parts per million
PCBs:	Polychlorinated Biphenyls
PCE:	Perchloroethylene (Tetrachloroethylene or Teterachloroethene)
pH_{KCL} :	pH of filtered 1:20, 1M KCL extract, shaken overnight
pH_{ox} :	pH of filtered 1:20 1M KCl after peroxide digestion
PQL:	Practical Quantitation Limit
RS:	Rinsate Sample
RSL:	Regional Screening Levels
RSW:	Restricted Solid Waste
SAC:	Site Assessment Criteria
SCC:	Specific Contaminant Concentration
S_{Cr}:	Chromium reducible sulfur
S_{POS}:	Peroxide oxidisable Sulfur
SSA:	Site Specific Assessment
SSHSLs:	Site Specific Health Screening Levels
TAA:	Total Actual Acidity in 1M KCL extract titrated to pH6.5
TB:	Trip Blank
TCA:	1,1,1 Trichloroethane (methyl chloroform)
TCE:	Trichloroethylene (Trichloroethene)
TCLP:	Toxicity Characteristics Leaching Procedure
TPA:	Total Potential Acidity, 1M KCL peroxide digest
TS:	Trip Spike
TRH:	Total Recoverable Hydrocarbons
TSA:	Total Sulfide Acidity (TPA-TAA)
UCL:	Upper Level Confidence Limit on Mean Value
USEPA	United States Environmental Protection Agency
VOCC:	Volatile Organic Chlorinated Compounds
WHO:	World Health Organisation

Table Specific Explanations:

HIL Tables:

- The chromium results are for Total Chromium which includes Chromium III and VI. For initial screening purposes, we have assumed that the samples contain only Chromium VI unless demonstrated otherwise by additional analysis.
- Carcinogenic PAHs is a toxicity weighted sum of analyte concentrations for a specific list of PAH compounds relative to B(a)P. It is also refered to as the B(a)P Toxic Equivalence Quotient (TEQ).
- Statistical calculations are undertaken using ProUCL (USEPA). Statistical calculation is usually undertaken using data from fill samples.

EIL/ESL Table:

- ABC Values for selected metals have been adopted from the published background concentrations presented in Olszowy et. al., (1995), Trace Element Concentrations in Soils from Rural and Urban New South Wales (the 25th percentile values for old suburbs with high traffic have been quoted).

QA/QC Table:

- Field blank, Inter and Intra laboratory duplicate results are reported in mg/kg.
- Trip spike results are reported as percentage recovery.
- Field rinsate results are reported in µg/L.

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TABLE S1
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013.
HIL-C: 'Public open space; secondary schools; and footpaths'

All data in mg/kg unless stated otherwise			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)	TOTAL PCBs	ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	Carcinogenic PAHs	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos		
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC)			300	90	300	17000	600	80	1200	30000	300	3	10	340	400	10	70	400	10	250	1	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**																				
BH101	0-0.1	F: Silty Clay	6	<0.4	16	10	38	0.1	3	51	0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH101	0-0.1	Lab duplicate	7	<0.4	18	11	40	0.1	3	57	0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH101	0.3-0.5	F: Silty Clay	4	<0.4	13	2	16	<0.1	2	9	0.3	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH101	0.8-1	Silty Clay	7	<0.4	24	1	17	<0.1	2	3	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP102	0-0.1	F: Silty Clay	<4	<0.4	9	10	12	<0.1	11	28	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP102	0.6-0.7	F: Silty Clay	9	<0.4	24	2	12	<0.1	1	3	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH103	0-0.1	F: Silty Clay	4	<0.4	11	5	35	<0.1	2	26	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH103	0.6-0.8	Silty Clay	<4	<0.4	14	3	12	<0.1	2	4	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH104	0-0.1	F: Silty Clay	<4	<0.4	11	5	26	<0.1	2	25	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH104	0.1-0.3	Silty Clay	5	<0.4	18	2	14	<0.1	4	12	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH105	0-0.1	F: Silty Clay	<4	<0.4	12	7	59	<0.1	3	30	0.07	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH105	0.3-0.4	F: Silty Clay	<4	<0.4	8	2	21	<0.1	2	12	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
TP106	0-0.1	F: Silty Clay	9	<0.4	17	11	58	0.2	2	56	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH107	0-0.1	F: Silty Clay	<4	<0.4	7	7	45	<0.1	2	28	0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH107	0-0.1	Lab duplicate	<4	<0.4	7	8	60	<0.1	2	30	0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH108	0-0.1	F: Silty Clay	6	0.5	18	28	170	0.1	10	230	1.4	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH108	0.4-0.5	Silty Clay	<4	<0.4	16	20	15	<0.1	5	25	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH109	0-0.1	F: Silty Clay	4	<0.4	17	13	62	<0.1	7	57	1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP110	0-0.1	F: Silty Clay	5	<0.4	19	14	29	<0.1	8	40	0.6	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP110	0.2-0.3	F: Silty Clay	<4	<0.4	9	2	10	<0.1	1	1	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH111	0-0.1	F: Silty Clay	15	<0.4	27	41	210	0.4	17	110	0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH111	0.3-0.5	Silty Clay	<4	<0.4	5	6	2	<0.1	3	14	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH112	0-0.1	F: Silty Clay	<4	<0.4	10	9	39	<0.1	3	34	0.06	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH112	0.5-0.7	Silty Clay	<4	<0.4	11	2	14	<0.1	2	8	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH113	0-0.1	F: Silty Clay	<4	<0.4	18	18	120	0.1	10	42	0.2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH113	0.15-0.35	Silty Clay	6	<0.4	32	39	210	<0.1	4	74	0.69	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP114	0-0.1	F: Silty Clay	<4	<0.4	37	8	24	<0.1	14	32	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP114	0.7-0.8	Silty Clay	9	<0.4	21	13	20	<0.1	19	15	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH115	0-0.1	F: Silty Clay	21	0.6	14	45	83	0.2	11	170	<0.25	<2.5	<0.5	<0.1	<0.5	<0.1	<0.1	<0.5	<0.5	<0.1	<0.5	Not Detected
BH115	0.1-0.4	Silty Clay	8	<0.4	12	<1	14	<0.1	<1	5	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH116	0-0.1	F: Silty Clay	18	1	28	140	240	0.5	16	430	<0.25	<2.5	<0.5	<0.1	<0.5	<0.1	<0.1	<0.5	<0.5	<0.1	<0.5	Not Detected
BH116	0-0.1	Lab duplicate	20	1	28	120	240	0.4	19	460	<0.25	<2.5	<0.5	<0.1	<0.5	<0.1	<0.1	<0.5	<0.5	<0.1	<0.5	NA
BH116	0.4-0.7	Silty Clay	12	<0.4	30	24	52	<0.1	20	180	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH117	0-0.1	F: Silty Clay	<4	<0.4	8	13	18	<0.1	2	38	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH117	0.3-0.5	F: Silty Clay	5	<0.4	14	15	57	0.1	5	35	0.06	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH117	0.7-1	Silty Clay	5	<0.4	14	2	14	<0.1	<1	67	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH118	0-0.1	F: Silty Clay	7	0.6	14	73	49	0.1	11	290	0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH118	0.15-0.5	Silty Clay	7	<0.4	21	3	20	<0.1	<1	20	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP119	0-0.1	F: Silty Clay	5	<0.4	13	5	39	<0.1	1	20	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP119	0.5-0.6	F: Silty Clay	8	<0.4	29	<1	15	<0.1	1	3	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
TP120	0-0.1	F: Silty Clay	6	<0.4	10	11	110	<0.1	2	81	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP120	0.6-0.7	F: Silty Clay	11	<0.4	29	1	20	<0.1	1	13	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
TP121	0-0.1	F: Silty Clay	9	<0.4	21	5	44	<0.1	1	28	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP121	0.6-0.7	Silty Clay	7	<0.4	33	<1	16	0.2	1	6	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP122	0-0.1	F: Silty Clay	6	<0.4	12	25	59	0.1	4	83	2.2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP122	0-0.1	Lab duplicate	7	<0.4	11	28	64	0.1	3	90	1.9	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
TP122	0.7-0.8	Silty Clay	6	<0.4	22	2	18	<0.1	<1	2	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP123	0-0.1	F: Silty Clay	5	<0.4	15	11	40	0.1	1	49	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP123	0.4-0.5	F: Silty Clay	7	<0.4	26	3	19	0.1	2	21	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH124	0-0.1	F: Silty Clay	6	<0.4	14	17	26	<0.1	10	60	6.2	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH124	0.7-1	Silty Clay	<4	<0.4	9	<1	21	<0.1	<1	5	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH125	0-0.1	F: Silty Clay	5	<0.4	16	10	34	<0.1	4	21	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH125	0.1-0.2	Silty Clay	5	<0.4	20	1	14	<0.1	2	4	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TP126	0-0.1	F: Silty Clay	5	<0.4	23	5	23	<0.1	4	25	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP126	0-0.1	Lab duplicate	7	<0.4	21	5	22	<0.1	4	25	0.06	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
TP126	0.6-0.7	F: Silty Clay	<4	<0.4	27	11	15	<0.1	19	21	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
TP127	0-0.1	F: Silty Clay	<4	<0.4	23	19	22	<0.1	27	46	3.2	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
TP127	0.9-1	F: Silty Sandy Clay	<4	<0.4	19	13	13	<0.1	17	19	3.2	0.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
SM101	0.5-0.6	F: Silty Clay	<4	<0.4	9	2	14	<0.1	1	9	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
SM101	0.5-0.6	Lab duplicate	<4	<0.4	9	2	18	<0.1	1	8	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SM102	0.4-0.5	Silty Clay	5	<0.4	18	2	19	<0.1	5	11	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
SM103	0.2-0.3	F: Silty Clay	<4	<0.4	14	8	55	<0.1	6	21	1.6	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
SM104	0.35-0.45	F: Silty Clay	<4	<0.4	17	6	13	<0.1	4	14	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
SM105	0.5-0.6	F: Silty Clay	<4	<0.4	12	4	17	<0.1	2	9	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
SM105	0.5-0.6	Lab duplicate	<4	<0.4	13	4	20	<0.1	3	10	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SS1	0.1-0.2	Silty Clay	10	<0.4	17	15	39	0.1	36	220	<0.15	<1.5	<0.3	<0.1	<0.3	<0.1	<0.1	<0.3	<0.3	<0.1	<0.3	NA
SS2	0.1-0.2	Silty Clay	15	1	30	67	350	0.3	64	790	<0.15	<1.5	<0.3	<0.1	<0.3	<0.1	<0.1	<0.3	<0.3	<0.1	<0.3	NA
SS3	0.1-0.2	Silty Clay	6	<0.4	16	22	76	0.1	6	130	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SS4	0.1-0.2	Silty Clay	6	1	25	110	330	0.1	16	410	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SDUP101	0-0.1	F: Silty Clay	7	<0.4	14	11	14	<0.1	10	20	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SDUP102	0-0.1	F: Silty Clay	6	<0.4	16	19	98	0.3	4	98	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SDUP103	0-0.1	F: Silty Clay	<4	<0.4	13	4	17	<0.1	6	25	1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SDUP104	0-0.1	F: Silty Clay	6	<0.4	29	11	32	<0.1	13	36	0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SDUP105	0-0.1	F: Silty Clay	<4	<0.4	28	6	23	<0.1	8	30	0.4	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SDUP106	0-0.1	F: Silty Clay	<4	<0.4	22	23	23	<0.1	28	48	3.2	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SDUP106	0-0.1	Lab duplicate	<4	<0.4	20	22	24	<0.1	29	50	3.8	0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SDUP107	0-0.1	F: Silty Clay	7	<0.4	9	10	87	<0.1	2	79	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
SDUP108	0-0.1	F: Silty Clay	<4	<0.4	8	5	39	<0.1	1	20	0.3	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SDUP109	0-0.1	F: Silty Clay	6	<0.4	13	5	40	<0.1	1	27	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SDUP110	0-0.1	F: Silty Clay	<4	<0.4	10	12	42	<0.1	1	57	0.1	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SDUP111	0-0.1	F: Silty Clay	5	<0.4	9	28	63	0.1	4	84	1.9	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TB1	-	Trip blank	<4	<0.4	3	<1	3	<0.1	<1	2	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TB2	-	Trip blank	<4	<0.4	4	1	2	<0.1	<1	2	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TB3	-	Trip blank	<4	<0.4	3	1	2	<0.1	<1	2	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TB3	-	Lab duplicate	<4	<0.4	3	<1	2	<0.1	<1	7	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TB4	-	Trip blank	<4	<0.4	4	<1	2	<0.1	<1	14	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TS2	-	Trip spike	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TS4	-	Trip spike	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
FR1 - AUGER	-	Field Rinsate	<0.05	<0.01	<0.01	0.2	<0.03	<0.0005	<0.02	<0.02	<0.1	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
FR1 - AUGER	-	Lab duplicate	NA	NA	NA	NA	NA	NA	NA	NA	<0.1	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
FR2 - SHOVEL	-	Field Rinsate	<0.05	<0.01	<0.01	0.3	<0.03	<0.0005	<0.02	<0.02	<0.1	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Number of Samples			88	88	88	88	88	88	88	88	89	89	51	51	51	51	51	51	51	51	51	41
Maximum Value			21	1	37	140	350	0.5	64	790	6.2	1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	Not Detected

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**

JKEnvironments

TABLE S1a
SOIL LABORATORY RESULTS COMPARED TO GUIDELINES FOR SEDIMENT QUALITY

All data in mg/kg unless stated otherwise			HEAVY METALS										ORGANOCHLORINE PESTICIDES (OCPs)						TOTAL PCBs
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	Total TRH	Total DDT	pp- DDE	Endrin	Dieldrin	Chlordane	o,p'DDD+ p,p'DDD	
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	50	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Deafult Guideline Value (DGV)			20	1.5	80	65	50	0.15	21	200	10000	280	10	1.4	2.7	2.8	4.5	3.5	34
Upper Guideline Value (GV-high)			70	10	370	270	220	1	52	410	50000	550	10	7	60	7	9	9	280
Sample Reference	**Sample Depth**	**Sample Description**																	
SS1	0.1-0.2	Silty Clay	**10**	<0.4	**17**	**15**	**39**	**0.1**	**36**	**220**	<0.15	<100	<0.3	<0.3	<0.3	<0.1	<0.3	<0.3	<0.3
SS2	0.1-0.2	Silty Clay	**15**	1	**30**	**67**	**350**	**0.3**	**64**	**790**	<0.15	**1500**	<0.3	<0.3	<0.3	<0.1	<0.3	<0.3	<0.3
SS3	0.1-0.2	Silty Clay	**6**	<0.4	**16**	**22**	**76**	**0.1**	**6**	**130**	<0.05	<50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SS4	0.1-0.2	Silty Clay	**6**	1	**25**	**110**	**330**	**0.1**	**16**	**410**	<0.05	<50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Number of Samples			4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Maximum Value			15	1	30	110	350	0.3	64	790	<PQL	1500	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL

Concentration above the GV-high **VALUE**
Concentration above the PQL **Bold**

TABLE S2
SOIL LABORATORY RESULTS COMPARED TO HSLs
All data in mg/kg unless stated otherwise

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Field PID Measurement
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1	ppm
NEPM 2013 HSL Land Use Category					HSL-D: COMMERCIAL/INDUSTRIAL							
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**								
BH101	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.6
BH101	0-0.1	Lab duplicate	0m to <1m	Sand	<25	**50**	<0.2	<0.5	<1	<1	<1	-
BH101	0.3-0.5	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.5
BH101	0.8-1	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.3
TP102	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.3
TP102	0.6-0.7	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.6
BH103	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.2
BH103	0.6-0.8	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.7
BH104	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.6
BH104	0.1-0.3	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	3
BH105	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1
BH105	0.3-0.4	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	3.8
TP106	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.2
BH107	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	**88**	<0.2	<0.5	<1	<1	<1	1.4
BH107	0-0.1	Lab duplicate	0m to <1m	Sand	<25	**73**	<0.2	<0.5	<1	<1	<1	-
BH108	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.9
BH108	0.4-0.5	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	3.4
BH109	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.7
TP110	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1
TP110	0.2-0.3	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.6
BH111	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	**120**	<0.2	<0.5	<1	<1	<1	2
BH111	0.3-0.5	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	3
BH112	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.4
BH112	0.5-0.7	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.6
BH113	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2
BH113	0.15-0.35	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.1
TP114	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.9
TP114	0.7-0.8	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.8
BH115	0-0.1	F: Silty Clay	0m to <1m	Sand	<100	<200	<0.8	<2	<4	<4	<4	1.5
BH115	0.1-0.4	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.3
BH116	0-0.1	F: Silty Clay	0m to <1m	Sand	<120	<250	<1	<2	<5	<5	<5	1.1
BH116	0-0.1	Lab duplicate	0m to <1m	Sand	<120	<250	<1	<2	<5	<5	<5	-
BH116	0.4-0.7	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.3
BH117	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.2
BH117	0.3-0.5	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2
BH117	0.7-1	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2
BH118	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.7
BH118	0.15-0.5	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	4.5
TP119	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1
TP119	0.5-0.6	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2
TP120	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.3
TP120	0.6-0.7	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.2
TP121	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.1
TP121	0.6-0.7	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.9
TP122	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.1
TP122	0-0.1	Lab duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	-
TP122	0.7-0.8	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.9
TP123	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.4
TP123	0.4-0.5	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.2
BH124	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.8
BH124	0.7-1	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.7
BH125	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.1
BH125	0.1-0.2	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1
TP126	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.4
TP126	0-0.1	Lab duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	-
TP126	0.6-0.7	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.2
TP127	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.4
TP127	0.9-1	F: Silty Sandy Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.4
SM101	0.5-0.6	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.3
SM101	0.5-0.6	Lab duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	-
SM102	0.4-0.5	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.4
SM103	0.2-0.3	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.5
SM104	0.35-0.45	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1
SM105	0.5-0.6	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.6
SM105	0.5-0.6	Lab duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	-
SS1	0.1-0.2	Silty Clay	0m to <1m	Sand	<50	<100	<0.4	<1	<2	<2	<2	0.5
SS2	0.1-0.2	Silty Clay	0m to <1m	Sand	<50	<100	<0.4	<1	<2	<2	<2	1
SS3	0.1-0.2	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.5
SS4	0.1-0.2	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0.3
SDUP101	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	2.3
SDUP102	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	**74**	<0.2	<0.5	<1	<1	<1	2.2
SDUP103	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1
SDUP104	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.9
SDUP105	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1
SDUP106	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.3
SDUP106	0-0.1	Lab duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	-
SDUP107	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.1
SDUP108	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.1
SDUP109	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.4
SDUP110	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.1
SDUP111	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	1.4
Total Number of Samples					81	81	81	81	81	81	81	73
Maximum Value					<PQL	120	<PQL	<PQL	<PQL	<PQL	<PQL	4.5

Concentration above the SAC — **VALUE**
Concentration above the PQL — **Bold**
The guideline corresponding to the concentration above the SAC is highlighted in grey in the Site Assessment Criteria Table below

HSL SOIL ASSESSMENT CRITERIA

Sample Reference	Sample Depth	Sample Description	Depth Category	Soil Category	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
BH101	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH101	0-0.1	Lab duplicate	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH101	0.3-0.5	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH101	0.8-1	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP102	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP102	0.6-0.7	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH103	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH103	0.6-0.8	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH104	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH104	0.1-0.3	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH105	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH105	0.3-0.4	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP106	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH107	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH107	0-0.1	Lab duplicate	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH108	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH108	0.4-0.5	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH109	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP110	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP110	0.2-0.3	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH111	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH111	0.3-0.5	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH112	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH112	0.5-0.7	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH113	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH113	0.15-0.35	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP114	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP114	0.7-0.8	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH115	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH115	0.1-0.4	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH116	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH116	0-0.1	Lab duplicate	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH116	0.4-0.7	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH117	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH117	0.3-0.5	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH117	0.7-1	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH118	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH118	0.15-0.5	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP119	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP119	0.5-0.6	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP120	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP120	0.6-0.7	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP121	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP121	0.6-0.7	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP122	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP122	0-0.1	Lab duplicate	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP122	0.7-0.8	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP123	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP123	0.4-0.5	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH124	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH124	0.7-1	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH125	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH125	0.1-0.2	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP126	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP126	0-0.1	Lab duplicate	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP126	0.6-0.7	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP127	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
TP127	0.9-1	F: Silty Sandy Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SM101	0.5-0.6	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SM101	0.5-0.6	Lab duplicate	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SM102	0.4-0.5	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SM103	0.2-0.3	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SM104	0.35-0.45	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SM105	0.5-0.6	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SM105	0.5-0.6	Lab duplicate	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SS1	0.1-0.2	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SS2	0.1-0.2	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SS3	0.1-0.2	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SS4	0.1-0.2	Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP101	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP102	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP103	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP104	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP105	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP106	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP106	0-0.1	Lab duplicate	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP107	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP108	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP109	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP110	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP111	0-0.1	F: Silty Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL

TABLE S3
SOIL LABORATORY RESULTS COMPARED TO MANAGEMENT LIMITS
All data in mg/kg unless stated otherwise

			C_6-C_{10} (F1) plus BTEX	>C_{10}-C_{16} (F2) plus napthalene	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)
PQL - Envirolab Services			25	50	100	100
NEPM 2013 Land Use Category			RESIDENTIAL, PARKLAND & PUBLIC OPEN SPACE			
Sample	**Sample Depth**	**Soil Texture**				
BH101	0-0.1	Fine	<25	<50	**130**	<100
BH101	0-0.1	Fine	<25	**50**	**300**	**130**
BH101	0.3-0.5	Fine	<25	<50	**120**	<100
BH101	0.8-1	Fine	<25	<50	**<100**	<100
TP102	0-0.1	Fine	<25	<50	**110**	<100
TP102	0.6-0.7	Fine	<25	<50	**<100**	<100
BH103	0-0.1	Fine	<25	<50	**<100**	<100
BH103	0.6-0.8	Fine	<25	<50	**<100**	<100
BH104	0-0.1	Fine	<25	<50	**370**	**110**
BH104	0.1-0.3	Fine	<25	<50	**<100**	<100
BH105	0-0.1	Fine	<25	<50	**280**	**200**
BH105	0.3-0.4	Fine	<25	<50	**<100**	<100
TP106	0-0.1	Fine	<25	<50	**140**	<100
BH107	0-0.1	Fine	<25	**88**	**730**	**280**
BH107	0-0.1	Fine	<25	**73**	**610**	**260**
BH108	0-0.1	Fine	<25	<50	**180**	**120**
BH108	0.4-0.5	Fine	<25	<50	**<100**	<100
BH109	0-0.1	Fine	<25	<50	**450**	**190**
TP110	0-0.1	Fine	<25	<50	**130**	<100
TP110	0.2-0.3	Fine	<25	<50	**<100**	<100
BH111	0-0.1	Fine	<25	**120**	**1700**	**720**
BH111	0.3-0.5	Fine	<25	<50	**<100**	<100
BH112	0-0.1	Fine	<25	<50	**300**	**150**
BH112	0.5-0.7	Fine	<25	<50	**<100**	<100
BH113	0-0.1	Fine	<25	<50	**220**	**120**
BH113	0.15-0.35	Fine	<25	<50	**<100**	<100
TP114	0-0.1	Fine	<25	<50	**300**	**290**
TP114	0.7-0.8	Fine	<25	<50	**<100**	<100
BH115	0-0.1	Fine	<100	<200	**680**	<400
BH115	0.1-0.4	Fine	<25	<50	**<100**	<100
BH116	0-0.1	Fine	<120	<250	**<500**	<500
BH116	0-0.1	Fine	<120	<250	**700**	<500
BH116	0.4-0.7	Fine	<25	<50	**<100**	<100
BH117	0-0.1	Fine	<25	<50	**<100**	<100
BH117	0.3-0.5	Fine	<25	<50	**<100**	<100
BH117	0.7-1	Fine	<25	<50	**<100**	<100
BH118	0-0.1	Fine	<25	<50	**300**	**120**
BH118	0.15-0.5	Fine	<25	<50	**<100**	<100
TP119	0-0.1	Fine	<25	<50	**420**	**210**
TP119	0.5-0.6	Fine	<25	<50	**<100**	<100
TP120	0-0.1	Fine	<25	<50	**290**	**140**
TP120	0.6-0.7	Fine	<25	<50	**<100**	<100
TP121	0-0.1	Fine	<25	<50	**270**	**150**
TP121	0.6-0.7	Fine	<25	<50	**<100**	<100
TP122	0-0.1	Fine	<25	<50	**220**	<100
TP122	0-0.1	Fine	<25	<50	**240**	**120**
TP122	0.7-0.8	Fine	<25	<50	**<100**	<100
TP123	0-0.1	Fine	<25	<50	**230**	**120**
TP123	0.4-0.5	Fine	<25	<50	**160**	**100**
BH124	0-0.1	Fine	<25	<50	**600**	**500**
BH124	0.7-1	Fine	<25	<50	**<100**	<100
BH125	0-0.1	Fine	<25	<50	**500**	**180**
BH125	0.1-0.2	Fine	<25	<50	**280**	**160**
TP126	0-0.1	Fine	<25	<50	**130**	<100
TP126	0-0.1	Fine	<25	<50	**190**	**110**
TP126	0.6-0.7	Fine	<25	<50	**110**	**120**
TP127	0-0.1	Fine	<25	<50	**140**	**100**
TP127	0.9-1	Fine	<25	<50	**<100**	<100
SM101	0.5-0.6	Fine	<25	<50	**<100**	<100
SM101	0.5-0.6	Fine	<25	<50	**<100**	<100
SM102	0.4-0.5	Fine	<25	<50	**<100**	<100
SM103	0.2-0.3	Fine	<25	<50	**170**	**130**
SM104	0.35-0.45	Fine	<25	<50	**<100**	<100
SM105	0.5-0.6	Fine	<25	<50	**<100**	<100
SM105	0.5-0.6	Fine	<25	<50	**<100**	<100
SS1	0.1-0.2	Fine	<50	<100	**<200**	<200
SS2	0.1-0.2	Fine	<50	<100	**1000**	**520**
SS3	0.1-0.2	Fine	<25	<50	**<100**	<100
SS4	0.1-0.2	Fine	<25	<50	**<100**	<100
SDUP101	0-0.1	Fine	<25	<50	**120**	<100
SDUP102	0-0.1	Fine	<25	**74**	**210**	**150**
SDUP103	0-0.1	Fine	<25	<50	**140**	<100
SDUP104	0-0.1	Fine	<25	<50	**<100**	<100
SDUP105	0-0.1	Fine	<25	<50	**<100**	<100
SDUP106	0-0.1	Fine	<25	<50	**200**	**120**
SDUP106	0-0.1	Fine	<25	<50	**170**	**120**
SDUP107	0-0.1	Fine	<25	<50	**190**	<100
SDUP108	0-0.1	Fine	<25	<50	**310**	**220**
SDUP109	0-0.1	Fine	<25	<50	**180**	<100
SDUP110	0-0.1	Fine	<25	<50	**290**	<100
SDUP111	0-0.1	Fine	<25	<50	**160**	<100
Total Number of Samples			81	81	81	81
Maximum Value			<PQL	120	1700	720

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**

MANAGEMENT LIMIT ASSESSMENT CRITERIA

Sample Reference	Sample Depth	Soil Texture	C_6-C_{10} (F1) plus BTEX	>C_{10}-C_{16} (F2) plus	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)
BH101	0-0.1	Fine	800	1000	3500	10000
BH101	0-0.1	Fine	800	1000	3500	10000
BH101	0.3-0.5	Fine	800	1000	3500	10000
BH101	0.8-1	Fine	800	1000	3500	10000
TP102	0-0.1	Fine	800	1000	3500	10000
TP102	0.6-0.7	Fine	800	1000	3500	10000
BH103	0-0.1	Fine	800	1000	3500	10000
BH103	0.6-0.8	Fine	800	1000	3500	10000
BH104	0-0.1	Fine	800	1000	3500	10000
BH104	0.1-0.3	Fine	800	1000	3500	10000
BH105	0-0.1	Fine	800	1000	3500	10000
BH105	0.3-0.4	Fine	800	1000	3500	10000
TP106	0-0.1	Fine	800	1000	3500	10000
BH107	0-0.1	Fine	800	1000	3500	10000
BH107	0-0.1	Fine	800	1000	3500	10000
BH108	0-0.1	Fine	800	1000	3500	10000
BH108	0.4-0.5	Fine	800	1000	3500	10000
BH109	0-0.1	Fine	800	1000	3500	10000
TP110	0-0.1	Fine	800	1000	3500	10000
TP110	0.2-0.3	Fine	800	1000	3500	10000
BH111	0-0.1	Fine	800	1000	3500	10000
BH111	0.3-0.5	Fine	800	1000	3500	10000
BH112	0-0.1	Fine	800	1000	3500	10000
BH112	0.5-0.7	Fine	800	1000	3500	10000
BH113	0-0.1	Fine	800	1000	3500	10000
BH113	0.15-	Fine	800	1000	3500	10000
TP114	0-0.1	Fine	800	1000	3500	10000
TP114	0.7-0.8	Fine	800	1000	3500	10000
BH115	0-0.1	Fine	800	1000	3500	10000
BH115	0.1-0.4	Fine	800	1000	3500	10000
BH116	0-0.1	Fine	800	1000	3500	10000
BH116	0-0.1	Fine	800	1000	3500	10000
BH116	0.4-0.7	Fine	800	1000	3500	10000
BH117	0-0.1	Fine	800	1000	3500	10000
BH117	0.3-0.5	Fine	800	1000	3500	10000
BH117	0.7-1	Fine	800	1000	3500	10000
BH118	0-0.1	Fine	800	1000	3500	10000
BH118	0.15-	Fine	800	1000	3500	10000
TP119	0-0.1	Fine	800	1000	3500	10000
TP119	0.5-0.6	Fine	800	1000	3500	10000
TP120	0-0.1	Fine	800	1000	3500	10000
TP120	0.6-0.7	Fine	800	1000	3500	10000
TP121	0-0.1	Fine	800	1000	3500	10000
TP121	0.6-0.7	Fine	800	1000	3500	10000
TP122	0-0.1	Fine	800	1000	3500	10000
TP122	0-0.1	Fine	800	1000	3500	10000
TP122	0.7-0.8	Fine	800	1000	3500	10000
TP123	0-0.1	Fine	800	1000	3500	10000
TP123	0.4-0.5	Fine	800	1000	3500	10000
BH124	0-0.1	Fine	800	1000	3500	10000
BH124	0.7-1	Fine	800	1000	3500	10000
BH125	0-0.1	Fine	800	1000	3500	10000
BH125	0.1-0.2	Fine	800	1000	3500	10000
TP126	0-0.1	Fine	800	1000	3500	10000
TP126	0-0.1	Fine	800	1000	3500	10000
TP126	0.6-0.7	Fine	800	1000	3500	10000
TP127	0-0.1	Fine	800	1000	3500	10000
TP127	0.9-1	Fine	800	1000	3500	10000
SM101	0.5-0.6	Fine	800	1000	3500	10000
SM101	0.5-0.6	Fine	800	1000	3500	10000
SM102	0.4-0.5	Fine	800	1000	3500	10000
SM103	0.2-0.3	Fine	800	1000	3500	10000
SM104	0.35-	Fine	800	1000	3500	10000
SM105	0.5-0.6	Fine	800	1000	3500	10000
SM105	0.5-0.6	Fine	800	1000	3500	10000
SS1	0.1-0.2	Fine	800	1000	3500	10000
SS2	0.1-0.2	Fine	800	1000	3500	10000
SS3	0.1-0.2	Fine	800	1000	3500	10000
SS4	0.1-0.2	Fine	800	1000	3500	10000
SDUP101	0-0.1	Fine	800	1000	3500	10000
SDUP102	0-0.1	Fine	800	1000	3500	10000
SDUP103	0-0.1	Fine	800	1000	3500	10000
SDUP104	0-0.1	Fine	800	1000	3500	10000
SDUP105	0-0.1	Fine	800	1000	3500	10000
SDUP106	0-0.1	Fine	800	1000	3500	10000
SDUP106	0-0.1	Fine	800	1000	3500	10000
SDUP107	0-0.1	Fine	800	1000	3500	10000
SDUP108	0-0.1	Fine	800	1000	3500	10000
SDUP109	0-0.1	Fine	800	1000	3500	10000
SDUP110	0-0.1	Fine	800	1000	3500	10000
SDUP111	0-0.1	Fine	800	1000	3500	10000

JKEnvironments

TABLE S4
SOIL LABORATORY RESULTS COMPARED T0 DIRECT CONTACT CRITERIA
All data in mg/kg unless stated otherwise

Analyte		C_6-C_{10}	>C_{10}-C_{16}	>C_{16}-C_{34}	>C_{34}-C_{40}	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID
PQL - Envirolab Services		25	50	100	100	0.2	0.5	1	1	1	
CRC 2011 -Direct contact Criteria		5,100	3,800	5,300	7,400	120	18,000	5,300	15,000	1,900	
Site Use		**RECREATIONAL - DIRECT SOIL CONTACT**									
Sample Reference	**Sample Depth**										
BH101	0-0.1	<25	<50	**130**	<100	<0.2	<0.5	<1	<1	<1	**1.6**
BH101	0-0.1	<25	**50**	**300**	**130**	<0.2	<0.5	<1	<1	<1	-
BH101	0.3-0.5	<25	<50	**120**	<100	<0.2	<0.5	<1	<1	<1	**1.5**
BH101	0.8-1	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**2.3**
TP102	0-0.1	<25	<50	**110**	<100	<0.2	<0.5	<1	<1	<1	**2.3**
TP102	0.6-0.7	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1.6**
BH103	0-0.1	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1.2**
BH103	0.6-0.8	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1.7**
BH104	0-0.1	<25	<50	**370**	**110**	<0.2	<0.5	<1	<1	<1	**2.6**
BH104	0.1-0.3	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**3**
BH105	0-0.1	<25	<50	**280**	**200**	<0.2	<0.5	<1	<1	<1	**1**
BH105	0.3-0.4	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**3.8**
TP106	0-0.1	<25	<50	**140**	<100	<0.2	<0.5	<1	<1	<1	**2.2**
BH107	0-0.1	<25	**88**	**730**	**280**	<0.2	<0.5	<1	<1	<1	**1.4**
BH107	0-0.1	<25	**73**	**610**	**260**	<0.2	<0.5	<1	<1	<1	-
BH108	0-0.1	<25	<50	**180**	**120**	<0.2	<0.5	<1	<1	<1	**2.9**
BH108	0.4-0.5	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**3.4**
BH109	0-0.1	<25	<50	**450**	**190**	<0.2	<0.5	<1	<1	<1	**1.7**
TP110	0-0.1	<25	<50	**130**	<100	<0.2	<0.5	<1	<1	<1	**1**
TP110	0.2-0.3	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1.6**
BH111	0-0.1	<25	**120**	**1700**	**720**	<0.2	<0.5	<1	<1	<1	**2**
BH111	0.3-0.5	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**3**
BH112	0-0.1	<25	<50	**300**	**150**	<0.2	<0.5	<1	<1	<1	**2.4**
BH112	0.5-0.7	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**2.6**
BH113	0-0.1	<25	<50	**220**	**120**	<0.2	<0.5	<1	<1	<1	**2**
BH113	0.15-0.35	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**2.1**
TP114	0-0.1	<25	<50	**300**	**290**	<0.2	<0.5	<1	<1	<1	**1.9**
TP114	0.7-0.8	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1.8**
BH115	0-0.1	<100	<200	**680**	<400	<0.8	<2	<4	<4	<4	**1.5**
BH115	0.1-0.4	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1.3**
BH116	0-0.1	<120	<250	**<500**	<500	<1	<2	<5	<5	<5	**1.1**
BH116	0-0.1	<120	<250	**700**	<500	<1	<2	<5	<5	<5	-
BH116	0.4-0.7	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1.3**
BH117	0-0.1	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**2.2**
BH117	0.3-0.5	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**2**
BH117	0.7-1	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**2**
BH118	0-0.1	<25	<50	**300**	**120**	<0.2	<0.5	<1	<1	<1	**1.7**
BH118	0.15-0.5	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**4.5**
TP119	0-0.1	<25	<50	**420**	**210**	<0.2	<0.5	<1	<1	<1	**1**
TP119	0.5-0.6	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**2**
TP120	0-0.1	<25	<50	**290**	**140**	<0.2	<0.5	<1	<1	<1	**1.3**
TP120	0.6-0.7	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1.2**
TP121	0-0.1	<25	<50	**270**	**150**	<0.2	<0.5	<1	<1	<1	**1.1**
TP121	0.6-0.7	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**0.9**
TP122	0-0.1	<25	<50	**220**	<100	<0.2	<0.5	<1	<1	<1	**1.1**
TP122	0-0.1	<25	<50	**240**	**120**	<0.2	<0.5	<1	<1	<1	-
TP122	0.7-0.8	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**0.9**
TP123	0-0.1	<25	<50	**230**	**120**	<0.2	<0.5	<1	<1	<1	**1.4**
TP123	0.4-0.5	<25	<50	**160**	**100**	<0.2	<0.5	<1	<1	<1	**1.2**
BH124	0-0.1	<25	<50	**600**	**500**	<0.2	<0.5	<1	<1	<1	**2.8**
BH124	0.7-1	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**2.7**
BH125	0-0.1	<25	<50	**500**	**180**	<0.2	<0.5	<1	<1	<1	**1.1**
BH125	0.1-0.2	<25	<50	**280**	**160**	<0.2	<0.5	<1	<1	<1	**1**
TP126	0-0.1	<25	<50	**130**	<100	<0.2	<0.5	<1	<1	<1	**1.4**
TP126	0-0.1	<25	<50	**190**	**110**	<0.2	<0.5	<1	<1	<1	-
TP126	0.6-0.7	<25	<50	**110**	**120**	<0.2	<0.5	<1	<1	<1	**2.2**
TP127	0-0.1	<25	<50	**140**	**100**	<0.2	<0.5	<1	<1	<1	**1.4**
TP127	0.9-1	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1.4**
SM101	0.5-0.6	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1.3**
SM101	0.5-0.6	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	-
SM102	0.4-0.5	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1.4**
SM103	0.2-0.3	<25	<50	**170**	**130**	<0.2	<0.5	<1	<1	<1	**1.5**
SM104	0.35-0.45	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1**
SM105	0.5-0.6	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1.6**
SM105	0.5-0.6	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	-
SS1	0.1-0.2	<50	<100	**<200**	<200	<0.4	<1	<2	<2	<2	**0.5**
SS2	0.1-0.2	<50	<100	**1000**	**520**	<0.4	<1	<2	<2	<2	**1**
SS3	0.1-0.2	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**0.5**
SS4	0.1-0.2	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**0.3**
SDUP101	0-0.1	<25	<50	**120**	<100	<0.2	<0.5	<1	<1	<1	**2.3**
SDUP102	0-0.1	<25	**74**	**210**	**150**	<0.2	<0.5	<1	<1	<1	**2.2**
SDUP103	0-0.1	<25	<50	**140**	<100	<0.2	<0.5	<1	<1	<1	**1**
SDUP104	0-0.1	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1.9**
SDUP105	0-0.1	<25	<50	**<100**	<100	<0.2	<0.5	<1	<1	<1	**1**
SDUP106	0-0.1	<25	<50	**200**	**120**	<0.2	<0.5	<1	<1	<1	**1.3**
SDUP106	0-0.1	<25	<50	**170**	**120**	<0.2	<0.5	<1	<1	<1	-
SDUP107	0-0.1	<25	<50	**190**	<100	<0.2	<0.5	<1	<1	<1	**1.1**
SDUP108	0-0.1	<25	<50	**310**	**220**	<0.2	<0.5	<1	<1	<1	**1.1**
SDUP109	0-0.1	<25	<50	**180**	<100	<0.2	<0.5	<1	<1	<1	**1.4**
SDUP110	0-0.1	<25	<50	**290**	<100	<0.2	<0.5	<1	<1	<1	**1.1**
SDUP111	0-0.1	<25	<50	**160**	<100	<0.2	<0.5	<1	<1	<1	**1.4**
Total Number of Samples		81	81	81	81	81	81	81	81	81	73
Maximum Value		<PQL	120	1700	720	<PQL	<PQL	<PQL	<PQL	<PQL	4.5

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**

TABLE S5
ASBESTOS QUANTIFICATION - FIELD OBSERVATIONS AND LABORATORY RESULTS
HSL-C:Public open space; secondary schools; and footpaths

FIELD DATA															LABORATORY DATA													
Date Sampled	Sample reference	Sample Depth	Visible ACM in top 100mm	Approx. Volume of Soil (L)	Soil Mass (g)	Mass ACM (g)	Mass Asbestos in ACM (g)	[Asbestos from ACM in soil] (%w/w)	Mass ACM <7mm (g)	Mass Asbestos in ACM <7mm (g)	[Asbestos from ACM <7mm in soil] (%w/w)	Mass FA (g)	Mass Asbestos in FA (g)	[Asbestos from FA in soil] (%w/w)	Lab Report Number	Sample refeference	Sample Depth	Sample Mass (g)	Asbestos ID in soil (AS4964) >0.1g/kg	Trace Analysis	Total Asbestos (g/kg)	Asbestos ID in soil <0.1g/kg	ACM >7mm Estimation (g)	FA and AF Estimation (g)	ACM >7mm Estimation %(w/w)	FA and AF Estimation %(w/w)
SAC			**No**					**0.02**			**0.001**			**0.001**											**0.02**	**0.001**
15/06/2023	BH101	0-0.1	No	10	10,690	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH101	0-0.1	503.2	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/06/2023	BH101	0.1-0.8	No	10	11,750	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP102	0-0.1	782.78	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP102	0-0.1	No	10	10,110	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP102	0.6-0.7	705.59	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP102	0.6-0.7	No	10	10,210	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH103	0-0.1	724.84	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/06/2023	BH103	0-0.1	No	10	11,780	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH104	0-0.1	465.68	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/06/2023	BH103	0.1-0.6	No	10	9,560	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH105	0-0.1	597.6	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
16/06/2023	BH104	0-0.1	No	10	10,650	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH105	0.3-0.4	659.55	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
16/06/2023	BH105	0-0.1	No	10	11,420	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP106	0-0.1	705.29	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP106	0-0.1	No	10	11,610	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH107	0-0.1	447.77	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
16/06/2023	BH107	0-0.1	No	10	10,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH108	0-0.1	549.2	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
16/06/2023	BH108	0-0.1	No	10	12,100	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH109	0-0.1	447.85	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
16/06/2023	BH109	0-0.1	No	10	10,100	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP110	0-0.1	526.84	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP110	0-0.1	No	10	11,250	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP110	0.2-0.3	609.83	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP110	0.2-0.3	No	10	10,250	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH111	0-0.1	128.71	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
16/06/2023	BH11	0-0.1	No	10	10,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH112	0-0.1	466.74	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
16/06/2023	BH112	0-0.1	No	10	10,010	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH113	0-0.1	351.24	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
16/06/2023	BH113	0-0.1	No	10	10,140	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP114	0-0.1	662.36	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP114	0-0.1	No	10	11,010	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH115	0-0.1	123.86	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
16/06/2023	BH115	0-0.1	No	10	11,070	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH116	0-0.1	122.92	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
16/06/2023	BH116	0-0.1	No	10	10,070	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH117	0-0.1	379.51	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/06/2023	BH117	0-0.1	No	10	10,310	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH117	0.3-0.5	274.54	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/06/2023	BH117	0.1-0.7	No	2	1,950	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH118	0-0.1	340.94	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
16/06/2023	BH118	0-0.1	No	10	10,100	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP119	0-0.1	416.09	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP119	0-0.1	No	10	10,440	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP119	0.5-0.6	592.63	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP119	0.5-0.6	No	10	10,000	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP120	0-0.1	524.09	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP120	0-0.1	No	10	10,210	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP120	0.6-0.7	624.04	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP120	0.6-0.7	No	10	10,440	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP121	0-0.1	660.29	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP121	0-0.1	No	10	10,330	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP122	0-0.1	530.42	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP122	0-0.1	No	10	10,680	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP123	0-0.1	567.82	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP123	0-0.1	No	10	10,910	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP123	0.4-0.5	595.06	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP123	0.4-0.5	No	10	10,500	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH124	0-0.1	422.88	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/06/2023	BH124	0-0.1	No	10	10,910	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	BH125	0-0.1	406.63	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	BH125	0-0.1	No	10	10,100	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP126	0-0.1	729.69	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP126	0-0.1	No	10	12,100	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP126	0.6-0.7	831.04	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP126	0.6-0.7	No	10	13,100	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP127	0-0.1	616.37	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP127	0-0.1	No	10	10,450	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	TP127	0.9-1	747.29	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
14/06/2023	TP127	0.9-1	No	10	10,600	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	SM101	0.5-0.6	636.82	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/06/2023	SM101	0-0.2	No	10	11,460	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	SM102	0.4-0.5	434.25	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/06/2023	SM102	0-0.2	No	10	11,080	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	SM103	0.2-0.3	740.9	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/06/2023	SM102	0.2-0.5	No	2	1,050	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	SM104	0.35-0.45	655.77	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/06/2023	SM103	0-0.1	No	10	12,440	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	326037	SM105	0.5-0.6	730.75	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
15/06/2023	SM104	0-0.1	No	10	10,520	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
15/06/2023	SM105	0-0.1	No	10	10,910	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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Concentration above the SAC VALUE

TABLE S6
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013 EILs AND ESLs
All data in mg/kg unless stated otherwise

Land Use Category				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																			
							AGED HEAVY METALS-EILs						EILs		ESLs								
				pH	CEC (cmolc/kg)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	1	0.1	25	50	100	100	0.2	0.5	1	1	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	Sample Depth	Sample Description	Soil Texture																				
BH101	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	6	16	10	38	3	51	<1	<0.1	<25	<50	130	<100	<0.2	<0.5	<1	<1	0.07
BH101	0-0.1	Lab duplicate	Fine	5.7	20.5	37	7	18	11	40	3	57	<1	<0.1	<25	50	300	130	<0.2	<0.5	<1	<1	0.08
BH101	0.3-0.5	F: Silty Clay	Fine	5.7	20.5	37	4	13	2	16	2	9	<1	NA	<25	<50	120	<100	<0.2	<0.5	<1	<1	0.09
BH101	0.8-1	Silty Clay	Fine	5.7	20.5	37	7	24	1	17	2	3	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP102	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	9	10	12	11	28	<1	<0.1	<25	<50	110	<100	<0.2	<0.5	<1	<1	<0.05
TP102	0.6-0.7	F: Silty Clay	Fine	5.7	20.5	37	9	24	2	12	1	3	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH103	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	4	11	5	35	2	26	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH103	0.6-0.8	Silty Clay	Fine	5.7	20.5	37	<4	14	3	12	2	4	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH104	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	11	5	26	2	25	<1	<0.1	<25	<50	370	110	<0.2	<0.5	<1	<1	<0.05
BH104	0.1-0.3	Silty Clay	Fine	5.7	20.5	37	5	18	2	14	4	12	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH105	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	12	7	59	3	30	<1	<0.1	<25	<50	280	200	<0.2	<0.5	<1	<1	0.07
BH105	0.3-0.4	F: Silty Clay	Fine	5.7	20.5	37	<4	8	2	21	2	12	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP106	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	9	17	11	58	2	56	<1	<0.1	<25	<50	140	<100	<0.2	<0.5	<1	<1	<0.05
BH107	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	7	7	45	2	28	<1	<0.1	<25	88	730	280	<0.2	<0.5	<1	<1	0.07
BH107	0-0.1	Lab duplicate	Fine	5.7	20.5	37	<4	7	8	60	2	30	<1	<0.1	<25	73	610	260	<0.2	<0.5	<1	<1	0.07
BH108	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	6	18	28	170	10	230	<1	<0.1	<25	<50	180	120	<0.2	<0.5	<1	<1	0.1
BH108	0.4-0.5	Silty Clay	Fine	5.7	20.5	37	<4	16	20	15	5	25	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH109	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	4	17	13	62	7	57	<1	<0.1	<25	<50	450	190	<0.2	<0.5	<1	<1	0.1
TP110	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	5	19	14	29	8	40	<1	<0.1	<25	<50	130	<100	<0.2	<0.5	<1	<1	0.1
TP110	0.2-0.3	F: Silty Clay	Fine	5.7	20.5	37	<4	9	2	10	1	1	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH111	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	15	27	41	210	17	110	<1	<0.1	<25	120	1700	720	<0.2	<0.5	<1	<1	0.05
BH111	0.3-0.5	Silty Clay	Fine	5.7	20.5	37	<4	5	6	2	3	14	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH112	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	10	9	39	3	34	<1	<0.1	<25	<50	300	150	<0.2	<0.5	<1	<1	0.06
BH112	0.5-0.7	Silty Clay	Fine	5.7	20.5	37	<4	11	2	14	2	8	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH113	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	18	18	120	10	42	<1	<0.1	<25	<50	220	120	<0.2	<0.5	<1	<1	<0.05
BH113	0.15-0.35	Silty Clay	Fine	5.7	20.5	37	6	32	39	210	4	74	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.1
TP114	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	37	8	24	14	32	<1	<0.1	<25	<50	300	290	<0.2	<0.5	<1	<1	<0.05
TP114	0.7-0.8	Silty Clay	Fine	5.7	20.5	37	9	21	13	20	19	15	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH115	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	21	14	45	83	11	170	<4	<0.5	<100	<200	680	<400	<0.8	<2	<4	<4	<0.2
BH115	0.1-0.4	Silty Clay	Fine	5.7	20.5	37	8	12	<1	14	<1	5	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH116	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	18	28	140	240	16	430	<5	<0.5	<120	<250	<500	<500	<1	<2	<5	<5	<0.2
BH116	0-0.1	Lab duplicate	Fine	5.7	20.5	37	20	28	120	240	19	460	<5	<0.5	<120	<250	700	<500	<1	<2	<5	<5	<0.2
BH116	0.4-0.7	Silty Clay	Fine	5.7	20.5	37	12	30	24	52	20	180	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH117	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	8	13	18	2	38	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH117	0.3-0.5	F: Silty Clay	Fine	5.7	20.5	37	5	14	15	57	5	35	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.06
BH117	0.7-1	Silty Clay	Fine	5.7	20.5	37	5	14	2	14	<1	67	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH118	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	7	14	73	49	11	290	<1	<0.1	<25	<50	300	120	<0.2	<0.5	<1	<1	<0.05
BH118	0.15-0.5	Silty Clay	Fine	5.7	20.5	37	7	21	3	20	<1	20	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP119	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	5	13	5	39	1	20	<1	<0.1	<25	<50	420	210	<0.2	<0.5	<1	<1	<0.05
TP119	0.5-0.6	F: Silty Clay	Fine	5.7	20.5	37	8	29	<1	15	1	3	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP120	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	6	10	11	110	2	81	<1	<0.1	<25	<50	290	140	<0.2	<0.5	<1	<1	<0.05
TP120	0.6-0.7	F: Silty Clay	Fine	5.7	20.5	37	11	29	1	20	1	13	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP121	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	9	21	5	44	1	28	<1	<0.1	<25	<50	270	150	<0.2	<0.5	<1	<1	<0.05
TP121	0.6-0.7	Silty Clay	Fine	5.7	20.5	37	7	33	<1	16	1	6	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP122	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	6	12	25	59	4	83	<1	<0.1	<25	<50	220	<100	<0.2	<0.5	<1	<1	0.2
TP122	0-0.1	Lab duplicate	Fine	5.7	20.5	37	7	11	28	64	3	90	<1	<0.1	<25	<50	240	120	<0.2	<0.5	<1	<1	0.2
TP122	0.7-0.8	Silty Clay	Fine	5.7	20.5	37	6	22	2	18	<1	2	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
TP123	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	5	15	11	40	1	49	<1	<0.1	<25	<50	230	120	<0.2	<0.5	<1	<1	<0.05
TP123	0.4-0.5	F: Silty Clay	Fine	5.7	20.5	37	7	26	3	19	2	21	<1	NA	<25	<50	160	100	<0.2	<0.5	<1	<1	<0.05
BH124	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	6	14	17	26	10	60	<1	<0.1	<25	<50	600	500	<0.2	<0.5	<1	<1	0.68
BH124	0.7-1	Silty Clay	Fine	5.7	20.5	37	<4	9	<1	21	<1	5	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH125	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	5	16	10	34	4	21	<1	<0.1	<25	<50	500	180	<0.2	<0.5	<1	<1	<0.05
BH125	0.1-0.2	Silty Clay	Fine	5.7	20.5	37	5	20	1	14	2	4	<1	NA	<25	<50	280	160	<0.2	<0.5	<1	<1	<0.05
TP126	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	5	23	5	23	4	25	<1	<0.1	<25	<50	130	<100	<0.2	<0.5	<1	<1	<0.05
TP126	0-0.1	Lab duplicate	Fine	5.7	20.5	37	7	21	5	22	4	25	<1	<0.1	<25	<50	190	110	<0.2	<0.5	<1	<1	0.06
TP126	0.6-0.7	F: Silty Clay	Fine	5.7	20.5	37	<4	27	11	15	19	21	<1	NA	<25	<50	110	120	<0.2	<0.5	<1	<1	<0.05
TP127	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	23	19	22	27	46	<1	<0.1	<25	<50	140	100	<0.2	<0.5	<1	<1	0.4
TP127	0.9-1	F: Silty Sandy Clay	Fine	5.7	20.5	37	<4	19	13	13	17	19	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.55
SM101	0.5-0.6	F: Silty Clay	Fine	5.7	20.5	37	<4	9	2	14	1	9	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
SM101	0.5-0.6	Lab duplicate	Fine	5.7	20.5	37	<4	9	2	18	1	8	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
SM102	0.4-0.5	Silty Clay	Fine	5.7	20.5	37	5	18	2	19	5	11	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
SM103	0.2-0.3	F: Silty Clay	Fine	5.7	20.5	37	<4	14	8	55	6	21	<1	<0.1	<25	<50	170	130	<0.2	<0.5	<1	<1	0.2
SM104	0.35-0.45	F: Silty Clay	Fine	5.7	20.5	37	<4	17	6	13	4	14	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
SM105	0.5-0.6	F: Silty Clay	Fine	5.7	20.5	37	<4	12	4	17	2	9	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
SM105	0.5-0.6	Lab duplicate	Fine	5.7	20.5	37	<4	13	4	20	3	10	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
SS1	0.1-0.2	Silty Clay	Fine	3.8	1.2	42	10	17	15	39	36	220	<2	<0.3	<50	<100	<200	<200	<0.4	<1	<2	<2	<0.2
SS2	0.1-0.2	Silty Clay	Fine	4.1	4.1	22	15	30	67	350	64	790	<2	<0.3	<50	<100	1000	520	<0.4	<1	<2	<2	<0.2
SS3	0.1-0.2	Silty Clay	Fine	NA	NA	NA	6	16	22	76	6	130	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
SS4	0.1-0.2	Silty Clay	Fine	8.2	11	30	6	25	110	330	16	410	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
SDUP101	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	7	14	11	14	10	20	<1	<0.1	<25	<50	120	<100	<0.2	<0.5	<1	<1	<0.05
SDUP102	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	6	16	19	98	4	98	<1	<0.1	<25	74	210	150	<0.2	<0.5	<1	<1	<0.05
SDUP103	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	13	4	17	6	25	<1	<0.1	<25	<50	140	<100	<0.2	<0.5	<1	<1	0.2
SDUP104	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	6	29	11	32	13	36	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.1
SDUP105	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	28	6	23	8	30	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	0.07
SDUP106	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	22	23	23	28	48	<1	<0.1	<25	<50	200	120	<0.2	<0.5	<1	<1	0.4
SDUP106	0-0.1	Lab duplicate	Fine	5.7	20.5	37	<4	20	22	24	29	50	<1	<0.1	<25	<50	170	120	<0.2	<0.5	<1	<1	0.5
SDUP107	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	7	9	10	87	2	79	<1	<0.1	<25	<50	190	<100	<0.2	<0.5	<1	<1	<0.05
SDUP108	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	8	5	39	1	20	<1	NA	<25	<50	310	220	<0.2	<0.5	<1	<1	0.09
SDUP109	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	6	13	5	40	1	27	<1	NA	<25	<50	180	<100	<0.2	<0.5	<1	<1	<0.05
SDUP110	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	<4	10	12	42	1	57	<1	NA	<25	<50	290	<100	<0.2	<0.5	<1	<1	0.1
SDUP111	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	5	9	28	63	4	84	<1	NA	<25	<50	160	<100	<0.2	<0.5	<1	<1	0.3
Total Number of Samples				80	80	80	81	81	81	81	81	81	81	51	81	81	81	81	81	81	81	81	81
Maximum Value				8.2	20.5	42	21	37	140	350	64	790	<PQL	<PQL	<PQL	120	1700	720	<PQL	<PQL	<PQL	<PQL	0.68

Concentration above the SAC — VALUE
Concentration above the PQL — **Bold**
The guideline corresponding to the elevated value is highlighted in grey in the EIL and ESL Assessment Criteria Table below

EIL AND ESL ASSESSMENT CRITERIA

Sample Reference	Sample Depth	Sample Description	Soil Texture	pH	CEC (cmolc/kg)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
BH101	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH101	0-0.1	Lab duplicate	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH101	0.3-0.5	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH101	0.8-1	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
TP102	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
TP102	0.6-0.7	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH103	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH103	0.6-0.8	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH104	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH104	0.1-0.3	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH105	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH105	0.3-0.4	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
TP106	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH107	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH107	0-0.1	Lab duplicate	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH108	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH108	0.4-0.5	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH109	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
TP110	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
TP110	0.2-0.3	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH111	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH111	0.3-0.5	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH112	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH112	0.5-0.7	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH113	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH113	0.15-0.35	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
TP114	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
TP114	0.7-0.8	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH115	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH115	0.1-0.4	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH116	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH116	0-0.1	Lab duplicate	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH116	0.4-0.7	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH117	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH117	0.3-0.5	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH117	0.7-1	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH118	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH118	0.15-0.5	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
TP119	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
TP119	0.5-0.6	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
TP120	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
TP120	0.6-0.7	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
TP121	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
TP121	0.6-0.7	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
TP122	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
TP122	0-0.1	Lab duplicate	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
TP122	0.7-0.8	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
TP123	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
TP123	0.4-0.5	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH124	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH124	0.7-1	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
BH125	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
BH125	0.1-0.2	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
TP126	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
TP126	0-0.1	Lab duplicate	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
TP126	0.6-0.7	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
TP127	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
TP127	0.9-1	F: Silty Sandy Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
SM101	0.5-0.6	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SM101	0.5-0.6	Lab duplicate	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SM102	0.4-0.5	Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SM103	0.2-0.3	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SM104	0.35-0.45	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SM105	0.5-0.6	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SM105	0.5-0.6	Lab duplicate	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SS1	0.1-0.2	Silty Clay	Fine	3.8	1.2	42	100	410	90	1300	35	190	170	180	180	120	1300	5600	65	105	125	45	20
SS2	0.1-0.2	Silty Clay	Fine	4.1	4.1	22	100	410	90	1300	35	220	170	180	180	120	1300	5600	65	105	125	45	20
SS3	0.1-0.2	Silty Clay	Fine	NA	NA	NA	100	200	90	1300	35	190	170	180	180	120	1300	5600	65	105	125	45	20
SS4	0.1-0.2	Silty Clay	Fine	8.2	11	30	100	410	240	1300	280	820	170	180	180	120	1300	5600	65	105	125	45	20
SDUP101	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SDUP102	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SDUP103	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SDUP104	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SDUP105	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SDUP106	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SDUP106	0-0.1	Lab duplicate	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SDUP107	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	180	180	120	1300	5600	65	105	125	45	20
SDUP108	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
SDUP109	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
SDUP110	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20
SDUP111	0-0.1	F: Silty Clay	Fine	5.7	20.5	37	100	410	220	1300	360	520	170	--	180	120	1300	5600	65	105	125	45	20

JKEnvironments

TABLE S7
SOIL QA/QC SUMMARY

			TRH C6 - C10	TRH >C10-C16	TRH >C16-C34	TRH >C34-C40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-Xylene	Naphthalene	Acenaphthylene	Acenaph-thene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b,j+k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h)anthra-cene	Benzo(g,h,i)perylene
	PQL Envirolab SYD		*25*	*50*	*100*	*100*	*0.2*	*0.5*	*1*	*2*	*1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.05*	*0.1*	*0.1*	*0.1*
	PQL Envirolab VIC		*25*	*50*	*100*	*100*	*0.2*	*0.5*	*1.0*	*2.0*	*1.0*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*
Intra laboratory duplicate	TP102	0-0.1	<25	<50	110	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
	SDUP101	0-0.1	<25	<50	120	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
	MEAN		nc	nc	115	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	9%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP106	0-0.1	<25	<50	140	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
	SDUP102	0-0.1	<25	74	210	150	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
	MEAN		nc	49.5	175	100	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	99%	40%	100%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP126	0-0.1	<25	<50	130	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
	SDUP103	0-0.1	<25	<50	140	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.2	0.2	0.1	<0.1	0.2
	MEAN		nc	nc	135	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.075	0.075	0.075	0.15	0.1125	0.075	nc	0.125
	RPD %		nc	nc	7%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	67%	67%	67%	67%	156%	67%	nc	120%
Intra laboratory duplicate	TP110	0-0.1	<25	<50	130	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	<0.1	<0.1	<0.2	0.1	<0.1	<0.1	0.1
	SDUP104	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	<0.1	<0.1	<0.2	0.1	<0.1	<0.1	<0.1
	MEAN		nc	nc	90	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.2	0.2	nc	nc	nc	0.1	nc	nc	0.075
	RPD %		nc	nc	89%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	0%	nc	nc	nc	0%	nc	nc	67%
Intra laboratory duplicate	TP114	0-0.1	<25	<50	300	290	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
	SDUP105	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.2	0.07	<0.1	<0.1	<0.1
	MEAN		nc	nc	175	170	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.075	0.075	nc	nc	nc	0.0475	nc	nc	nc
	RPD %		nc	nc	143%	141%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	67%	67%	nc	nc	nc	95%	nc	nc	nc
Intra laboratory duplicate	TP127	0-0.1	<25	<50	140	100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.5	0.6	0.3	0.3	0.6	0.4	0.2	<0.1	0.3
	SDUP106	0-0.1	<25	<50	200	120	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.5	0.6	0.2	0.3	0.6	0.4	0.2	<0.1	0.3
	MEAN		nc	nc	170	110	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.1	nc	0.5	0.6	0.25	0.3	0.6	0.4	0.2	nc	0.3
	RPD %		nc	nc	35%	18%	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	nc	0%	0%	40%	0%	0%	0%	0%	nc	0%
Intra laboratory duplicate	TP120	0-0.1	<25	<50	290	140	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
	SDUP107	0-0.1	<25	<50	190	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
	MEAN		nc	nc	240	95	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	42%	95%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP119	0-0.1	<25	<50	420	210	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
	SDUP108	0-0.1	<25	<50	310	220	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.2	0.09	<0.1	<0.1	<0.1
	MEAN		nc	nc	365	215	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.075	0.075	nc	nc	nc	0.0575	nc	nc	nc
	RPD %		nc	nc	30%	5%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	67%	67%	nc	nc	nc	113%	nc	nc	nc
Intra laboratory duplicate	TP121	0-0.1	<25	<50	270	150	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
	SDUP109	0-0.1	<25	<50	180	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
	MEAN		nc	nc	225	100	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	40%	100%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP123	0-0.1	<25	<50	230	120	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
	SDUP110	0-0.1	<25	<50	290	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	0.1	<0.1	<0.1	<0.1
	MEAN		nc	nc	260	85	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.0625	nc	nc	nc
	RPD %		nc	nc	23%	82%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	120%	nc	nc	nc
Intra laboratory duplicate	TP122	0-0.1	<25	<50	220	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	0.4	0.5	0.2	0.2	0.3	0.2	<0.1	<0.1	0.1
	SDUP111	0-0.1	<25	<50	160	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.3	0.3	0.2	0.2	0.2	0.3	0.1	<0.1	0.1
	MEAN		nc	nc	190	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.2	nc	0.35	0.4	0.2	0.2	0.25	0.25	0.075	nc	0.1
	RPD %		nc	nc	32%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	100%	nc	29%	50%	0%	0%	40%	40%	67%	nc	0%
Field Blank	TB1 16/06/23	-	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
Field Blank	TB2 16/06/23	-	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
Field Blank	TB3 16/06/23	-	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
Field Blank	TB4 16/06/23	-	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
Field Rinsate	FR1 - AUGER 16/06/23	µg/L	46	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
Field Rinsate	FR2 - SHOVEI 16/06/23	µg/L	46	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1
Trip Spike	TS1 16/06/23		-	-	-	-	100%	100%	99%	99%	99%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS2 16/06/23		-	-	-	-	92%	91%	93%	93%	93%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS3 16/06/23		-	-	-	-	101%	107%	109%	109%	109%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS4 16/06/23		-	-	-	-	103%	110%	120%	114%	117%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			HCB	alpha- BHC	gamma- BHC	beta- BHC	Heptachlor	delta- BHC	Aldrin	Heptachlor Epoxide	Gamma- Chlordane	alpha- chlordane	Endosulfan I	pp- DDE	Dieldrin	Endrin	pp- DDD	Endosulfan II	pp- DDT	Endrin Aldehyde	Endosulfan Sulphate	Methoxychlor
	PQL Envirolab SYD		*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*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
	PQL Envirolab VIC		*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*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
Intra laboratory duplicate	TP102	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	SDUP101	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP106	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	SDUP102	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP126	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	SDUP103	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP110	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	SDUP104	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP114	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	SDUP105	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP127	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	SDUP106	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP120	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	SDUP107	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP119	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	SDUP108	0-0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP121	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	SDUP109	0-0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP123	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	SDUP110	0-0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra laboratory duplicate	TP122	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	SDUP111	0-0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Field Blank	TB1 16/06/23	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank	TB2 16/06/23	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank	TB3 16/06/23	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank	TB4 16/06/23	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Rinsate	FR1 - AUGER 16/06/23	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Rinsate	FR2 - SHOVEI 16/06/23	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trip Spike	TS1 16/06/23		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS2 16/06/23		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS3 16/06/23		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS4 16/06/23		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Azinphos-methyl (Guthion)	Bromophos-ethyl	Chlorpyriphos	Chlorpyriphos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenitrothion	Malathion	Parathion	Ronnel	Total PCBS	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
	PQL Envirolab SYD		*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*	*4*	*0.4*	*1*	*1*	*1*	*0.1*	*1*	*1*
	PQL Envirolab VIC		*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*	*4.0*	*0.4*	*1.0*	*1.0*	*1.0*	*0.1*	*1.0*	*1.0*
Intra laboratory duplicate	TP102	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	9	10	12	<0.1	11	28
	SDUP101	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7	<0.4	14	11	14	<0.1	10	20
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	4.5	nc	11.5	10.5	13	nc	10.5	24
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	111%	nc	43%	10%	15%	nc	10%	33%
Intra laboratory duplicate	TP106	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	9	<0.4	17	11	58	0.2	2	56
	SDUP102	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	6	<0.4	16	19	98	0.3	4	98
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	7.5	nc	16.5	15	78	0.25	3	77
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	40%	nc	6%	53%	51%	40%	67%	55%
Intra laboratory duplicate	TP126	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5	<0.4	23	5	23	<0.1	4	25
	SDUP103	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	13	4	17	<0.1	6	25
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	3.5	nc	18	4.5	20	nc	5	25
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	86%	nc	56%	22%	30%	nc	40%	0%
Intra laboratory duplicate	TP110	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5	<0.4	19	14	29	<0.1	8	40
	SDUP104	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	6	<0.4	29	11	32	<0.1	13	36
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	5.5	nc	24	12.5	30.5	nc	10.5	38
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	18%	nc	42%	24%	10%	nc	48%	11%
Intra laboratory duplicate	TP114	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	37	8	24	<0.1	14	32
	SDUP105	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	28	6	23	<0.1	8	30
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	32.5	7	23.5	nc	11	31
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	28%	29%	4%	nc	55%	6%
Intra laboratory duplicate	TP127	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	23	19	22	<0.1	27	46
	SDUP106	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	22	23	23	<0.1	28	48
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	22.5	21	22.5	nc	27.5	47
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	4%	19%	4%	nc	4%	4%
Intra laboratory duplicate	TP120	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	6	<0.4	10	11	110	<0.1	2	81
	SDUP107	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7	<0.4	9	10	87	<0.1	2	79
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	6.5	nc	9.5	10.5	98.5	nc	2	80
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	15%	nc	11%	10%	23%	nc	0%	3%
Intra laboratory duplicate	TP119	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5	<0.4	13	5	39	<0.1	1	20
	SDUP108	0-0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4	<0.4	8	5	39	<0.1	1	20
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	3.5	nc	10.5	5	39	nc	1	20
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	86%	nc	48%	0%	0%	nc	0%	0%
Intra laboratory duplicate	TP121	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	9	<0.4	21	5	44	<0.1	1	28
	SDUP109	0-0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6	<0.4	13	5	40	<0.1	1	27
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	7.5	nc	17	5	42	nc	1	27.5
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	40%	nc	47%	0%	10%	nc	0%	4%
Intra laboratory duplicate	TP123	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5	<0.4	15	11	40	0.1	1	49
	SDUP110	0-0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4	<0.4	10	12	42	<0.1	1	57
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	3.5	nc	12.5	11.5	41	0.075	1	53
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	86%	nc	40%	9%	5%	67%	0%	15%
Intra laboratory duplicate	TP122	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	6	<0.4	12	25	59	0.1	4	83
	SDUP111	0-0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	<0.4	9	28	63	0.1	4	84
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	5.5	nc	10.5	26.5	61	0.1	4	83.5
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	18%	nc	29%	11%	7%	0%	0%	1%
Field Blank	TB1 16/06/23	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4	<0.4	3	<1	3	<0.1	<1	2
Field Blank	TB2 16/06/23	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4	<0.4	4	1	2	<0.1	<1	2
Field Blank	TB3 16/06/23	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4	<0.4	3	1	2	<0.1	<1	2
Field Blank	TB4 16/06/23	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4	<0.4	4	<1	2	<0.1	<1	14
Field Rinsate	FR1 - AUGER 16/06/23	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.05	<0.01	<0.01	0.2	<0.03	<0.0005	<0.02	<0.02
Field Rinsate	FR2 - SHOVEI 16/06/23	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.05	<0.01	<0.01	0.3	<0.03	<0.0005	<0.02	<0.02
Trip Spike	TS1 16/06/23		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS2 16/06/23		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS3 16/06/23		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Spike	TS4 16/06/23		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Result outside of QA/QC acceptance criteria

Rinsate metals results in mg/L

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ADWG:	AustralianDrinking Water Guidelines
ANZG	Australian and New Zealand Guidelines
B(a)P:	Benzo(a)pyrene
CRC:	Cooperative Research Centre
ESLs:	Ecological Screening Levels
GIL:	Groundwater Investigation Levels
HILs:	Health Investigation Levels
HSLs:	Health Screening Levels
HSL-SSA:	Health Screening Level-SiteSpecific Assessment
NA:	Not Analysed
NC:	Not Calculated
NEPM:	National Environmental Protection Measure
NHMRC:	National Health and Medical Research Council
NL:	Not Limiting
NSL:	No Set Limit
OCP:	Organochlorine Pesticides
OPP:	Organophosphorus Pesticides
PAHs:	Polycyclic Aromatic Hydrocarbons
ppm:	Parts per million
PCBs:	Polychlorinated Biphenyls
PCE:	Perchloroethylene (Tetrachloroethylene or Tetrachloroethene)
PQL:	Practical Quantitation Limit
RS:	Rinsate Sample
RSL:	Regional Screening Levels
SAC:	Site Assessment Criteria
SSA:	Site Specific Assessment
SSHSLs:	Site Specific Health Screening Levels
TB:	Trip Blank
TCA:	1,1,1 Trichloroethane (methyl chloroform)
TCE:	Trichloroethylene (Trichloroethene)
TS:	Trip Spike
TRH:	Total Recoverable Hydrocarbons
UCL:	Upper Level Confidence Limit on Mean Value
USEPA	United States Environmental Protection Agency
VOCC:	Volatile Organic Chlorinated Compounds
WHO:	World Health Organisation

TABLE G1
SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO ECOLOGICAL GILs SAC
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	ANZG 2018 Fresh Waters	SAMPLES											
			MW101	MW101 Dup	MW117	MW124	SW1	SW2	SW3	SW4	GWDUP1	SWDUP1	GWDUP2	SWDUP2
Inorganic Compounds and Parameters														
pH		6.5 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)		NSL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals and Metalloids														
Arsenic (As III)	1	24	<1	<1	<1	<1	<1	<1	**5**	**3**	<1	<1	<1	<1
Cadmium	0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.2	<0.2
Chromium (SAC for Cr III adopted)	1	3.3	**1**	**2**	**2**	<1	<1	<1	**2**	<1	**1**	<1	**2**	<1
Copper	1	1.4	<1	<1	**1**	<1	**7**	<1	**1**	**3**	<1	**7**	<2	<2
Lead	1	3.4	<1	<1	<1	<1	<1	<1	**5**	**3**	<1	<1	<1	<1
Total Mercury (inorganic)	0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	1	11	**11**	**11**	**2**	**2**	<1	**3**	**24**	**4**	**11**	<1	**2**	**3**
Zinc	1	8	**68**	**68**	**18**	**35**	**32**	**40**	**120**	**140**	**67**	**34**	**24**	**55**
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)														
Benzene	1	950	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	1	180	<1	<1	<1	<1	<1	<1	<1	<1	**1**	<1	<1	<1
Ethylbenzene	1	80	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
m+p-xylene	2	75	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
o-xylene	1	350	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total xylenes	2	NSL	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons (PAHs)														
Naphthalene	0.2	16	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1
Acenaphthylene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	0.1	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	0.1	0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	0.1	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
Pyrene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	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	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**
GIL >PQL	Red

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TABLE G2
SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO HUMAN CONTACT GILs
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	Recreational (10 x NHMRC ADWG)	SAMPLES											
			MW101	MW101	MW117	MW124	SW1	SW2	SW3	SW4	GWDUP1	SWDUP1	GWDUP2	SWDUP2
Inorganic Compounds and Parameters														
pH		6.5 - 8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)		NSL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals and Metalloids														
Arsenic (As III)	1	100	<1	<1	<1	<1	<1	<1	**5**	**3**	<1	<1	<1	<1
Cadmium	0.1	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.2	<0.2
Chromium (total)	1	500	**1**	**2**	**2**	<1	<1	<1	**2**	<1	**1**	<1	**2**	<1
Copper	1	20000	<1	<1	**1**	<1	**7**	<1	**1**	**3**	<1	**7**	<2	<2
Lead	1	100	<1	<1	<1	<1	<1	<1	**5**	**3**	<1	<1	<1	<1
Total Mercury (inorganic)	0.05	10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	1	200	**11**	**11**	**2**	**2**	<1	**3**	**24**	**4**	**11**	<1	**2**	**3**
Zinc	1	30000	**68**	**68**	**18**	**35**	**32**	**40**	**120**	**140**	**67**	**34**	**24**	**55**
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)														
Benzene	1	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	1	8000	<1	<1	<1	<1	<1	<1	<1	<1	**1**	<1	<1	<1
Ethylbenzene	1	3000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
m+p-xylene	2	NSL	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
o-xylene	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total xylenes	2	6000	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons (PAHs)														
Naphthalene	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1
Acenaphthylene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	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	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**
GIL >PQL	Red

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TABLE G3
GROUNDWATER LABORATORY RESULTS COMPARED TO HSLs
All data in µg/L unless stated otherwise

				C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID
PQL - Envirolab Services				10	50	1	1	1	2	1	
NEPM 2013 - Land Use Category				**HSL-D: COMMERCIAL/INDUSTRIAL**							
Sample Reference	**Water Depth**	**Depth Category**	**Soil Category**								
MW101	4.66	2m to <4m	Clay	<10	<50	<1	<1	<1	<2	<1	28.4
MW101	4.66	2m to <4m	Clay	<10	<50	<1	<1	<1	<2	<1	28.4
MW117	4.52	2m to <4m	Clay	<10	<50	<1	<1	<1	<2	<1	2.8
MW124	2.98	2m to <4m	Clay	<10	<50	<1	<1	<1	<2	<1	0.5
GWDUP1	4.66	2m to <4m	Clay	<10	<50	<1	**1**	<1	<2	<1	NA
GWDUP2	4.52	2m to <4m	Clay	<10	<50	<1	<1	<1	<2	<1	NA
Total Number of Samples				6	6	6	6	6	6	6	4
Maximum Value				<PQL	<PQL	<PQL	1	<PQL	<PQL	<PQL	28.4

Concentration above the SAC	**VALUE**
Site specific assesment (SSA) required	**VALUE**
Concentration above the PQL	**Bold**

The guideline corresponding to the elevated value is highlighted in grey in the Groundwater Assessment Criteria Table below

HSL GROUNDWATER ASSESSMENT CRITERIA

Sample Reference	Water Depth	Depth Category	Soil Category	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
MW101	4.66	2m to <4m	Clay	NL	NL	30000	NL	NL	NL	NL
MW101	4.66	2m to <4m	Clay	NL	NL	30000	NL	NL	NL	NL
MW117	4.52	2m to <4m	Clay	NL	NL	30000	NL	NL	NL	NL
MW124	2.98	2m to <4m	Clay	NL	NL	30000	NL	NL	NL	NL
GWDUP1	4.66	2m to <4m	Clay	NL	NL	30000	NL	NL	NL	NL
GWDUP2	4.52	2m to <4m	Clay	NL	NL	30000	NL	NL	NL	NL

JKEnvironments

TABLE G4
GROUNDWATER QA/QC SUMMARY

		TRH C6 - C10	TRH >C10-C16	TRH >C16-C34	TRH >C34-C40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-Xylene	Naphthalene	Acenaphthylene	Acenaph-thene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b,j+k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h)anthra-cene	Benzo(g,h,i)perylene	Arsenic	Cadmium	Chromium VI	Copper	Lead	Mercury	Nickel	Zinc
	PQL Envirolab SYD	*10*	*50*	*100*	*100*	*1*	*1*	*1*	*2*	*1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*1*	*0.1*	*1*	*1*	*1*	*0.05*	*1*	*1*
	PQL Envirolab VIC	*10*	*50*	*100*	*100*	*1.0*	*1.0*	*1.0*	*2.0*	*1.0*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*1*	*0.1*	*1*	*1*	*1*	*0.05*	*1*	*1*
Intra	MW101	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	1	<1	<1	<0.05	11	68
laboratory	GWDUP1	<10	<50	<100	<100	<1	1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	1	<1	<1	<0.05	11	67
duplicate	MEAN	nc	nc	nc	nc	nc	0.75	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	1	nc	nc	nc	11	67.5
	RPD %	nc	nc	nc	nc	nc	67%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	nc	nc	nc	0%	1%
Intra	SW1	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	7	<1	<0.05	<1	32
laboratory	SWDUP1	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	7	<1	<0.05	<1	34
duplicate	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	7	nc	nc	nc	33
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	nc	nc	nc	6%
Inter	MW117	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	2	1	<1	<0.05	2	18
laboratory	GWDUP2	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.2	2	<2	<1	<0.05	2	24
duplicate	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	2	0.75	nc	nc	2	21
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	67%	nc	nc	0%	29%
Inter	SW2	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<1	<1	<0.05	3	40
laboratory	SWDUP2	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.2	<1	<2	<1	<0.05	3	55
duplicate	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	3	47.5
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	32%
Field	TB1	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<1	<1	<0.05	<1	<1
Blank	23/06/2023																																
Trip	TS1	-	-	-	-	107%	109%	117%	105%	110%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Spike	23/06/2023																																

Result outside of QA/QC acceptance criteria: Value

Appendix D: Borehole / Test pit Logs

JKEnvironments

ENVIRONMENTAL LOG

Log No. BH/MW101

1/2

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN
Project: PUBLIC PARK UPGRADE
Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** SPIRAL AUGER **R.L. Surface:** N/A
Date: 15/6/23 **Datum:** -
Plant Type: JK305 **Logged/Checked by:** O.B./T.H.

Groundwater Record	Field Tests	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION		0		FILL: Silty clay, low plasticity, brown, trace of igneous, ironstone and sandstone gravel, glass, plastic, metal, root fibres and ash.	w≈PL			GRASS COVER SCREEN: 10.69kg 0-0.1m, NO FCF SCREEN: 11.75kg 0.1-0.8m, NO FCF
	N = 15 4,7,8	0.5						
		1	CI-CH	Silty CLAY: medium to high plasticity, light brown mottled orange.	w≈PL			RESIDUAL SPT HAMMER BROKE AFTER 400mm
	N = 6 1,2,4	1.5						
		2	-	Extremely Weathered sandstone: silty SAND, fine to coarse grained, light grey and red.	XW			HAWKESBURY SANDSTONE
		2.5						
	N = SPT 17/ 150mm REFUSAL	3						
		3.5		SANDSTONE: light grey and red.	DW			MODERATE 'TC'

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH/MW101**

2/2

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P | **Method:** SPIRAL AUGER | **R.L. Surface:** N/A

Date: 15/6/23 | **Datum:** -

Plant Type: JK305 | **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES (ES, ASS, ASB, SAL, DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						SANDSTONE: light grey and red.	DW			RESISTANCE HAWKESBURY SANDSTONE
			4							
	ES		4.5			as above, but red-brown and light grey.	DW			HAWKESBURY SANDSTONE
			5							MODERATE TO HIGH RESISTANCE
	ES		5.5							HIGH RESISTANCE
						END OF BOREHOLE AT 5.6m				'TC' BIT RESISTANCE GROUNDWATER MONITORING WELL INSTALLED TO 5.6m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 2.5m TO 5.5m. CASING 0.1m TO 2.5m. 2mm SAND FILTER PACK 2.3m TO 5.5m. BENTONITE SEAL 1.5m TO 2.3m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
			6							
			6.5							
			7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **TP102**

1/1

SDUP101: 0-0.1m

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** TEST PIT **R.L. Surface:** N/A

Date: 14/6/23 **Datum:** -

Plant Type: EXCAVATOR **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES (ES, ASS, ASB, SAL, DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Silty clay, low plasticity, brown, trace of ironstone and igneous gravel, and root fibres.	w<PL			GRASS COVER SCREEN: 10.11kg 0-0.1m, NO FCF
			0.5							SCREEN: 10.21kg 0.6-0.7m, NO FCF
					CL	Silty CLAY: low plasticity, red-brown mottled light brown, trace of ironstone gravel.	w<PL			RESIDUAL
			1							
						END OF TEST PIT AT 1.2m				
			1.5							
			2							
			2.5							
			3							
			3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No. BH103

1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 15/6/23 **Datum:** -

Plant Type: JK305 **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES (ES, ASS, ASB, SAL, DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Silty clay, low plasticity, brown, trace of ironstone gravel, glass, root fibres and ash.	w≈PL			SCREEN: 11.78kg 0-0.1m, NO FCF SCREEN: 9.56kg 0.1-0.6m, NO FCF
		N = 15 6,6,9	0.5		CI-CH	Silty CLAY: medium to high plasticity, light brown mottled red and orange, trace of ash.	w≈PL			RESIDUAL
			1		-	Extremely Weathered siltstone: silty CLAY, medium to high plasticity, light grey and red.	XW			HAWKESBURY SANDSTONE
		N = 21 9,10,11	1.5							
			2			END OF BOREHOLE AT 1.95m				
			2.5							
			3							
			3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH104**

1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 16/6/23 **Datum:** -

Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES (ES, ASS, ASB, SAL, DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Silty clay, medium plasticity, dark brown, trace of ironstone and sandstone gravel and root fibres.	w≈PL			LEAF COVER SCREEN: 10.65kg 0-0.1m, NO FCF
			0.5		CI-CH	Silty CLAY: medium to high plasticity, light brown.	w≈PL			RESIDUAL
						END OF BOREHOLE AT 0.6m				
			1							
			1.5							
			2							
			2.5							
			3							
			3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No. BH105

1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 16/6/23 **Datum:** -

Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty clay, low to medium plasticity, brown, trace of ironstone and sandstone gravel, slag and root fibres.	w≈PL			SCREEN: 11.42kg 0-0.1m, NO FCF
							0.5			END OF BOREHOLE AT 0.4m				HAND AUGER REFUSAL ON STIFF CLAY
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **TP106** 1/1

SDUP102: 0-0.1m

Client: COMPLETE URBAN
Project: PUBLIC PARK UPGRADE
Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** TEST PIT **R.L. Surface:** N/A
Date: 14/6/23 **Datum:** -
Plant Type: EXCAVATOR **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■		■		0			FILL: Silty clay, low plasticity, brown, trace of igneous gravel, glass and root fibres.	w<PL			GRASS COVER SCREEN: 11.61kg 0-0.1m, NO FCF
	■		■				0.5		CL-CI	Silty CLAY: low to medium plasticity, light brown mottled red, trace of ironstone gravel.	w<PL			RESIDUAL
							1			END OF TEST PIT AT 1.0m				
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No. BH107

1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 16/6/23 **Datum:** -

Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■		■		0			FILL: Silty clay, low plasticity, brown, trace of sandstone and ironstone gravel and root fibres.	w≈PL			LEAF COVER SCREEN: 10.2kg 0-0.1m, NO FCF
										END OF BOREHOLE AT 0.25m				HAND AUGER REFUSAL ON TREE ROOTS
							0.5							
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH108**

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 16/6/23 **Datum:** -

Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■		■		0			FILL: Silty clay, medium to high plasticity, brown, trace of ironstone gravel, slag, ash and root fibres.	w≈PL			SCREEN: 12.10kg 0-0.1m, NO FCF
	■		■				0.5		CI-CH	Silty CLAY: medium to high plasticity, brown mottled grey.	w≈PL			RESIDUAL
										END OF BOREHOLE AT 0.6m				
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No. BH109

1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 16/6/23 **Datum:** -

Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■		■		0			FILL: Silty clay, low plasticity, brown, trace of ironstone gravel, slag, plastic, glass and root fibres.	w<PL			SCREEN: 10.1kg 0-0.1m, NO FCF
	■		■						-	Extremely Weathered sandstone: silty SAND, fine to medium grained, light grey.	XW			HAWKESBURY SANDSTONE
							0.5			END OF BOREHOLE AT 0.4m				HAND AUGER REFUSAL
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **TP110**

1/1

SDUP104: 0-0.1m

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** TEST PIT **R.L. Surface:** N/A

Date: 14/6/23 **Datum:** -

Plant Type: EXCAVATOR **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty clay, medium plasticity, brown, trace of brick and plastic fragments, mulch and root fibres.	w≈PL			GRASS COVER 11.25kg 0-0.1m, NO FCF
										FILL: Silty clay, medium to high plasticity, grey brown mottled orange, trace of igneous gravel and mulch.	w≈PL			SCREEN: 10.25kg 0.2-0.3m, NO FCF
							0.5		CI-CH	Silty CLAY: medium to high plasticity, grey mottled orange and dark grey.	w≈PL			RESIDUAL
										END OF TEST PIT AT 0.8m				
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No. BH111 1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN
Project: PUBLIC PARK UPGRADE
Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A
Date: 16/6/23 **Datum:** -
Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	Samples (ES / ASS / ASB / SAL / DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	ES, ASB, DB		0			FILL: Silty clay, medium to high plasticity, brown, trace of root fibres.	w>PL			LEAF COVER SCREEN: 10.20kg 0-0.1m, NO FCF
	ES, ASB		0.5		CH	Silty CLAY: high plasticity, light grey.	w>PL			RESIDUAL
						END OF BOREHOLE AT 0.6m				
			1							
			1.5							
			2							
			2.5							
			3							
			3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH112** 1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN
Project: PUBLIC PARK UPGRADE
Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A
Date: 16/6/23 **Datum:** -
Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty clay, medium to high plasticity, dark brown, trace of ash, roots and root fibres.	w≈PL			SCREEN: 10.01kg 0-0.1m, NO FCF
							0.5		CI-CH	Silty CLAY: medium to high plasticity, light brown mottled orange.	w≈PL			RESIDUAL
							1			END OF BOREHOLE AT 0.7m				
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH113**

1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P | **Method:** HAND AUGER | **R.L. Surface:** N/A

Date: 16/6/23 | **Datum:** -

Plant Type: - | **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES: ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■		■		0			FILL: Silty clay, medium to high plasticity, dark brown, trace of ironstone gravel, roots and root fibres.	w≈PL			LEAF COVER SCREEN: 10.14kg 0-0.1m, NO FCF
	■		■						CI-CH	Silty CLAY: medium to high plasticity, light brown mottled orange.	w≈PL			RESIDUAL
										END OF BOREHOLE AT 0.35m				HAND AUGER REFUSAL
							0.5							
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **TP114**

1/1

SDUP105: 0-0.1m

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** TEST PIT **R.L. Surface:** N/A

Date: 14/6/23 **Datum:** -

Plant Type: EXCAVATOR **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■		■		0			FILL: Silty clay, low to medium plasticity, brown, trace of ironstone gravel, glass fragments and roots.	w≈PL			GRASS COVER SCREEN: 11.01kg 0-0.1m, NO FCF
							0.5		CI-CH	Silty CLAY: medium to high plasticity, grey mottled orange and brown.	w≈PL			RESIDUAL
	■		■											
							1			END OF TEST PIT AT 0.8m				
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No.
BH115
1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 16/6/23 **Datum:** -

Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty clay, medium plasticity, dark brown, trace of leaves, roots and root fibres.	w≈PL			SCREEN: 11.07kg 0-0.1m, NO FCF
									CH	Silty CLAY: high plasticity, light brown mottled red and orange, trace of ironstone gravel.	w>PL			RESIDUAL
							0.5			END OF BOREHOLE AT 0.4m				HAND AUGER REFUSAL
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH116

1/1

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P | **Method:** HAND AUGER | **R.L. Surface:** N/A

Date: 16/6/23 | **Datum:** -

Plant Type: - | **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES: ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty clay, medium plasticity, dark brown, trace of roots and root fibres.	w>PL			SCREEN: 10.07kg 0-0.1m, NO FCF
									CI-CH	Silty CLAY: medium to high plasticity, light grey mottled orange.	w>PL			RESIDUAL
							0.5							
										END OF BOREHOLE AT 0.7m				
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH/MW117**

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 15/6/23 **Datum:** -

Plant Type: JK305 **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES (ES, ASS, ASB, SAL, DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Silty clay, medium plasticity, brown, trace of ironstone gravel, ironstone cobbles, plastic fragments, root fibres and ash.	w≈PL			GRASS COVER SCREEN: 10.31kg 0-0.1m, NO FCF SCREEN: 1.95kg 0.1-0.7m, NO FCF
		N = 1 2,0,1	0.5							
			1		CI-CH	Silty CLAY: medium to high plasticity, light grey mottled orange and red.	w≈PL			RESIDUAL
		N = 13 6,6,7	1.5							
			2							
			2.5							
		N = 16 9,9,7	3		-	Extremely Weathered siltstone: silty CLAY, medium plasticity, light grey mottled red.	XW			HAWKESBURY SANDSTONE
			3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH/MW117**

2/2

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 15/6/23 **Datum:** -

Plant Type: JK305 **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES (ES, ASS, ASB, SAL, DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						Extremely Weathered siltstone: silty CLAY, medium plasticity, light grey mottled red.	XW			HAWKESBURY SANDSTONE
			4 4.5 5 5.5			SANDSTONE: fine to medium grained, light grey and red.	DW			LOW TO MODERATE 'TC' BIT RESISTANCE
			6 6.5 7			END OF BOREHOLE AT 5.7m				GROUNDWATER MONITORING WELL INSTALLED TO 5.7m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 2.7m TO 5.7m. CASING 0.1m TO 2.7m. 2mm SAND FILTER PACK 2.4m TO 5.7m. BENTONITE SEAL 1.8m TO 2.4m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH118**

1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 16/6/23 **Datum:** -

Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty clay, medium plasticity, dark brown, with bricks, trace of sandstone gravel, plastic fragments, roots and root fibres.	w≈PL			LEAF COVER SCREEN: 10.10kg 0-0.1m, NO FCF
							0.5		CI-CH	Silty CLAY: medium to high plasticity, light brown mottled orange and grey.	w>PL			RESIDUAL
										END OF BOREHOLE AT 0.65m				
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No.
TP119
1/1

Environmental logs are not to be used for geotechnical purposes

SDUP108: 0-0.1m

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** TEST PIT **R.L. Surface:** N/A

Date: 14/6/23 **Datum:** -

Plant Type: EXCAVATOR **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■		■		0			FILL: Silty clay, low plasticity, brown, trace of ironstone gravel and root fibres.	w≈PL			GRASS COVER SCREEN: 10.44kg 0-0.1m, NO FCF
	■		■		■		0.5			FILL: Silty clay, low plasticity, light brown, trace of ironstone and sandstone gravel and roots.	w≈PL			SCREEN: 10.0kg 0.5-0.6m, NO FCF
							1			END OF TEST PIT AT 1.0m				EXCAVATOR REFUSAL ON INFERRED BEDROCK
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. TP120

1/1

SDUP107: 0-0.1m

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P | **Method:** TEST PIT | **R.L. Surface:** N/A

Date: 14/6/23 | **Datum:** -

Plant Type: EXCAVATOR | **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty clay, low plasticity, brown, trace of ironstone and sandstone cobbles, roots and root fibres.	w≈PL			GRASS COVER SCREEN: 10.21kg 0-0.1m, NO FCF
							0.5			as above, but trace of brick fragments.	w≈PL			SCREEN: 10.44kg 0.6-0.7m, NO FCF
							1		CI	Silty CLAY: medium plasticity, light grey mottled red and orange.	w≈PL			RESIDUAL
							1.5			END OF TEST PIT AT 1.3m				
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. TP121

1/1

SDUP109: 0-0.1m

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** TEST PIT **R.L. Surface:** N/A

Date: 14/6/23 **Datum:** -

Plant Type: EXCAVATOR **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty clay, low plasticity, brown, trace of ironstone gravel, roots and root fibres.	w≈PL			LEAF COVER SCREEN: 10.33kg 0-0.1m, NO FCF
							0.5		CL-CI	Silty CLAY: low to medium plasticity, light brown mottled red, with ironstone cobbles.	w≈PL			RESIDUAL
							1 1.5 2 2.5 3 3.5			END OF TEST PIT AT 0.8m				EXCAVATOR REFUSAL ON INFERRED BEDROCK

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **TP122**

1/1

SDUP111: 0-0.1m

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** TEST PIT **R.L. Surface:** N/A

Date: 14/6/23 **Datum:** -

Plant Type: EXCAVATOR **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty clay, low to medium plasticity, brown, trace of clay nodules, and root fibres.	w≈PL			GRASS COVER SCREEN: 10.68kg 0-0.1m, NO FCF
							0.5		CI	Silty CLAY: medium plasticity, red-brown mottled orange.	w≈PL			RESIDUAL
							1			END OF TEST PIT AT 0.8m				
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No.	TP123
	1/1

Environmental logs are not to be used for geotechnical purposes

SDUP110: 0-0.1m

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** TEST PIT **R.L. Surface:** N/A

Date: 14/6/23 **Datum:** -

Plant Type: EXCAVATOR **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES (ES, ASS, ASB, SAL, DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	ES, ASB, DB		0			FILL: Silty clay, low plasticity, brown, trace of ironstone cobbles and gravel, roots and root fibres.	w≈PL			LEAF COVER SCREEN: 10.91kg 0-0.1m, NO FCF
	ES, ASB, DB		0.5			as above, but light brown.	w≈PL			SCREEN: 10.50kg 0.4-0.5m, NO FCF
			1			END OF TEST PIT AT 0.8m				EXCAVATOR REFUSAL ON INFERRED BEDROCK
			1.5							
			2							
			2.5							
			3							
			3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH/MW124**

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 15/6/23 **Datum:** -

Plant Type: JK305 **Logged/Checked by:** O.B./T.H.

Groundwater Record	Samples (ES, ASS, ASB, SAL, DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Silty clay, medium to high plasticity, brown and grey, trace of igneous gravel, brick fragments and root fibres.	w≈PL			GRASS COVER SCREEN: 10.91kg 0-0.1m, NO FCF
					CI-CH	Silty CLAY: medium to high plasticity, light grey mottled orange.	w≈PL			RESIDUAL
		N = 11 3,5,6	0.5 – 1							
		N = 29 8,12,17	1.5			as above, but light grey mottled red.				
		N > 17 6,17/0mm REFUSAL	3		-	Extremely Weathered siltstone: silty CLAY, medium to high plasticity, light grey.	XW			HAWKESBURY SANDSTONE
			3.5							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH/MW124

2/2

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 15/6/23 **Datum:** -

Plant Type: JK305 **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES (ES, ASS, ASB, SAL, DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES (~4.0)					Extremely Weathered siltstone: silty CLAY, medium to high plasticity, light grey.	XW			HAWKESBURY SANDSTONE
	ES (~5.6)		4.5			SANDSTONE: fine to medium grained, light grey and red.	DW			
			5.7			END OF BOREHOLE AT 5.7m				GROUNDWATER MONITORING WELL INSTALLED TO 5.7m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 2.7m TO 5.7m. CASING 0.1m TO 2.7m. 2mm SAND FILTER PACK 2.6m TO 5.7m. BENTONITE SEAL 2.1m TO 2.6m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.

Depth scale: 4, 4.5, 5, 5.5, 6, 6.5, 7

JKEnvironments

ENVIRONMENTAL LOG

Log No.
BH125
1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 14/6/23 **Datum:** -

Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■		■		0			FILL: Silty clay, low plasticity, brown, trace of ironstone gravel and root fibres.	w≈PL			LEAF COVER SCREEN: 10.10kg 0-0.1m, NO FCF
									CL	Silty CLAY: low plasticity, light brown.	w≈PL			RESIDUAL
							0.3			END OF BOREHOLE AT 0.3m				HAND AUGER REFUSAL ON VERY STIFF CLAY
							0.5							
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **TP126**

1/1

SDUP103: 0-0.1m

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** TEST PIT **R.L. Surface:** N/A

Date: 14/6/23 **Datum:** -

Plant Type: EXCAVATOR **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES (ES, ASS, ASB, SAL, DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	ES, ASB, DB		0			FILL: Silty clay, low plasticity, brown, trace of ironstone gravel and root fibres.	w<PL			GRASS COVER SCREEN: 12.10kg 0-0.1m, NO FCF
	ES, ASB, DB		0.5			as above, but trace of asphalt.	w<PL			SCREEN: 13.10kg 0.6-0.7m, NO FCF
	ES, ASB		1		CI-CH	Silty CLAY: medium to high plasticity, grey mottled orange.	w≈PL			RESIDUAL
			1.5			END OF BOREHOLE AT 1.4m				
			2							
			2.5							
			3							
			3.5							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. TP127

1/1

SDUP106: 0-0.1m

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** TEST PIT **R.L. Surface:** N/A

Date: 14/6/23 **Datum:** -

Plant Type: EXCAVATOR **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES (ES / ASS / ASB / SAL / DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	ES, ASB, DB (0-0.1m)		0			FILL: Silty clay, low to medium plasticity, brown, trace of ironstone gravel, glass and bark fragments and root fibres.	w<PL			GRASS COVER SCREEN: 10.45kg 0-0.1m, NO FCF
	ES, ASB, DB (0.9-1.0m)		0.5			FILL: Silty sandy clay, medium plasticity, brown, fine to medium grained sand, trace of sandstone and ironstone gravel and root fibres.	w≈PL			SCREEN: 10.60kg 0.9-1.0m, NO FCF
	ES, ASB (1.4-1.5m)		1		CI-CH	Silty CLAY: medium to high plasticity, grey mottled dark grey and orange.	w≈PL			RESIDUAL
			1.5			END OF TEST PIT AT 1.5m				
			2							
			2.5							
			3							
			3.5							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. SM101

1/1

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 15/6/23 **Datum:** -

Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES (ES, ASS, ASB, SAL, DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0 – 0.6			FILL: Silty clay, low plasticity, light brown, trace of igneous and sandstone gravel, ash and root fibres.				SCREEN: 11.46kg 0-0.2m, NO FCF
						END OF BOREHOLE AT 0.6m				

JKEnvironments

ENVIRONMENTAL LOG

Log No. SM102

1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 15/6/23 **Datum:** -

Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES: ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty clay, medium to high plasticity, light grey mottled brown, trace of ash.	w≈PL			SCREEN: 11.08kg 0-0.2m, NO FCF
														SCREEN: 1.05kg 0.2-0.5m, NO FCF
							0.5			END OF BOREHOLE AT 0.5m				
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							

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ENVIRONMENTAL LOG

Log No. SM103 1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN
Project: PUBLIC PARK UPGRADE
Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P | **Method:** HAND AUGER | **R.L. Surface:** N/A
Date: 15/6/23 | **Datum:** -
Plant Type: - | **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0			FILL: Silty clay, low plasticity, brown, trace of ironstone, sandstone and igneous gravel, glass, tile, rubber, slag, ash and root fibres.	w≈PL			SCREEN: 12.44kg 0-0.1m, NO FCF
										END OF BOREHOLE AT 0.3m				HAND AUGER REFUSAL ON STIFF CLAY
							0.5							
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							

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ENVIRONMENTAL LOG

Log No.
SM104
1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 15/6/23 **Datum:** -

Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty clay, low plasticity, trace of ironstone gravel, siltstone boulders, metal fragments, slag, ash and root fibres.	w≈PL			SCREEN: 10.52kg 0-0.1m, NO FCF
							0.5			END OF BOREHOLE AT 0.45m				
							1							
							1.5							
							2							
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Log No.
SM105
1/1

Environmental logs are not to be used for geotechnical purposes

Client: COMPLETE URBAN

Project: PUBLIC PARK UPGRADE

Location: BRICK PART RESERVE, FRENCHS FOREST, NSW

Job No.: E35432P **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 15/6/23 **Datum:** -

Plant Type: - **Logged/Checked by:** O.B./T.H.

Groundwater Record	SAMPLES (ES / ASS / ASB / SAL / DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Silty clay, low plasticity, brown, trace of glass and root fibres.	w≈PL			SCREEN: 10.91kg 0-0.1m, NO FCF
			0.5							
						END OF BOREHOLE AT 0.6m				
			1							
			1.5							
			2							
			2.5							
			3							
			3.5							

ENVIRONMENTAL LOGS EXPLANATION NOTES

INTRODUCTION

These notes have been provided to amplify the environmental report in regard to classification methods, field procedures and certain matters relating to the logging of soil and rock. Not all notes are necessarily relevant to all reports.

Where geotechnical borehole logs are utilised for environmental purpose, reference should also be made to the explanatory notes included in the geotechnical report. Environmental logs are not suitable for geotechnical purposes.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Environmental studies include gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726:2017 *'Geotechnical Site Investigations'*. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geoenvironmental practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached soil classification table qualified by the grading of other particles present (eg. sandy clay) as set out below:

Soil Classification	Particle Size
Clay	< 0.002mm
Silt	0.002 to 0.075mm
Sand	0.075 to 2.36mm
Gravel	2.36 to 63mm
Cobbles	63 to 200mm
Boulders	> 200mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose (VL)	< 4
Loose (L)	4 to 10
Medium dense (MD)	10 to 30
Dense (D)	30 to 50
Very Dense (VD)	> 50

Cohesive soils are classified on the basis of strength (consistency) either by use of a hand penetrometer, vane shear, laboratory testing and/or tactile engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength (kPa)	Indicative Undrained Shear Strength (kPa)
Very Soft (VS)	≤ 25	≤ 12
Soft (S)	> 25 and ≤ 50	> 12 and ≤ 25
Firm (F)	> 50 and ≤ 100	> 25 and ≤ 50
Stiff (St)	> 100 and ≤ 200	> 50 and ≤ 100
Very Stiff (VSt)	> 200 and ≤ 400	> 100 and ≤ 200
Hard (Hd)	> 400	> 200
Friable (Fr)	Strength not attainable – soil crumbles	

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'shale' is used to describe fissile mudstone, with a weakness parallel to bedding. Rocks with alternating inter-laminations of different grain size (eg. siltstone/claystone and siltstone/fine grained sandstone) are referred to as 'laminite'.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All methods except test pits, hand auger drilling and portable Dynamic Cone Penetrometers require the use of a mechanical rig which is commonly mounted on a truck chassis or track base.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils and 'weaker' bedrock if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for a large excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Refusal of the hand auger can occur on a variety of materials such as obstructions within any fill, tree roots, hard clay, gravel or ironstone, cobbles and boulders, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of limited reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

Rock Augering: Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock cuttings. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be assessed from the cuttings, together with some information from "feel" and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term 'mud' encompasses a range of products ranging from bentonite to polymers. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg. from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, NMLC or HQ triple tube core barrels, which give a core of about 50mm and 61mm diameter, respectively, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as NO CORE. The location of NO CORE recovery is determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the bottom of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289.6.3.1–2004 (R2016) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – Standard Penetration Test (SPT)'*.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63.5kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm 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 150mm of, say, 4, 6 and 7 blows, as

  N = 13
  4, 6, 7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as

  N > 30
  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

A modification to the SPT is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as 'N_c' on the borehole logs, together with the number of blows per 150mm penetration.

LOGS

The borehole or test pit logs presented herein are an interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment, but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The terms and symbols used in preparation of the logs are defined in the following pages.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than 'straight line' variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it 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 and may not be the same at the time of construction.
- 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 be washed out of the hole or 'reverted' chemically if reliable water observations are to be made.

More reliable measurements can be made by installing standpipes which are read after the groundwater level has stabilised at intervals ranging from several days to 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 perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg. bricks, steel, etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably assess the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse environmental characteristics or behaviour. If the volume and nature of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing has not been undertaken to confirm the soil classification and rock strengths indicated on the environmental logs unless noted in the report.

SYMBOL LEGENDS

SOIL

- FILL
- TOPSOIL
- CLAY (CL, CI, CH)
- SILT (ML, MH)
- SAND (SP, SW)
- GRAVEL (GP, GW)
- SANDY CLAY (CL, CI, CH)
- SILTY CLAY (CL, CI, CH)
- CLAYEY SAND (SC)
- SILTY SAND (SM)
- GRAVELLY CLAY (CL, CI, CH)
- CLAYEY GRAVEL (GC)
- SANDY SILT (ML, MH)
- PEAT AND HIGHLY ORGANIC SOILS (Pt)

ROCK

- CONGLOMERATE
- SANDSTONE
- SHALE/MUDSTONE
- SILTSTONE
- CLAYSTONE
- COAL
- LAMINITE
- LIMESTONE
- PHYLLITE, SCHIST
- TUFF
- GRANITE, GABBRO
- DOLERITE, DIORITE
- BASALT, ANDESITE
- QUARTZITE

OTHER MATERIALS

- BRICKS OR PAVERS
- CONCRETE
- ASPHALTIC CONCRETE

CLASSIFICATION OF COARSE AND FINE GRAINED SOILS

Major Divisions		Group Symbol	Typical Names	Field Classification of Sand and Gravel	Laboratory Classification	
Coarse grained soil (more than 65% of soil excluding oversize fraction is greater than 0.075mm)	GRAVEL (more than half of coarse fraction is larger than 2.36mm	GW	Gravel and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 4$ $1 < C_c < 3$
		GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		GM	Gravel-silt mixtures and gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	Fines behave as silt
		GC	Gravel-clay mixtures and gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	Fines behave as clay
	SAND (more than half of coarse fraction is smaller than 2.36mm)	SW	Sand and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 6$ $1 < C_c < 3$
		SP	Sand and gravel-sand mixtures, little or no fines	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		SM	Sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	N/A
		SC	Sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	

Major Divisions		Group Symbol	Typical Names	Field Classification of Silt and Clay			Laboratory Classification
				Dry Strength	Dilatancy	Toughness	% < 0.075mm
ine grained soils (more than 35% of soil excluding oversize fraction is less than 0.075mm)	SILT and CLAY (low to medium plasticity)	ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity	None to low	Slow to rapid	Low	Below A line
		CL, CI	Inorganic clay of low to medium plasticity, gravelly clay, sandy clay	Medium to high	None to slow	Medium	Above A line
		OL	Organic silt	Low to medium	Slow	Low	Below A line
	SILT and CLAY (high plasticity)	MH	Inorganic silt	Low to medium	None to slow	Low to medium	Below A line
		CH	Inorganic clay of high plasticity	High to very high	None	High	Above A line
		OH	Organic clay of medium to high plasticity, organic silt	Medium to high	None to very slow	Low to medium	Below A line
	Highly organic soil	Pt	Peat, highly organic soil	–	–	–	–

Laboratory Classification Criteria

A well graded coarse grained soil is one for which the coefficient of uniformity $Cu > 4$ and the coefficient of curvature $1 < C_c < 3$. Otherwise, the soil is poorly graded. These coefficients are given by:

$$C_U = \frac{D_{60}}{D_{10}} \quad \text{and} \quad C_C = \frac{(D_{30})^2}{D_{10}\,D_{60}}$$

Where D_{10}, D_{30} and D_{60} are those grain sizes for which 10%, 30% and 60% of the soil grains, respectively, are smaller.

NOTES:

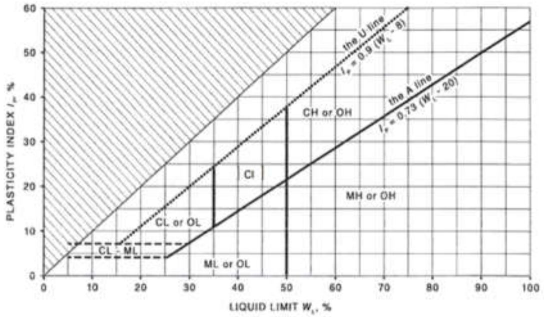
1 For a coarse grained soil with a fines content between 5% and 12%, the soil is given a dual classification comprising the two group symbols separated by a dash; for example, for a poorly graded gravel with between 5% and 12% silt fines, the classification is GP-GM.

2 Where the grading is determined from laboratory tests, it is defined by coefficients of curvature (C_c) and uniformity (C_u) derived from the particle size distribution curve.

3 Clay soils with liquid limits > 35% and ≤ 50% may be classified as being of medium plasticity.

4 The U line on the Modified Casagrande Chart is an approximate upper bound for most natural soils.

Modified Casagrande Chart for Classifying Silts and Clays according to their Behaviour



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LOG SYMBOLS

Log Column	Symbol	Definition
Groundwater Record		Standing water level. Time delay following completion of drilling/excavation may be shown. Extent of borehole/test pit collapse shortly after drilling/excavation. Groundwater seepage into borehole or test pit noted during drilling or excavation.
Samples	ES U50 DB DS ASB ASS SAL PFAS	Sample taken over depth indicated, for environmental analysis. Undisturbed 50mm diameter tube sample taken over depth indicated. Bulk disturbed sample taken over depth indicated. Small disturbed bag sample taken over depth indicated. Soil sample taken over depth indicated, for asbestos analysis. Soil sample taken over depth indicated, for acid sulfate soil analysis. Soil sample taken over depth indicated, for salinity analysis. Soil sample taken over depth indicated, for analysis of Per- and Polyfluoroalkyl Substances.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'Refusal' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	N_c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60° solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25 PID = 100	Vane shear reading in kPa of undrained shear strength. Photoionisation detector reading in ppm (soil sample headspace test).
Moisture Condition (Fine Grained Soils) (Coarse Grained Soils)	w > PL w ≈ PL w < PL w ≈ LL w > LL D M W	Moisture content estimated to be greater than plastic limit. Moisture content estimated to be approximately equal to plastic limit. Moisture content estimated to be less than plastic limit. Moisture content estimated to be near liquid limit. Moisture content estimated to be wet of liquid limit. DRY – runs freely through fingers. MOIST – does not run freely but no free water visible on soil surface. WET – free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS S F St VSt Hd Fr ( )	VERY SOFT – unconfined compressive strength ≤ 25kPa. SOFT – unconfined compressive strength > 25kPa and ≤ 50kPa. FIRM – unconfined compressive strength > 50kPa and ≤ 100kPa. STIFF – unconfined compressive strength > 100kPa and ≤ 200kPa. VERY STIFF – unconfined compressive strength > 200kPa and ≤ 400kPa. HARD – unconfined compressive strength > 400kPa. FRIABLE – strength not attainable, soil crumbles. Bracketed symbol indicates estimated consistency based on tactile examination or other assessment.
Density Index/ Relative Density (Cohesionless Soils)	 VL L MD D VD ( )	**Density Index (I_D) Range (%)** / **SPT 'N' Value Range (Blows/300mm)** VERY LOOSE ≤ 15 / 0 – 4 LOOSE > 15 and ≤ 35 / 4 – 10 MEDIUM DENSE > 35 and ≤ 65 / 10 – 30 DENSE > 65 and ≤ 85 / 30 – 50 VERY DENSE > 85 / > 50 Bracketed symbol indicates estimated density based on ease of drilling or other assessment.

Log Column	Symbol	Definition
Hand Penetrometer Readings	300 250	Measures reading in kPa of unconfined compressive strength. Numbers indicate individual test results on representative undisturbed material unless noted otherwise.
Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Twin pronged tungsten carbide bit.
	T_{60}	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.
	Soil Origin	The geological origin of the soil can generally be described as: RESIDUAL – soil formed directly from insitu weathering of the underlying rock. No visible structure or fabric of the parent rock. EXTREMELY WEATHERED – soil formed directly from insitu weathering of the underlying rock. Material is of soil strength but retains the structure and/or fabric of the parent rock. ALLUVIAL – soil deposited by creeks and rivers. ESTUARINE – soil deposited in coastal estuaries, including sediments caused by inflowing creeks and rivers, and tidal currents. MARINE – soil deposited in a marine environment. AEOLIAN – soil carried and deposited by wind. COLLUVIAL – soil and rock debris transported downslope by gravity, with or without the assistance of flowing water. Colluvium is usually a thick deposit formed from a landslide. The description 'slopewash' is used for thinner surficial deposits. LITTORAL – beach deposited soil.

Classification of Material Weathering

Term		Abbreviation		Definition
Residual Soil		RS		Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
Extremely Weathered		XW		Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
Highly Weathered	Distinctly Weathered (Note 1)	HW	DW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately Weathered		MW		The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.
Slightly Weathered		SW		Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh		FR		Rock shows no sign of decomposition of individual minerals or colour changes.

NOTE 1: The term 'Distinctly Weathered' is used where it is not practicable to distinguish between 'Highly Weathered' and 'Moderately Weathered' rock. 'Distinctly Weathered' is defined as follows: *'Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores'*. There is some change in rock strength.

Rock Material Strength Classification

			Guide to Strength	
Term	Abbreviation	Uniaxial Compressive Strength (MPa)	Point Load Strength Index $Is_{(50)}$ (MPa)	Field Assessment
Very Low Strength	VL	0.6 to 2	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30mm thick can be broken by finger pressure.
Low Strength	L	2 to 6	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium Strength	M	6 to 20	0.3 to 1	Scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High Strength	H	20 to 60	1 to 3	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High Strength	VH	60 to 200	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High Strength	EH	> 200	> 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Appendix E: Laboratory Report(s) & COC Documents

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CERTIFICATE OF ANALYSIS 326037

Client Details

Client	JK Environments
Attention	Todd Hore
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E35432P, Frenchs Forest**
Number of Samples	104 Soil, 2 Water
Date samples received	21/06/2023
Date completed instructions received	21/06/2023

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	27/06/2023
Date of Issue	27/06/2023

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vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-1	326037-2	326037-3	326037-8	326037-9
Your Reference	UNITS	BH101	BH101	BH101	TP102	TP102
Depth		0-0.1	0.3-0.5	0.8-1	0-0.1	0.6-0.7
Date Sampled		15/06/2023	15/06/2023	15/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
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	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	79	102	83	92	96

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-11	326037-12	326037-15	326037-16	326037-17
Your Reference	UNITS	BH103	BH103	BH104	BH104	BH105
Depth		0-0.1	0.6-0.8	0-0.1	0.1-0.3	0-0.1
Date Sampled		15/06/2023	15/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
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	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	85	95	83	83	87

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-18	326037-19	326037-21	326037-22	326037-23
Your Reference	UNITS	BH105	TP106	BH107	BH108	BH108
Depth		0.3-0.4	0-0.1	0-0.1	0-0.1	0.4-0.5
Date Sampled		16/06/2023	14/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
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	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	99	101	100	92	108

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-24	326037-26	326037-27	326037-29	326037-30
Your Reference	UNITS	BH109	TP110	TP110	BH111	BH111
Depth		0-0.1	0-0.1	0.2-0.3	0-0.1	0.3-0.5
Date Sampled		16/06/2023	14/06/2023	14/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
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	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	114	94	106	85	73

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-31	326037-32	326037-33	326037-34	326037-35
Your Reference	UNITS	BH112	BH112	BH113	BH113	TP114
Depth		0-0.1	0.5-0.7	0-0.1	0.15-0.35	0-0.1
Date Sampled		16/06/2023	16/06/2023	16/06/2023	16/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
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	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	76	76	66	97	82

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-36	326037-37	326037-38	326037-39	326037-40
Your Reference	UNITS	TP114	BH115	BH115	BH116	BH116
Depth		0.7-0.8	0-0.1	0.1-0.4	0-0.1	0.4-0.7
Date Sampled		14/06/2023	16/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
TRH C_6 - C_9	mg/kg	<25	<100	<25	<120	<25
TRH C_6 - C_{10}	mg/kg	<25	<100	<25	<120	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<100	<25	<120	<25
Benzene	mg/kg	<0.2	<0.8	<0.2	<1	<0.2
Toluene	mg/kg	<0.5	<2	<0.5	<2	<0.5
Ethylbenzene	mg/kg	<1	<4	<1	<5	<1
m+p-xylene	mg/kg	<2	<8	<2	<10	<2
o-Xylene	mg/kg	<1	<4	<1	<5	<1
Naphthalene	mg/kg	<1	<4	<1	<5	<1
Total +ve Xylenes	mg/kg	<1	<4	<1	<5	<1
Surrogate aaa-Trifluorotoluene	%	71	68	104	86	94

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-41	326037-42	326037-43	326037-49	326037-50
Your Reference	UNITS	BH117	BH117	BH117	BH118	BH118
Depth		0-0.1	0.3-0.5	0.7-1	0-0.1	0.15-0.5
Date Sampled		15/06/2023	15/06/2023	15/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
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	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	107	83	79	96	103

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-51	326037-52	326037-53	326037-54	326037-56
Your Reference	UNITS	TP119	TP119	TP120	TP120	TP121
Depth		0-0.1	0.5-0.6	0-0.1	0.6-0.7	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	106	105	91	102	102

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-57	326037-58	326037-59	326037-60	326037-61
Your Reference	UNITS	TP121	TP122	TP122	TP123	TP123
Depth		0.6-0.7	0-0.1	0.7-0.8	0-0.1	0.4-0.5
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	97	101	97	100	99

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-62	326037-63	326037-69	326037-70	326037-71
Your Reference	UNITS	BH124	BH124	BH125	BH125	TP126
Depth		0-0.1	0.7-1	0-0.1	0.1-0.2	0-0.1
Date Sampled		15/06/2023	15/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	78	96	83	91	100

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-72	326037-74	326037-75	326037-77	326037-78
Your Reference	UNITS	TP126	TP127	TP127	SM101	SM102
Depth		0.6-0.7	0-0.1	0.9-1	0.5-0.6	0.4-0.5
Date Sampled		14/06/2023	14/06/2023	14/06/2023	15/06/2023	15/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	101	97	100	97	96

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-79	326037-80	326037-81	326037-82	326037-83
Your Reference	UNITS	SM103	SM104	SM105	SS1	SS2
Depth		0.2-0.3	0.35-0.45	0.5-0.6	0.1-0.2	0.1-0.2
Date Sampled		15/06/2023	15/06/2023	15/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<50	<50
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<50	<50
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<50	<50
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.4	<0.4
Toluene	mg/kg	<0.5	<0.5	<0.5	<1	<1
Ethylbenzene	mg/kg	<1	<1	<1	<2	<2
m+p-xylene	mg/kg	<2	<2	<2	<4	<4
o-Xylene	mg/kg	<1	<1	<1	<2	<2
Naphthalene	mg/kg	<1	<1	<1	<2	<2
Total +ve Xylenes	mg/kg	<1	<1	<1	<2	<2
Surrogate aaa-Trifluorotoluene	%	99	97	98	91	77

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-84	326037-85	326037-86	326037-87	326037-88
Your Reference	UNITS	SS3	SS4	SDUP1	SDUP2	SDUP3
Depth		0.1-0.2	0.1-0.2	0-0.1	0-0.1	0-0.1
Date Sampled		15/06/2023	16/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	84	86	98	97	94

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-89	326037-90	326037-91	326037-92	326037-93
Your Reference	UNITS	SDUP4	SDUP5	SDUP6	SDUP7	SDUP8
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	90	94	97	95	93

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-94	326037-95	326037-96	326037-97	326037-98
Your Reference	UNITS	SDUP9	SDUP10	SDUP11	TB1	TB2
Depth		0-0.1	0-0.1	0-0.1	-	-
Date Sampled		14/06/2023	14/06/2023	14/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	96	95	89	98	99

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		326037-99	326037-100	326037-101	326037-102	326037-103
Your Reference	UNITS	TB3	TB4	TS1	TS2	TS3
Depth		-	-	-	-	-
Date Sampled		16/06/2023	16/06/2023	16/06/2023	16/06/2026	16/06/2029
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
TRH C_6 - C_9	mg/kg	<25	<25	[NA]	[NA]	[NA]
TRH C_6 - C_{10}	mg/kg	<25	<25	[NA]	[NA]	[NA]
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	[NA]	[NA]	[NA]
Benzene	mg/kg	<0.2	<0.2	100%	92%	101%
Toluene	mg/kg	<0.5	<0.5	100%	91%	107%
Ethylbenzene	mg/kg	<1	<1	99%	93%	109%
m+p-xylene	mg/kg	<2	<2	99%	93%	109%
o-Xylene	mg/kg	<1	<1	99%	93%	109%
Naphthalene	mg/kg	<1	<1	[NT]	[NT]	[NT]
Total +ve Xylenes	mg/kg	<1	<1	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%	99	100	100	100	106

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		326037-104
Your Reference	UNITS	TS4
Depth		-
Date Sampled		16/06/2032
Type of sample		Soil
Date extracted	-	22/06/2023
Date analysed	-	26/06/2023
Benzene	mg/kg	103%
Toluene	mg/kg	110%
Ethylbenzene	mg/kg	120%
m+p-xylene	mg/kg	114%
o-Xylene	mg/kg	117%
Naphthalene	mg/kg	[NT]
Total +ve Xylenes	mg/kg	[NT]
Surrogate aaa-Trifluorotoluene	%	82

svTRH (C10-C40) in Soil						
Our Reference		326037-1	326037-2	326037-3	326037-8	326037-9
Your Reference	UNITS	BH101	BH101	BH101	TP102	TP102
Depth		0-0.1	0.3-0.5	0.8-1	0-0.1	0.6-0.7
Date Sampled		15/06/2023	15/06/2023	15/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	100	120	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	100	120	<50	<50	<50
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	130	120	<100	110	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	130	120	<50	110	<50
Surrogate o-Terphenyl	%	83	83	82	80	70

svTRH (C10-C40) in Soil						
Our Reference		326037-11	326037-12	326037-15	326037-16	326037-17
Your Reference	UNITS	BH103	BH103	BH104	BH104	BH105
Depth		0-0.1	0.6-0.8	0-0.1	0.1-0.3	0-0.1
Date Sampled		15/06/2023	15/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	180	<100	110
TRH C_{29} - C_{36}	mg/kg	<100	<100	240	<100	260
Total +ve TRH (C10-C36)	mg/kg	<50	<50	420	<50	370
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	370	<100	280
TRH >C_{34} -C_{40}	mg/kg	<100	<100	110	<100	200
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	480	<50	480
Surrogate o-Terphenyl	%	85	85	94	85	88

svTRH (C10-C40) in Soil						
Our Reference		326037-18	326037-19	326037-21	326037-22	326037-23
Your Reference	UNITS	BH105	TP106	BH107	BH108	BH108
Depth		0.3-0.4	0-0.1	0-0.1	0-0.1	0.4-0.5
Date Sampled		16/06/2023	14/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	58	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	380	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	100	500	150	<100
Total +ve TRH (C10-C36)	mg/kg	<50	100	940	150	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	88	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	88	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	140	730	180	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	280	120	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	140	1,100	300	<50
Surrogate o-Terphenyl	%	83	86	98	87	85

svTRH (C10-C40) in Soil						
Our Reference		326037-24	326037-26	326037-27	326037-29	326037-30
Your Reference	UNITS	BH109	TP110	TP110	BH111	BH111
Depth		0-0.1	0-0.1	0.2-0.3	0-0.1	0.3-0.5
Date Sampled		16/06/2023	14/06/2023	14/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	24/06/2023	24/06/2023	24/06/2023	24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	65	<50
TRH C_{15} - C_{28}	mg/kg	170	<100	<100	880	<100
TRH C_{29} - C_{36}	mg/kg	370	<100	<100	1,200	<100
Total +ve TRH (C10-C36)	mg/kg	540	<50	<50	2,100	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	120	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	120	<50
TRH >C_{16} -C_{34}	mg/kg	450	130	<100	1,700	<100
TRH >C_{34} -C_{40}	mg/kg	190	<100	<100	720	<100
Total +ve TRH (>C10-C40)	mg/kg	640	130	<50	2,500	<50
Surrogate o-Terphenyl	%	91	90	86	108	88

svTRH (C10-C40) in Soil						
Our Reference		326037-31	326037-32	326037-33	326037-34	326037-35
Your Reference	UNITS	BH112	BH112	BH113	BH113	TP114
Depth		0-0.1	0.5-0.7	0-0.1	0.15-0.35	0-0.1
Date Sampled		16/06/2023	16/06/2023	16/06/2023	16/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	24/06/2023	24/06/2023	24/06/2023	24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	120	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	260	<100	190	<100	300
Total +ve TRH (C10-C36)	mg/kg	380	<50	190	<50	300
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	300	<100	220	<100	300
TRH >C_{34} -C_{40}	mg/kg	150	<100	120	<100	290
Total +ve TRH (>C10-C40)	mg/kg	450	<50	340	<50	590
Surrogate o-Terphenyl	%	91	86	95	85	88

svTRH (C10-C40) in Soil						
Our Reference		326037-36	326037-37	326037-38	326037-39	326037-40
Your Reference	UNITS	TP114	BH115	BH115	BH116	BH116
Depth		0.7-0.8	0-0.1	0.1-0.4	0-0.1	0.4-0.7
Date Sampled		14/06/2023	16/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	24/06/2023	24/06/2023	24/06/2023	24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<200	<50	<250	<50
TRH C_{15} - C_{28}	mg/kg	<100	<400	<100	<500	<100
TRH C_{29} - C_{36}	mg/kg	<100	470	<100	<500	<100
Total +ve TRH (C10-C36)	mg/kg	<50	470	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<200	<50	<250	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<200	<50	<250	<50
TRH >C_{16} -C_{34}	mg/kg	<100	680	<100	<500	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<400	<100	<500	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	680	<50	<50	<50
Surrogate o-Terphenyl	%	86	103	84	99	88

svTRH (C10-C40) in Soil						
Our Reference		326037-41	326037-42	326037-43	326037-49	326037-50
Your Reference	UNITS	BH117	BH117	BH117	BH118	BH118
Depth		0-0.1	0.3-0.5	0.7-1	0-0.1	0.15-0.5
Date Sampled		15/06/2023	15/06/2023	15/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	24/06/2023	24/06/2023	24/06/2023	24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	160	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	200	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	360	<50
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	300	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	120	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	420	<50
Surrogate o-Terphenyl	%	85	83	83	95	86

svTRH (C10-C40) in Soil						
Our Reference		326037-51	326037-52	326037-53	326037-54	326037-56
Your Reference	UNITS	TP119	TP119	TP120	TP120	TP121
Depth		0-0.1	0.5-0.6	0-0.1	0.6-0.7	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	24/06/2023	24/06/2023	24/06/2023	24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	170	<100	130	<100	<100
TRH C_{29} - C_{36}	mg/kg	360	<100	220	<100	250
Total +ve TRH (C10-C36)	mg/kg	520	<50	350	<50	250
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	420	<100	290	<100	270
TRH >C_{34} -C_{40}	mg/kg	210	<100	140	<100	150
Total +ve TRH (>C10-C40)	mg/kg	630	<50	430	<50	410
Surrogate o-Terphenyl	%	93	87	91	89	89

svTRH (C10-C40) in Soil						
Our Reference		326037-57	326037-58	326037-59	326037-60	326037-61
Your Reference	UNITS	TP121	TP122	TP122	TP123	TP123
Depth		0.6-0.7	0-0.1	0.7-0.8	0-0.1	0.4-0.5
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	24/06/2023	24/06/2023	24/06/2023	24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	160	<100	200	170
Total +ve TRH (C10-C36)	mg/kg	<50	160	<50	200	170
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	220	<100	230	160
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	120	100
Total +ve TRH (>C10-C40)	mg/kg	<50	220	<50	340	260
Surrogate o-Terphenyl	%	88	93	87	87	86

svTRH (C10-C40) in Soil						
Our Reference		326037-62	326037-63	326037-69	326037-70	326037-71
Your Reference	UNITS	BH124	BH124	BH125	BH125	TP126
Depth		0-0.1	0.7-1	0-0.1	0.1-0.2	0-0.1
Date Sampled		15/06/2023	15/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	24/06/2023	24/06/2023	24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	240	<100	290	<100	<100
TRH C_{29} - C_{36}	mg/kg	510	<100	310	290	110
Total +ve TRH (C10-C36)	mg/kg	740	<50	600	290	110
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	600	<100	500	280	130
TRH >C_{34} -C_{40}	mg/kg	500	<100	180	160	<100
Total +ve TRH (>C10-C40)	mg/kg	1,100	<50	680	430	130
Surrogate o-Terphenyl	%	100	84	94	87	85

svTRH (C10-C40) in Soil						
Our Reference		326037-72	326037-74	326037-75	326037-77	326037-78
Your Reference	UNITS	TP126	TP127	TP127	SM101	SM102
Depth		0.6-0.7	0-0.1	0.9-1	0.5-0.6	0.4-0.5
Date Sampled		14/06/2023	14/06/2023	14/06/2023	15/06/2023	15/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	24/06/2023	24/06/2023	24/06/2023	24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	110	130	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	110	130	<50	<50	<50
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	110	140	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	120	100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	240	250	<50	<50	<50
Surrogate o-Terphenyl	%	84	85	87	88	87

svTRH (C10-C40) in Soil						
Our Reference		326037-79	326037-80	326037-81	326037-82	326037-83
Your Reference	UNITS	SM103	SM104	SM105	SS1	SS2
Depth		0.2-0.3	0.35-0.45	0.5-0.6	0.1-0.2	0.1-0.2
Date Sampled		15/06/2023	15/06/2023	15/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	24/06/2023	24/06/2023	24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<100	<100
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<200	500
TRH C_{29} - C_{36}	mg/kg	140	<100	<100	<200	650
Total +ve TRH (C10-C36)	mg/kg	140	<50	<50	<100	1,100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<100	<100
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<100	<100
TRH >C_{16} -C_{34}	mg/kg	170	<100	<100	<200	1,000
TRH >C_{34} -C_{40}	mg/kg	130	<100	<100	<200	520
Total +ve TRH (>C10-C40)	mg/kg	300	<50	<50	<100	1,500
Surrogate o-Terphenyl	%	92	87	88	93	103

svTRH (C10-C40) in Soil						
Our Reference		326037-84	326037-85	326037-86	326037-87	326037-88
Your Reference	UNITS	SS3	SS4	SDUP1	SDUP2	SDUP3
Depth		0.1-0.2	0.1-0.2	0-0.1	0-0.1	0-0.1
Date Sampled		15/06/2023	16/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	24/06/2023	24/06/2023	24/06/2023	24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	85	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	120	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	160	120
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	370	120
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	74	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	74	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	120	210	140
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	150	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	120	430	140
Surrogate o-Terphenyl	%	90	93	88	90	90

svTRH (C10-C40) in Soil						
Our Reference		326037-89	326037-90	326037-91	326037-92	326037-93
Your Reference	UNITS	SDUP4	SDUP5	SDUP6	SDUP7	SDUP8
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	24/06/2023	24/06/2023	24/06/2023	24/06/2023	24/06/2023
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	170	130	270
Total +ve TRH (C10-C36)	mg/kg	<50	<50	170	130	390
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	200	190	310
TRH >C_{34} -C_{40}	mg/kg	<100	<100	120	<100	220
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	320	190	530
Surrogate o-Terphenyl	%	94	94	96	89	87

svTRH (C10-C40) in Soil						
Our Reference		326037-94	326037-95	326037-96	326037-97	326037-98
Your Reference	UNITS	SDUP9	SDUP10	SDUP11	TB1	TB2
Depth		0-0.1	0-0.1	0-0.1	-	-
Date Sampled		14/06/2023	14/06/2023	14/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	24/06/2023	24/06/2023	24/06/2023	24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	150	240	110	<100	<100
Total +ve TRH (C10-C36)	mg/kg	150	240	110	<50	<50
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	180	290	160	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	180	290	160	<50	<50
Surrogate o-Terphenyl	%	85	88	89	87	88

svTRH (C10-C40) in Soil			
Our Reference		326037-99	326037-100
Your Reference	UNITS	TB3	TB4
Depth		-	-
Date Sampled		16/06/2023	16/06/2023
Type of sample		Soil	Soil
Date extracted	-	22/06/2023	22/06/2023
Date analysed	-	24/06/2023	24/06/2023
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
Total +ve TRH (C10-C36)	mg/kg	<50	<50
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	%	86	85

PAHs in Soil						
Our Reference		326037-1	326037-2	326037-3	326037-8	326037-9
Your Reference	UNITS	BH101	BH101	BH101	TP102	TP102
Depth		0-0.1	0.3-0.5	0.8-1	0-0.1	0.6-0.7
Date Sampled		15/06/2023	15/06/2023	15/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	0.1	0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.07	0.09	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	0.3	0.3	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	91	122	118	87	120

PAHs in Soil						
Our Reference		326037-11	326037-12	326037-15	326037-16	326037-17
Your Reference	UNITS	BH103	BH103	BH104	BH104	BH105
Depth		0-0.1	0.6-0.8	0-0.1	0.1-0.3	0-0.1
Date Sampled		15/06/2023	15/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	0.07
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	0.07
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	89	121	103	88	90

PAHs in Soil						
Our Reference		326037-18	326037-19	326037-21	326037-22	326037-23
Your Reference	UNITS	BH105	TP106	BH107	BH108	BH108
Depth		0.3-0.4	0-0.1	0-0.1	0-0.1	0.4-0.5
Date Sampled		16/06/2023	14/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	0.1	0.3	<0.1
Pyrene	mg/kg	<0.1	<0.1	0.1	0.3	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	0.07	0.1	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	0.3	1.4	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	124	99	96	102	125

PAHs in Soil						
Our Reference		326037-24	326037-26	326037-27	326037-29	326037-30
Your Reference	UNITS	BH109	TP110	TP110	BH111	BH111
Depth		0-0.1	0-0.1	0.2-0.3	0-0.1	0.3-0.5
Date Sampled		16/06/2023	14/06/2023	14/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.2	0.2	<0.1	0.1	<0.1
Pyrene	mg/kg	0.2	0.2	<0.1	0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Chrysene	mg/kg	0.1	<0.1	<0.1	0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.1	0.1	<0.05	0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.1	0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	1.0	0.60	<0.05	0.5	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	95	102	116	109	117

PAHs in Soil						
Our Reference		326037-31	326037-32	326037-33	326037-34	326037-35
Your Reference	UNITS	BH112	BH112	BH113	BH113	TP114
Depth		0-0.1	0.5-0.7	0-0.1	0.15-0.35	0-0.1
Date Sampled		16/06/2023	16/06/2023	16/06/2023	16/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	0.1	0.2	<0.1
Pyrene	mg/kg	<0.1	<0.1	0.1	0.2	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.06	<0.05	<0.05	0.1	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	0.06	<0.05	0.2	0.69	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	99	115	104	117	95

PAHs in Soil						
Our Reference		326037-36	326037-37	326037-38	326037-39	326037-40
Your Reference	UNITS	TP114	BH115	BH115	BH116	BH116
Depth		0.7-0.8	0-0.1	0.1-0.4	0-0.1	0.4-0.7
Date Sampled		14/06/2023	16/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.5	<0.1	<0.5	<0.1
Acenaphthylene	mg/kg	<0.1	<0.5	<0.1	<0.5	<0.1
Acenaphthene	mg/kg	<0.1	<0.5	<0.1	<0.5	<0.1
Fluorene	mg/kg	<0.1	<0.5	<0.1	<0.5	<0.1
Phenanthrene	mg/kg	<0.1	<0.5	<0.1	<0.5	<0.1
Anthracene	mg/kg	<0.1	<0.5	<0.1	<0.5	<0.1
Fluoranthene	mg/kg	<0.1	<0.5	<0.1	<0.5	<0.1
Pyrene	mg/kg	<0.1	<0.5	<0.1	<0.5	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.5	<0.1	<0.5	<0.1
Chrysene	mg/kg	<0.1	<0.5	<0.1	<0.5	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<1	<0.2	<1	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.2	<0.05	<0.2	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.5	<0.1	<0.5	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.5	<0.1	<0.5	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.5	<0.1	<0.5	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.25	<0.05	<0.25	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<2.5	<0.5	<2.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<2.5	<0.5	<2.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<2.5	<0.5	<2.5	<0.5
Surrogate p-Terphenyl-d14	%	113	97	117	104	124

PAHs in Soil						
Our Reference		326037-41	326037-42	326037-43	326037-49	326037-50
Your Reference	UNITS	BH117	BH117	BH117	BH118	BH118
Depth		0-0.1	0.3-0.5	0.7-1	0-0.1	0.15-0.5
Date Sampled		15/06/2023	15/06/2023	15/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.06	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	0.06	<0.05	0.3	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	98	112	115	105	111

PAHs in Soil						
Our Reference		326037-51	326037-52	326037-53	326037-54	326037-56
Your Reference	UNITS	TP119	TP119	TP120	TP120	TP121
Depth		0-0.1	0.5-0.6	0-0.1	0.6-0.7	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	97	116	94	124	87

PAHs in Soil						
Our Reference		326037-57	326037-58	326037-59	326037-60	326037-61
Your Reference	UNITS	TP121	TP122	TP122	TP123	TP123
Depth		0.6-0.7	0-0.1	0.7-0.8	0-0.1	0.4-0.5
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.3	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	0.4	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	0.5	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	0.2	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	0.2	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	0.3	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.2	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	2.2	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	120	98	115	95	121

PAHs in Soil						
Our Reference		326037-62	326037-63	326037-69	326037-70	326037-71
Your Reference	UNITS	BH124	BH124	BH125	BH125	TP126
Depth		0-0.1	0.7-1	0-0.1	0.1-0.2	0-0.1
Date Sampled		15/06/2023	15/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.9	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	1.0	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.6	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.6	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	1	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.68	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.3	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.5	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	6.2	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.0	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.0	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.0	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	95	113	99	115	91

PAHs in Soil						
Our Reference		326037-72	326037-74	326037-75	326037-77	326037-78
Your Reference	UNITS	TP126	TP127	TP127	SM101	SM102
Depth		0.6-0.7	0-0.1	0.9-1	0.5-0.6	0.4-0.5
Date Sampled		14/06/2023	14/06/2023	14/06/2023	15/06/2023	15/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.1	0.2	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	0.5	0.4	<0.1	<0.1
Pyrene	mg/kg	<0.1	0.6	0.5	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	0.3	0.3	<0.1	<0.1
Chrysene	mg/kg	<0.1	0.3	0.3	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	0.6	0.5	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.4	0.55	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.2	0.2	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.3	0.2	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	3.2	3.2	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	0.7	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	0.5	0.7	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	0.6	0.8	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	119	96	122	93	87

PAHs in Soil						
Our Reference		326037-79	326037-80	326037-81	326037-82	326037-83
Your Reference	UNITS	SM103	SM104	SM105	SS1	SS2
Depth		0.2-0.3	0.35-0.45	0.5-0.6	0.1-0.2	0.1-0.2
Date Sampled		15/06/2023	15/06/2023	15/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.3	<0.3
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.3	<0.3
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.3	<0.3
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.3	<0.3
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.3	<0.3
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.3	<0.3
Fluoranthene	mg/kg	0.2	<0.1	<0.1	<0.3	<0.3
Pyrene	mg/kg	0.2	<0.1	<0.1	<0.3	<0.3
Benzo(a)anthracene	mg/kg	0.2	<0.1	<0.1	<0.3	<0.3
Chrysene	mg/kg	0.2	<0.1	<0.1	<0.3	<0.3
Benzo(b,j+k)fluoranthene	mg/kg	0.4	<0.2	<0.2	<0.6	<0.6
Benzo(a)pyrene	mg/kg	0.2	<0.05	<0.05	<0.2	<0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	<0.1	<0.1	<0.3	<0.3
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.3	<0.3
Benzo(g,h,i)perylene	mg/kg	0.2	<0.1	<0.1	<0.3	<0.3
Total +ve PAH's	mg/kg	1.6	<0.05	<0.05	<0.15	<0.15
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<1.5	<1.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<1.5	<1.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<1.5	<1.5
Surrogate p-Terphenyl-d14	%	93	94	95	96	104

PAHs in Soil						
Our Reference		326037-84	326037-85	326037-86	326037-87	326037-88
Your Reference	UNITS	SS3	SS4	SDUP1	SDUP2	SDUP3
Depth		0.1-0.2	0.1-0.2	0-0.1	0-0.1	0-0.1
Date Sampled		15/06/2023	16/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	1.0
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	93	98	93	93	90

PAHs in Soil						
Our Reference		326037-89	326037-90	326037-91	326037-92	326037-93
Your Reference	UNITS	SDUP4	SDUP5	SDUP6	SDUP7	SDUP8
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.2	0.1	0.5	<0.1	0.1
Pyrene	mg/kg	0.2	0.1	0.6	<0.1	0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	0.3	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	0.6	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.1	0.07	0.4	<0.05	0.09
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	0.3	<0.1	<0.1
Total +ve PAH's	mg/kg	0.5	0.4	3.2	<0.05	0.3
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	0.6	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	92	91	96	94	113

PAHs in Soil						
Our Reference		326037-94	326037-95	326037-96	326037-97	326037-98
Your Reference	UNITS	SDUP9	SDUP10	SDUP11	TB1	TB2
Depth		0-0.1	0-0.1	0-0.1	-	-
Date Sampled		14/06/2023	14/06/2023	14/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	0.3	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	0.3	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.1	0.3	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	0.1	1.9	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	108	110	126	125	107

PAHs in Soil			
Our Reference		326037-99	326037-100
Your Reference	UNITS	TB3	TB4
Depth		-	-
Date Sampled		16/06/2023	16/06/2023
Type of sample		Soil	Soil
Date extracted	-	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	109	123

Organochlorine Pesticides in soil						
Our Reference		326037-1	326037-8	326037-11	326037-15	326037-17
Your Reference	UNITS	BH101	TP102	BH103	BH104	BH105
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		15/06/2023	14/06/2023	15/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	%	94	101	95	103	98

Organochlorine Pesticides in soil						
Our Reference		326037-19	326037-21	326037-22	326037-24	326037-26
Your Reference	UNITS	TP106	BH107	BH108	BH109	TP110
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	16/06/2023	16/06/2023	16/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	%	96	96	99	98	105

Organochlorine Pesticides in soil						
Our Reference		326037-29	326037-31	326037-33	326037-35	326037-37
Your Reference	UNITS	BH111	BH112	BH113	TP114	BH115
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		16/06/2023	16/06/2023	16/06/2023	14/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Surrogate TCMX	%	111	105	105	94	111

Organochlorine Pesticides in soil						
Our Reference		326037-39	326037-41	326037-49	326037-51	326037-53
Your Reference	UNITS	BH116	BH117	BH118	TP119	TP120
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		16/06/2023	15/06/2023	16/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
alpha-BHC	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	111	97	104	98	94

Organochlorine Pesticides in soil						
Our Reference		326037-56	326037-58	326037-60	326037-62	326037-69
Your Reference	UNITS	TP121	TP122	TP123	BH124	BH125
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023	15/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	%	97	102	95	97	94

Organochlorine Pesticides in soil						
Our Reference		326037-71	326037-74	326037-77	326037-78	326037-79
Your Reference	UNITS	TP126	TP127	SM101	SM102	SM103
Depth		0-0.1	0-0.1	0.5-0.6	0.4-0.5	0.2-0.3
Date Sampled		14/06/2023	14/06/2023	15/06/2023	15/06/2023	15/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	%	91	97	96	91	92

Organochlorine Pesticides in soil						
Our Reference		326037-80	326037-81	326037-82	326037-83	326037-84
Your Reference	UNITS	SM104	SM105	SS1	SS2	SS3
Depth		0.35-0.45	0.5-0.6	0.1-0.2	0.1-0.2	0.1-0.2
Date Sampled		15/06/2023	15/06/2023	16/06/2023	16/06/2023	15/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
alpha-BHC	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
HCB	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Surrogate TCMX	%	95	96	102	109	102

Organochlorine Pesticides in soil						
Our Reference		326037-85	326037-86	326037-87	326037-88	326037-89
Your Reference	UNITS	SS4	SDUP1	SDUP2	SDUP3	SDUP4
Depth		0.1-0.2	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		16/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	%	108	89	96	96	98

Organochlorine Pesticides in soil				
Our Reference		326037-90	326037-91	326037-92
Your Reference	UNITS	SDUP5	SDUP6	SDUP7
Depth		0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023
alpha-BHC	mg/kg	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1
Surrogate TCMX	%	92	95	94

Organophosphorus Pesticides						
Our Reference		326037-1	326037-8	326037-11	326037-15	326037-17
Your Reference	UNITS	BH101	TP102	BH103	BH104	BH105
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		15/06/2023	14/06/2023	15/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Azinphos-methyl (Guthion)	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
Chlorpyriphos	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
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
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
Ethion	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
Parathion	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
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion (Methyl)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	94	101	95	103	98

Organophosphorus Pesticides						
Our Reference		326037-19	326037-21	326037-22	326037-24	326037-26
Your Reference	UNITS	TP106	BH107	BH108	BH109	TP110
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	16/06/2023	16/06/2023	16/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Azinphos-methyl (Guthion)	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
Chlorpyriphos	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
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
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
Ethion	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
Parathion	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
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion (Methyl)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	96	96	99	98	105

Organophosphorus Pesticides						
Our Reference		326037-29	326037-31	326037-33	326037-35	326037-37
Your Reference	UNITS	BH111	BH112	BH113	TP114	BH115
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		16/06/2023	16/06/2023	16/06/2023	14/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Parathion (Methyl)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Surrogate TCMX	%	111	105	105	94	111

Organophosphorus Pesticides						
Our Reference		326037-39	326037-41	326037-49	326037-51	326037-53
Your Reference	UNITS	BH116	BH117	BH118	TP119	TP120
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		16/06/2023	15/06/2023	16/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Azinphos-methyl (Guthion)	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Parathion (Methyl)	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	111	97	104	98	94

Organophosphorus Pesticides						
Our Reference		326037-56	326037-58	326037-60	326037-62	326037-69
Your Reference	UNITS	TP121	TP122	TP123	BH124	BH125
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023	15/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Azinphos-methyl (Guthion)	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
Chlorpyriphos	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
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
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
Ethion	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
Parathion	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
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion (Methyl)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	97	102	95	97	94

Organophosphorus Pesticides						
Our Reference		326037-71	326037-74	326037-77	326037-78	326037-79
Your Reference	UNITS	TP126	TP127	SM101	SM102	SM103
Depth		0-0.1	0-0.1	0.5-0.6	0.4-0.5	0.2-0.3
Date Sampled		14/06/2023	14/06/2023	15/06/2023	15/06/2023	15/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Azinphos-methyl (Guthion)	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
Chlorpyriphos	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
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
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
Ethion	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
Parathion	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
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion (Methyl)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	91	97	96	91	92

Organophosphorus Pesticides						
Our Reference		326037-80	326037-81	326037-82	326037-83	326037-84
Your Reference	UNITS	SM104	SM105	SS1	SS2	SS3
Depth		0.35-0.45	0.5-0.6	0.1-0.2	0.1-0.2	0.1-0.2
Date Sampled		15/06/2023	15/06/2023	16/06/2023	16/06/2023	15/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Parathion (Methyl)	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Surrogate TCMX	%	95	96	102	109	102

Organophosphorus Pesticides						
Our Reference		326037-85	326037-86	326037-87	326037-88	326037-89
Your Reference	UNITS	SS4	SDUP1	SDUP2	SDUP3	SDUP4
Depth		0.1-0.2	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		16/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Azinphos-methyl (Guthion)	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
Chlorpyriphos	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
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
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
Ethion	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
Parathion	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
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion (Methyl)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	108	89	96	96	98

Organophosphorus Pesticides				
Our Reference		326037-90	326037-91	326037-92
Your Reference	UNITS	SDUP5	SDUP6	SDUP7
Depth		0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1
Parathion (Methyl)	mg/kg	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1
Surrogate TCMX	%	92	95	94

PCBs in Soil						
Our Reference		326037-1	326037-8	326037-11	326037-15	326037-17
Your Reference	UNITS	BH101	TP102	BH103	BH104	BH105
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		15/06/2023	14/06/2023	15/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	%	94	101	95	103	98

PCBs in Soil						
Our Reference		326037-19	326037-21	326037-22	326037-24	326037-26
Your Reference	UNITS	TP106	BH107	BH108	BH109	TP110
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	16/06/2023	16/06/2023	16/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	%	96	96	99	98	105

PCBs in Soil						
Our Reference		326037-29	326037-31	326037-33	326037-35	326037-37
Your Reference	UNITS	BH111	BH112	BH113	TP114	BH115
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		16/06/2023	16/06/2023	16/06/2023	14/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.5
Surrogate TCMX	%	111	105	105	94	111

PCBs in Soil						
Our Reference		326037-39	326037-41	326037-49	326037-51	326037-53
Your Reference	UNITS	BH116	BH117	BH118	TP119	TP120
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		16/06/2023	15/06/2023	16/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Aroclor 1016	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.5	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	111	97	104	98	94

PCBs in Soil						
Our Reference		326037-56	326037-58	326037-60	326037-62	326037-69
Your Reference	UNITS	TP121	TP122	TP123	BH124	BH125
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023	15/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	%	97	102	95	97	94

PCBs in Soil						
Our Reference		326037-71	326037-74	326037-77	326037-78	326037-79
Your Reference	UNITS	TP126	TP127	SM101	SM102	SM103
Depth		0-0.1	0-0.1	0.5-0.6	0.4-0.5	0.2-0.3
Date Sampled		14/06/2023	14/06/2023	15/06/2023	15/06/2023	15/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	%	91	97	96	91	92

PCBs in Soil						
Our Reference		326037-80	326037-81	326037-82	326037-83	326037-84
Your Reference	UNITS	SM104	SM105	SS1	SS2	SS3
Depth		0.35-0.45	0.5-0.6	0.1-0.2	0.1-0.2	0.1-0.2
Date Sampled		15/06/2023	15/06/2023	16/06/2023	16/06/2023	15/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Aroclor 1016	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.3	<0.3	<0.1
Surrogate TCMX	%	95	96	102	109	102

PCBs in Soil						
Our Reference		326037-85	326037-86	326037-87	326037-88	326037-89
Your Reference	UNITS	SS4	SDUP1	SDUP2	SDUP3	SDUP4
Depth		0.1-0.2	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		16/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
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	%	108	89	96	96	98

PCBs in Soil				
Our Reference		326037-90	326037-91	326037-92
Your Reference	UNITS	SDUP5	SDUP6	SDUP7
Depth		0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil
Date extracted	-	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1
Surrogate TCMX	%	92	95	94

Acid Extractable metals in soil						
Our Reference		326037-1	326037-2	326037-3	326037-8	326037-9
Your Reference	UNITS	BH101	BH101	BH101	TP102	TP102
Depth		0-0.1	0.3-0.5	0.8-1	0-0.1	0.6-0.7
Date Sampled		15/06/2023	15/06/2023	15/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	6	4	7	<4	9
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	16	13	24	9	24
Copper	mg/kg	10	2	1	10	2
Lead	mg/kg	38	16	17	12	12
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	3	2	2	11	1
Zinc	mg/kg	51	9	3	28	3

Acid Extractable metals in soil						
Our Reference		326037-11	326037-12	326037-15	326037-16	326037-17
Your Reference	UNITS	BH103	BH103	BH104	BH104	BH105
Depth		0-0.1	0.6-0.8	0-0.1	0.1-0.3	0-0.1
Date Sampled		15/06/2023	15/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	4	<4	<4	5	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	11	14	11	18	12
Copper	mg/kg	5	3	5	2	7
Lead	mg/kg	35	12	26	14	59
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	2	2	2	4	3
Zinc	mg/kg	26	4	25	12	30

Acid Extractable metals in soil						
Our Reference		326037-18	326037-19	326037-21	326037-22	326037-23
Your Reference	UNITS	BH105	TP106	BH107	BH108	BH108
Depth		0.3-0.4	0-0.1	0-0.1	0-0.1	0.4-0.5
Date Sampled		16/06/2023	14/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	<4	9	<4	6	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	0.5	<0.4
Chromium	mg/kg	8	17	7	18	16
Copper	mg/kg	2	11	7	28	20
Lead	mg/kg	21	58	45	170	15
Mercury	mg/kg	<0.1	0.2	<0.1	0.1	<0.1
Nickel	mg/kg	2	2	2	10	5
Zinc	mg/kg	12	56	28	230	25

Acid Extractable metals in soil						
Our Reference		326037-24	326037-26	326037-27	326037-29	326037-30
Your Reference	UNITS	BH109	TP110	TP110	BH111	BH111
Depth		0-0.1	0-0.1	0.2-0.3	0-0.1	0.3-0.5
Date Sampled		16/06/2023	14/06/2023	14/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	4	5	<4	15	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	17	19	9	27	5
Copper	mg/kg	13	14	2	41	6
Lead	mg/kg	62	29	10	210	2
Mercury	mg/kg	<0.1	<0.1	<0.1	0.4	<0.1
Nickel	mg/kg	7	8	1	17	3
Zinc	mg/kg	57	40	1	110	14

Acid Extractable metals in soil						
Our Reference		326037-31	326037-32	326037-33	326037-34	326037-35
Your Reference	UNITS	BH112	BH112	BH113	BH113	TP114
Depth		0-0.1	0.5-0.7	0-0.1	0.15-0.35	0-0.1
Date Sampled		16/06/2023	16/06/2023	16/06/2023	16/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	<4	<4	<4	6	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	10	11	18	32	37
Copper	mg/kg	9	2	18	39	8
Lead	mg/kg	39	14	120	210	24
Mercury	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Nickel	mg/kg	3	2	10	4	14
Zinc	mg/kg	34	8	42	74	32

Acid Extractable metals in soil						
Our Reference		326037-36	326037-37	326037-38	326037-39	326037-40
Your Reference	UNITS	TP114	BH115	BH115	BH116	BH116
Depth		0.7-0.8	0-0.1	0.1-0.4	0-0.1	0.4-0.7
Date Sampled		14/06/2023	16/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	9	21	8	18	12
Cadmium	mg/kg	<0.4	0.6	<0.4	1	<0.4
Chromium	mg/kg	21	14	12	28	30
Copper	mg/kg	13	45	<1	140	24
Lead	mg/kg	20	83	14	240	52
Mercury	mg/kg	<0.1	0.2	<0.1	0.5	<0.1
Nickel	mg/kg	19	11	<1	16	20
Zinc	mg/kg	15	170	5	430	180

Acid Extractable metals in soil						
Our Reference		326037-41	326037-42	326037-43	326037-49	326037-50
Your Reference	UNITS	BH117	BH117	BH117	BH118	BH118
Depth		0-0.1	0.3-0.5	0.7-1	0-0.1	0.15-0.5
Date Sampled		15/06/2023	15/06/2023	15/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	<4	5	5	7	7
Cadmium	mg/kg	<0.4	<0.4	<0.4	0.6	<0.4
Chromium	mg/kg	8	14	14	14	21
Copper	mg/kg	13	15	2	73	3
Lead	mg/kg	18	57	14	49	20
Mercury	mg/kg	<0.1	0.1	<0.1	0.1	<0.1
Nickel	mg/kg	2	5	<1	11	<1
Zinc	mg/kg	38	35	67	290	20

Acid Extractable metals in soil						
Our Reference		326037-51	326037-52	326037-53	326037-54	326037-56
Your Reference	UNITS	TP119	TP119	TP120	TP120	TP121
Depth		0-0.1	0.5-0.6	0-0.1	0.6-0.7	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	5	8	6	11	9
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	13	29	10	29	21
Copper	mg/kg	5	<1	11	1	5
Lead	mg/kg	39	15	110	20	44
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	1	1	2	1	1
Zinc	mg/kg	20	3	81	13	28

Acid Extractable metals in soil						
Our Reference		326037-57	326037-58	326037-59	326037-60	326037-61
Your Reference	UNITS	TP121	TP122	TP122	TP123	TP123
Depth		0.6-0.7	0-0.1	0.7-0.8	0-0.1	0.4-0.5
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	7	6	6	5	7
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	33	12	22	15	26
Copper	mg/kg	<1	25	2	11	3
Lead	mg/kg	16	59	18	40	19
Mercury	mg/kg	0.2	0.1	<0.1	0.1	0.1
Nickel	mg/kg	1	4	<1	1	2
Zinc	mg/kg	6	83	2	49	21

Acid Extractable metals in soil						
Our Reference		326037-62	326037-63	326037-69	326037-70	326037-71
Your Reference	UNITS	BH124	BH124	BH125	BH125	TP126
Depth		0-0.1	0.7-1	0-0.1	0.1-0.2	0-0.1
Date Sampled		15/06/2023	15/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	6	<4	5	5	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	14	9	16	20	23
Copper	mg/kg	17	<1	10	1	5
Lead	mg/kg	26	21	34	14	23
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	10	<1	4	2	4
Zinc	mg/kg	60	5	21	4	25

Acid Extractable metals in soil						
Our Reference		326037-72	326037-74	326037-75	326037-77	326037-78
Your Reference	UNITS	TP126	TP127	TP127	SM101	SM102
Depth		0.6-0.7	0-0.1	0.9-1	0.5-0.6	0.4-0.5
Date Sampled		14/06/2023	14/06/2023	14/06/2023	15/06/2023	15/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	<4	<4	<4	<4	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	27	23	19	9	18
Copper	mg/kg	11	19	13	2	2
Lead	mg/kg	15	22	13	14	19
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	19	27	17	1	5
Zinc	mg/kg	21	46	19	9	11

Acid Extractable metals in soil						
Our Reference		326037-79	326037-80	326037-81	326037-82	326037-83
Your Reference	UNITS	SM103	SM104	SM105	SS1	SS2
Depth		0.2-0.3	0.35-0.45	0.5-0.6	0.1-0.2	0.1-0.2
Date Sampled		15/06/2023	15/06/2023	15/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	<4	<4	<4	10	15
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	1
Chromium	mg/kg	14	17	12	17	30
Copper	mg/kg	8	6	4	15	67
Lead	mg/kg	55	13	17	39	350
Mercury	mg/kg	<0.1	<0.1	<0.1	0.1	0.3
Nickel	mg/kg	6	4	2	36	64
Zinc	mg/kg	21	14	9	220	790

Acid Extractable metals in soil						
Our Reference		326037-84	326037-85	326037-86	326037-87	326037-88
Your Reference	UNITS	SS3	SS4	SDUP1	SDUP2	SDUP3
Depth		0.1-0.2	0.1-0.2	0-0.1	0-0.1	0-0.1
Date Sampled		15/06/2023	16/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	6	6	7	6	<4
Cadmium	mg/kg	<0.4	1	<0.4	<0.4	<0.4
Chromium	mg/kg	16	25	14	16	13
Copper	mg/kg	22	110	11	19	4
Lead	mg/kg	76	330	14	98	17
Mercury	mg/kg	0.1	0.1	<0.1	0.3	<0.1
Nickel	mg/kg	6	16	10	4	6
Zinc	mg/kg	130	410	20	98	25

Acid Extractable metals in soil						
Our Reference		326037-89	326037-90	326037-91	326037-92	326037-93
Your Reference	UNITS	SDUP4	SDUP5	SDUP6	SDUP7	SDUP8
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	6	<4	<4	7	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	29	28	22	9	8
Copper	mg/kg	11	6	23	10	5
Lead	mg/kg	32	23	23	87	39
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	13	8	28	2	1
Zinc	mg/kg	36	30	48	79	20

Acid Extractable metals in soil						
Our Reference		326037-94	326037-95	326037-96	326037-97	326037-98
Your Reference	UNITS	SDUP9	SDUP10	SDUP11	TB1	TB2
Depth		0-0.1	0-0.1	0-0.1	-	-
Date Sampled		14/06/2023	14/06/2023	14/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Arsenic	mg/kg	6	<4	5	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	13	10	9	3	4
Copper	mg/kg	5	12	28	<1	1
Lead	mg/kg	40	42	63	3	2
Mercury	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Nickel	mg/kg	1	1	4	<1	<1
Zinc	mg/kg	27	57	84	2	2

Acid Extractable metals in soil			
Our Reference		326037-99	326037-100
Your Reference	UNITS	TB3	TB4
Depth		-	-
Date Sampled		16/06/2023	16/06/2023
Type of sample		Soil	Soil
Date prepared	-	23/06/2023	23/06/2023
Date analysed	-	27/06/2023	27/06/2023
Arsenic	mg/kg	<4	<4
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	3	4
Copper	mg/kg	1	<1
Lead	mg/kg	2	2
Mercury	mg/kg	<0.1	<0.1
Nickel	mg/kg	<1	<1
Zinc	mg/kg	2	14

Moisture						
Our Reference		326037-1	326037-2	326037-3	326037-8	326037-9
Your Reference	UNITS	BH101	BH101	BH101	TP102	TP102
Depth		0-0.1	0.3-0.5	0.8-1	0-0.1	0.6-0.7
Date Sampled		15/06/2023	15/06/2023	15/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	12	12	16	9.2	12

Moisture						
Our Reference		326037-11	326037-12	326037-15	326037-16	326037-17
Your Reference	UNITS	BH103	BH103	BH104	BH104	BH105
Depth		0-0.1	0.6-0.8	0-0.1	0.1-0.3	0-0.1
Date Sampled		15/06/2023	15/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	12	14	25	21	15

Moisture						
Our Reference		326037-18	326037-19	326037-21	326037-22	326037-23
Your Reference	UNITS	BH105	TP106	BH107	BH108	BH108
Depth		0.3-0.4	0-0.1	0-0.1	0-0.1	0.4-0.5
Date Sampled		16/06/2023	14/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	14	17	16	23	23

Moisture						
Our Reference		326037-24	326037-26	326037-27	326037-29	326037-30
Your Reference	UNITS	BH109	TP110	TP110	BH111	BH111
Depth		0-0.1	0-0.1	0.2-0.3	0-0.1	0.3-0.5
Date Sampled		16/06/2023	14/06/2023	14/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	16	29	17	65	27

Moisture						
Our Reference		326037-31	326037-32	326037-33	326037-34	326037-35
Your Reference	UNITS	BH112	BH112	BH113	BH113	TP114
Depth		0-0.1	0.5-0.7	0-0.1	0.15-0.35	0-0.1
Date Sampled		16/06/2023	16/06/2023	16/06/2023	16/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	36	17	48	22	21

Moisture						
Our Reference		326037-36	326037-37	326037-38	326037-39	326037-40
Your Reference	UNITS	TP114	BH115	BH115	BH116	BH116
Depth		0.7-0.8	0-0.1	0.1-0.4	0-0.1	0.4-0.7
Date Sampled		14/06/2023	16/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	12	79	18	85	34

Moisture						
Our Reference		326037-41	326037-42	326037-43	326037-49	326037-50
Your Reference	UNITS	BH117	BH117	BH117	BH118	BH118
Depth		0-0.1	0.3-0.5	0.7-1	0-0.1	0.15-0.5
Date Sampled		15/06/2023	15/06/2023	15/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	24	16	15	53	26

Moisture						
Our Reference		326037-51	326037-52	326037-53	326037-54	326037-56
Your Reference	UNITS	TP119	TP119	TP120	TP120	TP121
Depth		0-0.1	0.5-0.6	0-0.1	0.6-0.7	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	17	16	17	20	14

Moisture						
Our Reference		326037-57	326037-58	326037-59	326037-60	326037-61
Your Reference	UNITS	TP121	TP122	TP122	TP123	TP123
Depth		0.6-0.7	0-0.1	0.7-0.8	0-0.1	0.4-0.5
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	13	25	19	14	17

Moisture						
Our Reference		326037-62	326037-63	326037-69	326037-70	326037-71
Your Reference	UNITS	BH124	BH124	BH125	BH125	TP126
Depth		0-0.1	0.7-1	0-0.1	0.1-0.2	0-0.1
Date Sampled		15/06/2023	15/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	30	19	18	12	8.8

Moisture						
Our Reference		326037-72	326037-74	326037-75	326037-77	326037-78
Your Reference	UNITS	TP126	TP127	TP127	SM101	SM102
Depth		0.6-0.7	0-0.1	0.9-1	0.5-0.6	0.4-0.5
Date Sampled		14/06/2023	14/06/2023	14/06/2023	15/06/2023	15/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	9.9	15	12	6.5	19

Moisture						
Our Reference		326037-79	326037-80	326037-81	326037-82	326037-83
Your Reference	UNITS	SM103	SM104	SM105	SS1	SS2
Depth		0.2-0.3	0.35-0.45	0.5-0.6	0.1-0.2	0.1-0.2
Date Sampled		15/06/2023	15/06/2023	15/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	10	15	15	62	68

Moisture						
Our Reference		326037-84	326037-85	326037-86	326037-87	326037-88
Your Reference	UNITS	SS3	SS4	SDUP1	SDUP2	SDUP3
Depth		0.1-0.2	0.1-0.2	0-0.1	0-0.1	0-0.1
Date Sampled		15/06/2023	16/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	44	50	11	19	10

Moisture						
Our Reference		326037-89	326037-90	326037-91	326037-92	326037-93
Your Reference	UNITS	SDUP4	SDUP5	SDUP6	SDUP7	SDUP8
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	23	21	14	16	11

Moisture						
Our Reference		326037-94	326037-95	326037-96	326037-97	326037-98
Your Reference	UNITS	SDUP9	SDUP10	SDUP11	TB1	TB2
Depth		0-0.1	0-0.1	0-0.1	-	-
Date Sampled		14/06/2023	14/06/2023	14/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/06/2023	22/06/2023	22/06/2023	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Moisture	%	1.5	16	6.5	0.2	0.4

Moisture			
Our Reference		326037-99	326037-100
Your Reference	UNITS	TB3	TB4
Depth		-	-
Date Sampled		16/06/2023	16/06/2023
Type of sample		Soil	Soil
Date prepared	-	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023
Moisture	%	0.1	0.3

Asbestos ID - soils NEPM - ASB-001						
Our Reference		326037-1	326037-8	326037-9	326037-11	326037-15
Your Reference	UNITS	BH101	TP102	TP102	BH103	BH104
Depth		0-0.1	0-0.1	0.6-0.7	0-0.1	0-0.1
Date Sampled		15/06/2023	14/06/2023	14/06/2023	15/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Sample mass tested	g	503.2	782.78	705.59	724.84	465.68
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	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
Total Asbestos#1	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM - ASB-001						
Our Reference		326037-17	326037-18	326037-19	326037-21	326037-22
Your Reference	UNITS	BH105	BH105	TP106	BH107	BH108
Depth		0-0.1	0.3-0.4	0-0.1	0-0.1	0-0.1
Date Sampled		16/06/2023	16/06/2023	14/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Sample mass tested	g	597.6	659.55	705.29	447.77	549.2
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	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
Total Asbestos[#1]	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM - ASB-001						
Our Reference		326037-24	326037-26	326037-27	326037-29	326037-31
Your Reference	UNITS	BH109	TP110	TP110	BH111	BH112
Depth		0-0.1	0-0.1	0.2-0.3	0-0.1	0-0.1
Date Sampled		16/06/2023	14/06/2023	14/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Sample mass tested	g	447.85	526.84	609.83	128.71	466.74
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Beige coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	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
Total Asbestos#1	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM - ASB-001						
Our Reference		326037-33	326037-35	326037-37	326037-39	326037-41
Your Reference	UNITS	BH113	TP114	BH115	BH116	BH117
Depth		0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled		16/06/2023	14/06/2023	16/06/2023	16/06/2023	15/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Sample mass tested	g	351.24	662.36	123.86	122.92	379.51
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & debris	Brown coarse-grained soil & debris	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	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
Total Asbestos#1	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM - ASB-001						
Our Reference		326037-42	326037-49	326037-51	326037-52	326037-53
Your Reference	UNITS	BH117	BH118	TP119	TP119	TP120
Depth		0.3-0.5	0-0.1	0-0.1	0.5-0.6	0-0.1
Date Sampled		15/06/2023	16/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Sample mass tested	g	274.54	340.94	416.09	592.63	524.09
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	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
Total Asbestos#1	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM - ASB-001						
Our Reference		326037-54	326037-56	326037-58	326037-60	326037-61
Your Reference	UNITS	TP120	TP121	TP122	TP123	TP123
Depth		0.6-0.7	0-0.1	0-0.1	0-0.1	0.4-0.5
Date Sampled		14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Sample mass tested	g	624.04	660.29	530.42	567.82	595.06
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	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
Total Asbestos#1	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM - ASB-001						
Our Reference		326037-62	326037-69	326037-71	326037-72	326037-74
Your Reference	UNITS	BH124	BH125	TP126	TP126	TP127
Depth		0-0.1	0-0.1	0-0.1	0.6-0.7	0-0.1
Date Sampled		15/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Sample mass tested	g	422.88	406.63	729.69	831.04	616.37
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	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
Total Asbestos[#1]	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM - ASB-001						
Our Reference		326037-75	326037-77	326037-78	326037-79	326037-80
Your Reference	UNITS	TP127	SM101	SM102	SM103	SM104
Depth		0.9-1	0.5-0.6	0.4-0.5	0.2-0.3	0.35-0.45
Date Sampled		14/06/2023	15/06/2023	15/06/2023	15/06/2023	15/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Sample mass tested	g	747.29	636.82	434.25	740.9	655.77
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Grey clayey soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	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
Total Asbestos#1	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM - ASB-001		
Our Reference		326037-81
Your Reference	UNITS	SM105
Depth		0.5-0.6
Date Sampled		15/06/2023
Type of sample		Soil
Date analysed	-	26/06/2023
Sample mass tested	g	730.75
Sample Description	-	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected
Total Asbestos[#1]	g/kg	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected
ACM >7mm Estimation*	g	–
FA and AF Estimation*	g	–
ACM >7mm Estimation*	%(w/w)	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001

Misc Inorg - Soil					
Our Reference		326037-82	326037-83	326037-84	326037-85
Your Reference	UNITS	SS1	SS2	SS3	SS4
Depth		0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2
Date Sampled		16/06/2023	16/06/2023	15/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Date analysed	-	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Total Organic Carbon (Combustion)	mg/kg	98,000	140,000	18,000	21,000

vTRH(C6-C10)/BTEXN in Water			
Our Reference		326037-105	326037-106
Your Reference	UNITS	FR1 - AUGER	FR2 - SHOVEL
Depth		-	-
Date Sampled		16/06/2023	16/06/2023
Type of sample		Water	Water
Date extracted	-	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023
TRH C_6 - C_9	µg/L	42	43
TRH C_6 - C_{10}	µg/L	46	46
TRH C_6 - C_{10} less BTEX (F1)	µg/L	46	46
Benzene	µg/L	<1	<1
Toluene	µg/L	<1	<1
Ethylbenzene	µg/L	<1	<1
m+p-xylene	µg/L	<2	<2
o-xylene	µg/L	<1	<1
Naphthalene	µg/L	<1	<1
Surrogate Dibromofluoromethane	%	113	110
Surrogate toluene-d8	%	115	109
Surrogate 4-BFB	%	104	107

svTRH (C10-C40) in Water			
Our Reference		326037-105	326037-106
Your Reference	UNITS	FR1 - AUGER	FR2 - SHOVEL
Depth		-	-
Date Sampled		16/06/2023	16/06/2023
Type of sample		Water	Water
Date extracted	-	22/06/2023	22/06/2023
Date analysed	-	23/06/2023	23/06/2023
TRH C_{10} - C_{14}	µg/L	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50
Surrogate o-Terphenyl	%	86	78

PAHs in Water			
Our Reference		326037-105	326037-106
Your Reference	UNITS	FR1 - AUGER	FR2 - SHOVEL
Depth		-	-
Date Sampled		16/06/2023	16/06/2023
Type of sample		Water	Water
Date extracted	-	22/06/2023	22/06/2023
Date analysed	-	22/06/2023	22/06/2023
Naphthalene	µg/L	<0.2	<0.2
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
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	86	77

Metals in Water - Dissolved			
Our Reference		326037-105	326037-106
Your Reference	UNITS	FR1 - AUGER	FR2 - SHOVEL
Depth		-	-
Date Sampled		16/06/2023	16/06/2023
Type of sample		Water	Water
Date digested	-	23/06/2023	23/06/2023
Date analysed	-	24/06/2023	24/06/2023
Arsenic - Dissolved	mg/L	<0.05	<0.05
Cadmium - Dissolved	mg/L	<0.01	<0.01
Chromium - Dissolved	mg/L	<0.01	<0.01
Copper - Dissolved	mg/L	0.2	0.3
Lead - Dissolved	mg/L	<0.03	<0.03
Mercury - Dissolved	mg/L	<0.0005	<0.0005
Nickel - Dissolved	mg/L	<0.02	<0.02
Zinc - Dissolved	mg/L	<0.02	<0.02

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.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. **NOTE** #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) **NOTE** #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-128	Dissolved or Total Carbon or Dissolved or Total Organic/Inorganic Carbon using the combustion method, high temperature catalytic combustion with NDIR.
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).

Method ID	Methodology Summary
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-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
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.
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.
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	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	Water samples are analysed directly 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.
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.

Method ID	Methodology Summary
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.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	326037-8
Date extracted	-			22/06/2023	1	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			26/06/2023	1	23/06/2023	23/06/2023		23/06/2023	23/06/2023
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	101	100
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	101	100
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	105	105
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	101	102
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	97	95
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	102	100
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	107	104
Naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	103	1	79	92	15	94	92

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	326037-31
Date extracted	-			[NT]	21	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	21	23/06/2023	23/06/2023		23/06/2023	23/06/2023
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	21	<25	<25	0	124	108
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	21	<25	<25	0	124	108
Benzene	mg/kg	0.2	Org-023	[NT]	21	<0.2	<0.2	0	130	113
Toluene	mg/kg	0.5	Org-023	[NT]	21	<0.5	<0.5	0	125	109
Ethylbenzene	mg/kg	1	Org-023	[NT]	21	<1	<1	0	119	104
m+p-xylene	mg/kg	2	Org-023	[NT]	21	<2	<2	0	124	108
o-Xylene	mg/kg	1	Org-023	[NT]	21	<1	<1	0	132	114
Naphthalene	mg/kg	1	Org-023	[NT]	21	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	21	100	103	3	113	99

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	326037-51
Date extracted	-			[NT]	39	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	39	23/06/2023	23/06/2023		26/06/2023	23/06/2023
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	39	<120	<120	0	96	113
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	39	<120	<120	0	96	113
Benzene	mg/kg	0.2	Org-023	[NT]	39	<1	<1	0	113	119
Toluene	mg/kg	0.5	Org-023	[NT]	39	<2	<2	0	102	115
Ethylbenzene	mg/kg	1	Org-023	[NT]	39	<5	<5	0	85	106
m+p-xylene	mg/kg	2	Org-023	[NT]	39	<10	<10	0	90	112
o-Xylene	mg/kg	1	Org-023	[NT]	39	<5	<5	0	100	115
Naphthalene	mg/kg	1	Org-023	[NT]	39	<5	<5	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	39	86	76	12	71	104

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-9	326037-82
Date extracted	-			[NT]	58	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	58	26/06/2023	26/06/2023		26/06/2023	23/06/2023
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	58	<25	<25	0	118	110
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	58	<25	<25	0	118	110
Benzene	mg/kg	0.2	Org-023	[NT]	58	<0.2	<0.2	0	121	114
Toluene	mg/kg	0.5	Org-023	[NT]	58	<0.5	<0.5	0	116	109
Ethylbenzene	mg/kg	1	Org-023	[NT]	58	<1	<1	0	113	106
m+p-xylene	mg/kg	2	Org-023	[NT]	58	<2	<2	0	119	111
o-Xylene	mg/kg	1	Org-023	[NT]	58	<1	<1	0	126	117
Naphthalene	mg/kg	1	Org-023	[NT]	58	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	58	101	96	5	100	90

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	326037-100
Date extracted	-			[NT]	71	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	71	26/06/2023	26/06/2023		26/06/2023	23/06/2023
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	71	<25	<25	0	114	121
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	71	<25	<25	0	114	121
Benzene	mg/kg	0.2	Org-023	[NT]	71	<0.2	<0.2	0	114	126
Toluene	mg/kg	0.5	Org-023	[NT]	71	<0.5	<0.5	0	112	119
Ethylbenzene	mg/kg	1	Org-023	[NT]	71	<1	<1	0	104	116
m+p-xylene	mg/kg	2	Org-023	[NT]	71	<2	<2	0	119	122
o-Xylene	mg/kg	1	Org-023	[NT]	71	<1	<1	0	125	129
Naphthalene	mg/kg	1	Org-023	[NT]	71	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	71	100	92	8	93	102

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]	77	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	77	26/06/2023	26/06/2023		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	77	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	77	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	77	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	77	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	77	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	77	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	77	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	77	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	77	97	95	2	[NT]	[NT]

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]	81	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	81	26/06/2023	26/06/2023		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	81	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	81	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	81	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	81	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	81	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	81	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	81	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	81	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	81	98	96	2	[NT]	[NT]

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]	91	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	91	26/06/2023	26/06/2023		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	91	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	91	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	91	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	91	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	91	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	91	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	91	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	91	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	91	97	94	3	[NT]	[NT]

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]	99	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	99	26/06/2023	26/06/2023		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	99	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	99	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	99	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	99	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	99	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	99	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	99	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	99	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	99	99	102	3	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	326037-8
Date extracted	-			22/06/2023	1	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			24/06/2023	1	23/06/2023	23/06/2023		23/06/2023	23/06/2023
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	75	40	129	114
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	<100	160	46	129	116
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	100	210	71	114	120
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	<50	50	0	129	114
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	130	300	79	129	116
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	<100	130	26	114	120
Surrogate o-Terphenyl	%		Org-020	89	1	83	88	6	94	80

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	326037-31
Date extracted	-			[NT]	21	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	21	23/06/2023	23/06/2023		24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	21	58	51	13	122	126
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	21	380	320	17	108	119
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	21	500	430	15	114	#
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	21	88	73	19	122	126
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	21	730	610	18	108	119
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	21	280	260	7	114	#
Surrogate o-Terphenyl	%		Org-020	[NT]	21	98	98	0	96	91

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	326037-51
Date extracted	-			[NT]	39	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	39	24/06/2023	24/06/2023		24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	39	<250	<250	0	137	123
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	39	<500	<500	0	139	126
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	39	<500	640	25	129	#
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	39	<250	<250	0	137	123
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	39	<500	700	33	139	126
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	39	<500	<500	0	129	#
Surrogate o-Terphenyl	%		Org-020	[NT]	39	99	103	4	99	93

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-9	326037-82
Date extracted	-			[NT]	58	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	58	24/06/2023	24/06/2023		24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	58	<50	<50	0	130	127
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	58	<100	110	10	115	114
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	58	160	170	6	114	103
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	58	<50	<50	0	130	127
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	58	220	240	9	115	114
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	58	<100	120	18	114	103
Surrogate o-Terphenyl	%		Org-020	[NT]	58	93	91	2	99	93

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	326037-100
Date extracted	-			[NT]	71	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	71	24/06/2023	24/06/2023		24/06/2023	24/06/2023
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	71	<50	<50	0	122	115
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	71	<100	<100	0	102	99
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	71	110	140	24	114	91
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	71	<50	<50	0	122	115
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	71	130	190	38	102	99
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	71	<100	110	10	114	91
Surrogate o-Terphenyl	%		Org-020	[NT]	71	85	87	2	97	85

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	77	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	77	24/06/2023	24/06/2023		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	77	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	77	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	77	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	77	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	77	<100	<100	0	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	77	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	77	88	86	2	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	81	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	81	24/06/2023	24/06/2023		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	81	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	81	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	81	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	81	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	81	<100	<100	0	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	81	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	81	88	87	1	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	91	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	91	24/06/2023	24/06/2023		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	91	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	91	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	91	170	150	12	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	91	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	91	200	170	16	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	91	120	120	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	91	96	99	3	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	99	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	99	24/06/2023	24/06/2023		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	99	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	99	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	99	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	99	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	99	<100	<100	0	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	99	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	99	86	86	0	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	326037-8
Date extracted	-			22/06/2023	1	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			26/06/2023	1	26/06/2023	26/06/2023		26/06/2023	26/06/2023
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	93	93
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	97	95
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	93	93
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	98
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	0.1	0.1	0	94	94
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	0.1	0.1	0	97	97
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	103	99
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	0.07	0.08	13	100	92
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	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	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	97	1	91	90	1	89	87

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	326037-31
Date extracted	-			[NT]	21	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	21	26/06/2023	26/06/2023		26/06/2023	26/06/2023
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	105	101
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	104	103
Fluorene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	100	99
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	108	102
Anthracene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	21	0.1	0.1	0	108	100
Pyrene	mg/kg	0.1	Org-022/025	[NT]	21	0.1	0.1	0	109	99
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	93	103
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	21	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	21	0.07	0.07	0	104	98
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	21	96	94	2	[NT]	97

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	326037-51
Date extracted	-			[NT]	39	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	39	26/06/2023	26/06/2023		26/06/2023	26/06/2023
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	95	97
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	97	101
Fluorene	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	92	97
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	98	97
Anthracene	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	98	94
Pyrene	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	99	97
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	103	103
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	39	<1	<1	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	39	<0.2	<0.2	0	98	82
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	39	104	106	2	88	91

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-9	326037-82
Date extracted	-			[NT]	58	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	58	26/06/2023	26/06/2023		26/06/2023	26/06/2023
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	95	103
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	95	105
Fluorene	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	93	101
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	58	0.3	0.2	40	108	104
Anthracene	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	58	0.4	0.3	29	108	104
Pyrene	mg/kg	0.1	Org-022/025	[NT]	58	0.5	0.4	22	109	105
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	58	0.2	0.2	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	58	0.2	0.2	0	111	107
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	58	0.3	0.3	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	58	0.2	0.2	0	94	100
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	58	0.1	0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	58	98	97	1	100	101

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	326037-100
Date extracted	-			[NT]	71	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	71	26/06/2023	26/06/2023		26/06/2023	26/06/2023
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	126	128
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	125	127
Fluorene	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	114	118
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	124	122
Anthracene	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	129	131
Pyrene	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	123	125
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	117	115
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	71	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	71	<0.05	0.06	18	86	127
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	71	91	95	4	122	127

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	77	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	77	26/06/2023	26/06/2023		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	77	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	77	<0.05	<0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	77	93	93	0	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	81	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	81	26/06/2023	26/06/2023		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	81	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	81	<0.05	<0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	81	95	99	4	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	91	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	91	26/06/2023	26/06/2023		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	91	0.1	0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	91	0.5	0.6	18	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	91	0.6	0.6	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	91	0.2	0.3	40	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	91	0.3	0.3	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	91	0.6	0.7	15	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	91	0.4	0.5	22	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	91	0.2	0.3	40	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	91	0.3	0.4	29	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	91	96	90	6	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	99	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	99	26/06/2023	26/06/2023		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	99	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	99	<0.05	<0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	99	109	121	10	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	326037-8
Date extracted	-			22/06/2023	1	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			26/06/2023	1	26/06/2023	26/06/2023		26/06/2023	26/06/2023
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	98
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	96	94
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	97	89
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	97	99
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	90	92
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	101	105
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	110	116
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	102
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	92	100
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	97	101
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	102	1	94	95	1	94	95

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	326037-31
Date extracted	-			[NT]	21	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	21	26/06/2023	26/06/2023		26/06/2023	26/06/2023
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	96	102
HCB	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	90	96
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	65	67
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	103	103
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	98	102
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	113	113
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	124	122
Endrin	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	74	88
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	104	102
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	80	101
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	21	96	95	1	94	102

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	326037-82
Date extracted	-			[NT]	39	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	39	26/06/2023	26/06/2023		26/06/2023	26/06/2023
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	96	132
HCB	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	86	128
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	100
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	95	100
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	94	108
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	105	122
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	110	130
Endrin	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	74	116
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	94	104
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	82	106
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	39	111	112	1	94	122

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	58	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	58	26/06/2023	26/06/2023		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	58	102	98	4	[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]	71	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	71	26/06/2023	26/06/2023		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	71	91	96	5	[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]	77	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	77	26/06/2023	26/06/2023		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	77	96	96	0	[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]	81	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	81	26/06/2023	26/06/2023		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	81	96	96	0	[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]	91	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	91	26/06/2023	26/06/2023		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	91	95	94	1	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	326037-8
Date extracted	-			22/06/2023	1	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			26/06/2023	1	26/06/2023	26/06/2023		26/06/2023	26/06/2023
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	94	108
Chlorpyriphos-methyl	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	115	123
Dimethoate	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	90	102
Fenitrothion	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	105	136
Malathion	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	103	116
Parathion	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	97	128
Ronnel	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	97	97
Coumaphos	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fenthion	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Parathion (Methyl)	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Phosalone	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	102	1	94	95	1	94	95

QUALITY CONTROL: Organophosphorus Pesticides					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	326037-31
Date extracted	-			[NT]	21	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	21	26/06/2023	26/06/2023		26/06/2023	26/06/2023
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	106	106
Chlorpyriphos-methyl	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	115	133
Dimethoate	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	106	109
Fenitrothion	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	123	130
Malathion	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	112	120
Parathion	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	126	128
Ronnel	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	104	104
Coumaphos	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Fenthion	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Parathion (Methyl)	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Phosalone	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	21	96	95	1	94	102

QUALITY CONTROL: Organophosphorus Pesticides					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	326037-82
Date extracted	-			[NT]	39	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	39	26/06/2023	26/06/2023		26/06/2023	26/06/2023
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	96	111
Chlorpyriphos-methyl	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	123	123
Dimethoate	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	98	108
Fenitrothion	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	115	132
Malathion	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	105	114
Parathion	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	117	134
Ronnel	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	99	99
Coumaphos	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Fenthion	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Parathion (Methyl)	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Phosalone	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	39	111	112	1	94	102

QUALITY CONTROL: Organophosphorus Pesticides					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	58	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	58	26/06/2023	26/06/2023		[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Fenthion	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Parathion (Methyl)	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Phosalone	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	58	102	98	4	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	71	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	71	26/06/2023	26/06/2023		[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Fenthion	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Parathion (Methyl)	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Phosalone	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	71	91	96	5	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	77	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	77	26/06/2023	26/06/2023		[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Fenthion	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Parathion (Methyl)	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Phosalone	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	77	96	96	0	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	81	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	81	26/06/2023	26/06/2023		[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Fenthion	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Parathion (Methyl)	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Phosalone	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	81	96	96	0	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	91	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	91	26/06/2023	26/06/2023		[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Fenthion	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Parathion (Methyl)	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Phosalone	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	91	95	94	1	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	326037-8
Date extracted	-			22/06/2023	1	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			26/06/2023	1	26/06/2023	26/06/2023		26/06/2023	26/06/2023
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	95	80
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	102	1	94	95	1	94	95

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	326037-31
Date extracted	-			[NT]	21	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	21	26/06/2023	26/06/2023		26/06/2023	26/06/2023
Aroclor 1016	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	126	100
Aroclor 1260	mg/kg	0.1	Org-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	21	96	95	1	94	102

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	326037-82
Date extracted	-			[NT]	39	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			[NT]	39	26/06/2023	26/06/2023		26/06/2023	26/06/2023
Aroclor 1016	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	102	100
Aroclor 1260	mg/kg	0.1	Org-021	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	39	111	112	1	94	102

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	58	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	58	26/06/2023	26/06/2023		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	[NT]	58	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	58	102	98	4	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	71	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	71	26/06/2023	26/06/2023		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	[NT]	71	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	71	91	96	5	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	77	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	77	26/06/2023	26/06/2023		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	77	96	96	0	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	81	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	81	26/06/2023	26/06/2023		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	81	96	96	0	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	91	22/06/2023	22/06/2023		[NT]	[NT]
Date analysed	-			[NT]	91	26/06/2023	26/06/2023		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	91	95	94	1	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	326037-8
Date prepared	-			23/06/2023	1	23/06/2023	23/06/2023		23/06/2023	23/06/2023
Date analysed	-			27/06/2023	1	27/06/2023	27/06/2023		27/06/2023	27/06/2023
Arsenic	mg/kg	4	Metals-020	<4	1	6	7	15	108	98
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	98	90
Chromium	mg/kg	1	Metals-020	<1	1	16	18	12	104	98
Copper	mg/kg	1	Metals-020	<1	1	10	11	10	101	106
Lead	mg/kg	1	Metals-020	<1	1	38	40	5	107	102
Mercury	mg/kg	0.1	Metals-021	<0.1	1	0.1	0.1	0	115	116
Nickel	mg/kg	1	Metals-020	<1	1	3	3	0	103	94
Zinc	mg/kg	1	Metals-020	<1	1	51	57	11	103	88

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	326037-31
Date prepared	-			[NT]	21	23/06/2023	23/06/2023		23/06/2023	23/06/2023
Date analysed	-			[NT]	21	27/06/2023	27/06/2023		27/06/2023	27/06/2023
Arsenic	mg/kg	4	Metals-020	[NT]	21	<4	<4	0	109	102
Cadmium	mg/kg	0.4	Metals-020	[NT]	21	<0.4	<0.4	0	101	95
Chromium	mg/kg	1	Metals-020	[NT]	21	7	7	0	106	100
Copper	mg/kg	1	Metals-020	[NT]	21	7	8	13	103	103
Lead	mg/kg	1	Metals-020	[NT]	21	45	60	29	110	91
Mercury	mg/kg	0.1	Metals-021	[NT]	21	<0.1	<0.1	0	120	118
Nickel	mg/kg	1	Metals-020	[NT]	21	2	2	0	106	100
Zinc	mg/kg	1	Metals-020	[NT]	21	28	30	7	106	79

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	326037-51
Date prepared	-			[NT]	39	23/06/2023	23/06/2023		23/06/2023	23/06/2023
Date analysed	-			[NT]	39	27/06/2023	27/06/2023		27/06/2023	27/06/2023
Arsenic	mg/kg	4	Metals-020	[NT]	39	18	20	11	111	91
Cadmium	mg/kg	0.4	Metals-020	[NT]	39	1	1	0	101	90
Chromium	mg/kg	1	Metals-020	[NT]	39	28	28	0	108	98
Copper	mg/kg	1	Metals-020	[NT]	39	140	120	15	103	107
Lead	mg/kg	1	Metals-020	[NT]	39	240	240	0	111	111
Mercury	mg/kg	0.1	Metals-021	[NT]	39	0.5	0.4	22	114	109
Nickel	mg/kg	1	Metals-020	[NT]	39	16	19	17	107	98
Zinc	mg/kg	1	Metals-020	[NT]	39	430	460	7	107	89

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-9	326037-82
Date prepared	-			[NT]	58	23/06/2023	23/06/2023		23/06/2023	23/06/2023
Date analysed	-			[NT]	58	27/06/2023	27/06/2023		27/06/2023	27/06/2023
Arsenic	mg/kg	4	Metals-020	[NT]	58	6	7	15	110	94
Cadmium	mg/kg	0.4	Metals-020	[NT]	58	<0.4	<0.4	0	101	86
Chromium	mg/kg	1	Metals-020	[NT]	58	12	11	9	106	92
Copper	mg/kg	1	Metals-020	[NT]	58	25	28	11	100	104
Lead	mg/kg	1	Metals-020	[NT]	58	59	64	8	108	110
Mercury	mg/kg	0.1	Metals-021	[NT]	58	0.1	0.1	0	112	127
Nickel	mg/kg	1	Metals-020	[NT]	58	4	3	29	105	#
Zinc	mg/kg	1	Metals-020	[NT]	58	83	90	8	105	#

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	326037-100
Date prepared	-			[NT]	71	23/06/2023	23/06/2023		[NT]	23/06/2023
Date analysed	-			[NT]	71	27/06/2023	27/06/2023		[NT]	27/06/2023
Arsenic	mg/kg	4	Metals-020	[NT]	71	5	7	33	[NT]	107
Cadmium	mg/kg	0.4	Metals-020	[NT]	71	<0.4	<0.4	0	[NT]	96
Chromium	mg/kg	1	Metals-020	[NT]	71	23	21	9	[NT]	102
Copper	mg/kg	1	Metals-020	[NT]	71	5	5	0	[NT]	107
Lead	mg/kg	1	Metals-020	[NT]	71	23	22	4	[NT]	108
Mercury	mg/kg	0.1	Metals-021	[NT]	71	<0.1	<0.1	0	[NT]	128
Nickel	mg/kg	1	Metals-020	[NT]	71	4	4	0	[NT]	102
Zinc	mg/kg	1	Metals-020	[NT]	71	25	25	0	[NT]	110

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	77	23/06/2023	23/06/2023		[NT]	[NT]
Date analysed	-			[NT]	77	27/06/2023	27/06/2023		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	77	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	77	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	77	9	9	0	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	77	2	2	0	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	77	14	18	25	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	77	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	77	1	1	0	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	77	9	8	12	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	81	23/06/2023	23/06/2023		[NT]	[NT]
Date analysed	-			[NT]	81	27/06/2023	27/06/2023		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	81	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	81	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	81	12	13	8	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	81	4	4	0	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	81	17	20	16	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	81	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	81	2	3	40	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	81	9	10	11	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	91	23/06/2023	23/06/2023		[NT]	[NT]
Date analysed	-			[NT]	91	27/06/2023	27/06/2023		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	91	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	91	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	91	22	20	10	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	91	23	22	4	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	91	23	24	4	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	91	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	91	28	29	4	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	91	48	50	4	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	99	23/06/2023	23/06/2023		[NT]	[NT]
Date analysed	-			[NT]	99	27/06/2023	27/06/2023		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	99	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	99	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	99	3	3	0	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	99	1	<1	0	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	99	2	2	0	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	99	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	99	<1	<1	0	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	99	2	7	111	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	[NT]
Date prepared	-			26/06/2023	[NT]	[NT]	[NT]	[NT]	26/06/2023	[NT]
Date analysed	-			26/06/2023	[NT]	[NT]	[NT]	[NT]	26/06/2023	[NT]
Total Organic Carbon (Combustion)	mg/kg	100	Inorg-128	<100	[NT]	[NT]	[NT]	[NT]	104	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			22/06/2023	[NT]	[NT]	[NT]	[NT]	22/06/2023	[NT]
Date analysed	-			23/06/2023	[NT]	[NT]	[NT]	[NT]	23/06/2023	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	109	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	109	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	114	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	113	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	110	[NT]	[NT]	[NT]	[NT]	98	[NT]
Surrogate toluene-d8	%		Org-023	110	[NT]	[NT]	[NT]	[NT]	103	[NT]
Surrogate 4-BFB	%		Org-023	107	[NT]	[NT]	[NT]	[NT]	106	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			22/06/2023	105	22/06/2023	22/06/2023		22/06/2023	[NT]
Date analysed	-			22/06/2023	105	23/06/2023	23/06/2023		22/06/2023	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	105	<50	<50	0	113	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	105	<100	<100	0	113	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	105	<100	<100	0	86	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	105	<50	<50	0	113	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	105	<100	<100	0	113	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	105	<100	<100	0	86	[NT]
Surrogate o-Terphenyl	%		Org-020	68	105	86	81	6	82	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	326037-106
Date extracted	-			22/06/2023	105	22/06/2023	22/06/2023		22/06/2023	22/06/2023
Date analysed	-			22/06/2023	105	22/06/2023	22/06/2023		22/06/2023	23/06/2023
Naphthalene	µg/L	0.2	Org-022/025	<0.2	105	<0.2	<0.2	0	71	120
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	105	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	105	<0.1	<0.1	0	70	116
Fluorene	µg/L	0.1	Org-022/025	<0.1	105	<0.1	<0.1	0	64	116
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	105	<0.1	<0.1	0	72	126
Anthracene	µg/L	0.1	Org-022/025	<0.1	105	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	105	<0.1	<0.1	0	69	126
Pyrene	µg/L	0.1	Org-022/025	<0.1	105	<0.1	<0.1	0	70	128
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	105	<0.1	<0.1	0	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	105	<0.1	<0.1	0	72	128
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	105	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	105	<0.1	<0.1	0	66	124
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	105	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	105	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	105	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	95	105	86	80	7	88	121

QUALITY CONTROL: Metals in Water - Dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date digested	-			23/06/2023	[NT]	[NT]	[NT]	[NT]	23/06/2023	[NT]
Date analysed	-			24/06/2023	[NT]	[NT]	[NT]	[NT]	24/06/2023	[NT]
Arsenic - Dissolved	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	98	[NT]
Cadmium - Dissolved	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	94	[NT]
Chromium - Dissolved	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	97	[NT]
Copper - Dissolved	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	100	[NT]
Lead - Dissolved	mg/L	0.03	Metals-020	<0.03	[NT]	[NT]	[NT]	[NT]	97	[NT]
Mercury - Dissolved	mg/L	0.0005	Metals-021	<0.0005	[NT]	[NT]	[NT]	[NT]	113	[NT]
Nickel - Dissolved	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	103	[NT]
Zinc - Dissolved	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	95	[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.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

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

Dissolved Metals: no filtered, preserved sample was received, therefore the unpreserved sample was filtered through 0.45µm filter at the lab.
Note: there is a possibility some elements may be underestimated.

TRH Soil C10-C40 NEPM
- # Percent recovery for the matrix spike is not possible to report as the high concentration of analytes in samples 326037-31ms, 51ms have caused interference.
- The PQL has been raised due to the high moisture content in samples 326037-37,39,39d,82,83, resulting in a high dilution factor.

TRH_BTEX_S_V_NEPM:The PQL has been raised due to the high moisture content in sample/s 326037-37,39,39d,82,83, resulting in a high dilution factor.

Asbestos-ID in soil: NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

Note: All samples analysed as received. However, samples 326037-29,33,37,39,41,42,49 are below the minimum recommended 500mL sample volume as per National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013.

8 metals in soil - # 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.

PAHs in Soil - The PQL has been raised due to the high moisture content in samples 326037-37, 39, 39d, 82, 83 resulting in a high dilution factor.

OC's in Soil - The PQL has been raised due to the high moisture content in samples 326037-37, 39, 39d, 82, 83 resulting in a high dilution factor.

OP's in Soil - The PQL has been raised due to the high moisture content in samples 326037-37, 39, 39d, 82, 83 resulting in a high dilution factor.

PCBs in Soil - The PQL has been raised due to the high moisture content in samples 326037-37, 39, 39d, 82, 83 resulting in a high dilution factor.

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customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	JK Environments
Attention	Todd Hore

Sample Login Details	
Your reference	E35432P, Frenchs Forest
Envirolab Reference	326037
Date Sample Received	21/06/2023
Date Instructions Received	21/06/2023
Date Results Expected to be Reported	27/06/2023

Sample Condition	
Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	104 Soil, 2 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	8
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
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Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides	PCBs in Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM - ASB-001	Misc Inorg - Soil	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water	Metals in Water - Dissolved	On Hold
BH101-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH101-0.3-0.5	✓	✓	✓				✓							
BH101-0.8-1	✓	✓	✓				✓							
BH101-1.8-1.95														✓
BH101-3-3.15														✓
BH101-4.5-4.6														✓
BH101-5.5-5.6														✓
TP102-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
TP102-0.6-0.7	✓	✓	✓				✓	✓						
TP102-1.1-1.2														✓
BH103-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH103-0.6-0.8	✓	✓	✓				✓							
BH103-1.1-1.4														✓
BH103-1.7-1.95														✓
BH104-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH104-0.1-0.3	✓	✓	✓				✓							
BH105-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH105-0.3-0.4	✓	✓	✓				✓	✓						
TP106-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
TP106-0.5-0.6														✓
BH107-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH108-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH108-0.4-0.5	✓	✓	✓				✓							
BH109-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH109-0.3-0.4														✓
TP110-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
TP110-0.2-0.3	✓	✓	✓				✓	✓						
TP110-0.7-0.8														✓
BH111-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH111-0.3-0.5	✓	✓	✓				✓							
BH112-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH112-0.5-0.7	✓	✓	✓				✓							

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides	PCBs in Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM - ASB-001	Misc Inorg - Soil	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water	Metals in Water - Dissolved	On Hold
BH113-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH113-0.15-0.35	✓	✓	✓				✓							
TP114-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
TP114-0.7-0.8	✓	✓	✓				✓							
BH115-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH115-0.1-0.4	✓	✓	✓				✓							
BH116-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH116-0.4-0.7	✓	✓	✓				✓							
BH117-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH117-0.3-0.5	✓	✓	✓				✓	✓						
BH117-0.7-1	✓	✓	✓				✓							
BH117-1.8-2														✓
BH117-3.2-3.45														✓
BH117-3.8-3.9														✓
BH117-4.5-4.6														✓
BH117-5.6-5.7														✓
BH118-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH118-0.15-0.5	✓	✓	✓				✓							
TP119-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
TP119-0.5-0.6	✓	✓	✓				✓	✓						
TP120-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
TP120-0.6-0.7	✓	✓	✓				✓	✓						
TP120-1-1.1														✓
TP121-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
TP121-0.6-0.7	✓	✓	✓				✓							
TP122-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
TP122-0.7-0.8	✓	✓	✓				✓							
TP123-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
TP123-0.4-0.5	✓	✓	✓				✓	✓						
BH124-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH124-0.7-1	✓	✓	✓				✓							
BH124-1.5-1.6														✓

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides	PCBs in Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM - ASB-001	Misc Inorg - Soil	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water	Metals in Water - Dissolved	On Hold
BH124-1.8-1.95														✓
BH124-3-3.15														✓
BH124-4-4.1														✓
BH124-5.6-5.7														✓
BH125-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
BH125-0.1-0.2	✓	✓	✓				✓							
TP126-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
TP126-0.6-0.7	✓	✓	✓				✓	✓						
TP126-1.3-1.4														✓
TP127-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓						
TP127-0.9-1	✓	✓	✓				✓	✓						
TP127-1.4-1.5														✓
SM101-0.5-0.6	✓	✓	✓	✓	✓	✓	✓	✓						
SM102-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓						
SM103-0.2-0.3	✓	✓	✓	✓	✓	✓	✓	✓						
SM104-0.35-0.45	✓	✓	✓	✓	✓	✓	✓	✓						
SM105-0.5-0.6	✓	✓	✓	✓	✓	✓	✓	✓						
SS1-0.1-0.2	✓	✓	✓	✓	✓	✓	✓		✓					
SS2-0.1-0.2	✓	✓	✓	✓	✓	✓	✓		✓					
SS3-0.1-0.2	✓	✓	✓	✓	✓	✓	✓		✓					
SS4-0.1-0.2	✓	✓	✓	✓	✓	✓	✓		✓					
SDUP1-0-0.1	✓	✓	✓	✓	✓	✓	✓							
SDUP2-0-0.1	✓	✓	✓	✓	✓	✓	✓							
SDUP3-0-0.1	✓	✓	✓	✓	✓	✓	✓							
SDUP4-0-0.1	✓	✓	✓	✓	✓	✓	✓							
SDUP5-0-0.1	✓	✓	✓	✓	✓	✓	✓							
SDUP6-0-0.1	✓	✓	✓	✓	✓	✓	✓							
SDUP7-0-0.1	✓	✓	✓	✓	✓	✓	✓							
SDUP8-0-0.1	✓	✓	✓				✓							
SDUP9-0-0.1	✓	✓	✓				✓							
SDUP10-0-0.1	✓	✓	✓				✓							
SDUP11-0-0.1	✓	✓	✓				✓							

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides	PCBs in Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM - ASB-001	Misc Inorg - Soil	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water	Metals in Water - Dissolved	On Hold
TB1	✓	✓	✓				✓							
TB2	✓	✓	✓				✓							
TB3	✓	✓	✓				✓							
TB4	✓	✓	✓				✓							
TS1	✓													
TS2	✓													
TS3	✓													
TS4	✓													
FR1 - AUGER										✓	✓	✓	✓	
FR2 - SHOVEL										✓	✓	✓	✓	

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.

SAMPLE AND CHAIN OF CUSTODY FORM

TO:	JKE Job Number: E35432P	FROM:
ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	JKE Job Number: E35432P Date Results Required: STANDARD Page: 1 of 5	JKEnvironments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Thore@jkenvironments.com.au

Location:	Frenchs Forest	Sample Preserved in Esky on Ice
Sampler:	OB	Tests Required

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 2	Combo 3	Combo 6	Combo 6a	8 Metals	PAHs	TRH/BTEX	BTEX	Asbestos (500mL)			
15/06/2023	1	BH101	0-0.1	G, A	2.1	F: Silty Clay			X						X			
15/06/2023	2	BH101	0.3-0.5	G	1.5	F: Silty Clay		X										
15/06/2023	3	BH101	0.8-1	G, A	2.3	Silty Clay		X										
15/06/2023	4	BH101	1.8-1.95	G, A	2.1	Silty Clay												
15/06/2023	5	BH101	3-3.15	G	0.2	XW Sandstone												
15/06/2023	6	BH101	4.5-4.6	G	0.3	XW Sandstone												
15/06/2023	7	BH101	5.5-5.6	G	0	XW Sandstone												
14/06/2023	8	TP102	0-0.1	G, A	2.3	F: Silty Clay			X						X			
14/06/2023	9	TP102	0.6-0.7	G, A	1.6	F: Silty Clay		X							X			
14/06/2023	10	TP102	1.1-1.2	G, A	2.2	Silty Clay												
15/06/2023	11	BH103	0-0.1	G, A	1.2	F: Silty Clay			X						X			
15/06/2023	12	BH103	0.6-0.8	G, A	1.7	Silty Clay		X										
16/06/2023	13	BH103	1.1-1.4	G	1.4	Silty Clay												
15/06/2023	14	BH103	1.7-1.95	G	0.1	XW Siltstone												
16/06/2023	15	BH104	0-0.1	G, A	2.6	F: Silty Clay			X						X			
16/06/2023	16	BH104	0.1-0.3	G, A	3	Silty Clay		X										
16/06/2023	17	BH105	0-0.1	G, A	1	F: Silty Clay			X						X			
16/06/2023	18	BH105	0.3-0.4	G, A	3.8	F: Silty Clay		X							X			
14/06/2023	19	TP106	0-0.1	G, A	2.2	F: Silty Clay			X						X			
14/06/2023	20	TP106	0.5-0.6	G, A	2.8	Silty Clay												
16/06/2023	21	BH107	0-0.1	G, A	1.4	F: Silty Clay			X						X			
16/06/2023	22	BH108	0-0.1	G, A	2.9	F: Silty Clay			X						X			
16/06/2023	23	BH108	0.4-0.5	G, A	3.4	Silty Clay		X										
16/06/2023	24	BH109	0-0.1	G, A	1.7	F: Silty Clay			X						X			
16/06/2023	25	BH109	0.3-0.4	G, A	3.3	XW Sandstone												
14/06/2023	26	TP110	0-0.1	G, A	1	F: Silty Clay			X						X			

Remarks (comments/detection limits required):	Sample Containers: G - 250mg Glass Jar G1 - 500mL Amber Glass Bottle V - BTEX Vial H - HNO3 Wash PVC A - Ziplock Asbestos Bag

Relinquished By: tHore	Date: 20/6/23	Time: 2pm	Received By: EW	Date: 20/6

ENVIROLAB
Job No: 326037.

Envirolab Se
12 Ast
Chatswood NSV
Ph: (02) 991

Date Received: 20/6/23
Time Received: 1515
Received By: EW
Temp: Cool/Ambient
Cooling: Ice/Icepack 8C
Security: Intact/Broken/Non

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:
ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	JKE Job Number: E35432P Date Results Required: STANDARD Page: 2 of 5	JKEnvironments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Thore@jkenvironments.com.au

Location: Frenchs Forest

Sampler: OB

Sample Preserved in Esky on Ice

Tests Required

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 2	Combo 3	Combo 6	Combo 6a	8 Metals	PAHs	TRH/BTEX	BTEX	Asbestos (500mL)			
14/06/2023	27	TP110	0.2-0.3	G, A	1.6	F: Silty Clay		X							X			
14/06/2023	28	TP110	0.7-0.8	G, A	1.9	Silty Clay												
16/06/2023	29	BH111	0-0.1	G, A	2	F: Silty Clay			X						X			
16/06/2023	30	BH111	0.3-0.5	G, A	3	Silty Clay		X										
16/06/2023	31	BH112	0-0.1	G, A	2.4	F: Silty Clay			X						X			
16/06/2023	32	BH112	0.5-0.7	G, A	2.6	Silty Clay		X										
16/06/2023	33	BH113	0-0.1	G, A	2	F: Silty Clay			X						X			
16/06/2023	34	BH113	0.15-0.35	G, A	2.1	Silty Clay		X										
14/06/2023	35	TP114	0-0.1	G, A	1.9	F: Silty Clay			X						X			
14/06/2023	36	TP114	0.7-0.8	G, A	1.8	Silty Clay		X										
16/06/2023	37	BH115	0-0.1	G, A	1.5	F: Silty Clay			X						X			
16/06/2023	38	BH115	0.1-0.4	G, A	1.3	Silty Clay		X										
16/06/2023	39	BH116	0-0.1	G, A	1.1	F: Silty Clay			X						X			
16/06/2023	40	BH116	0.4-0.7	G, A	1.3	Silty Clay		X										
15/06/2023	41	BH117	0-0.1	G, A	2.2	F: Silty Clay			X						X			
15/06/2023	42	BH117	0.3-0.5	G, A	2	F: Silty Clay		X							X			
15/06/2023	43	BH117	0.7-1	G, A	2	Silty Clay		X										
15/06/2023	44	BH117	1.8-2	G, A	1.5	Silty Clay												
15/06/2023	45	BH117	3.2-3.45	G	0.2	XW Siltstone												
15/06/2023	46	BH117	3.8-3.9	G	0.1	XW Siltstone												
15/06/2023	47	BH117	4.5-4.6	G	0.1	XW Siltstone												
15/06/2023	48	BH117	5.6-5.7	G	0	XW Siltstone												
16/06/2023	49	BH118	0-0.1	G, A	1.7	F: Silty Clay			X						X			
16/06/2023	50	BH118	0.15-0.5	G, A	4.5	Silty Clay		X										
14/06/2023	51	TP119	0-0.1	G, A	1	F: Silty Clay			X						X			

Remarks (comments/detection limits required):

Sample Containers:
G - 250mg Glass Jar G1 - 500mL Amber Glass Bottle
V - BTEX Vial H - HNO3 Wash PVC
A - Ziplock Asbestos Bag

Relinquished By:	Date: 20/6/23	Time: 2pm	Received By:	Date:
ttore			EW	20/6.

326037
20/6
EW.

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:
ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	JKE Job Number: E35432P Date Results Required: STANDARD Page: 3 of 5	JKEnvironments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Thore@jkenvironments.com.au

Location:	Frenchs Forest						Sample Preserved in Esky on Ice												
Sampler:	OB						Tests Required												
Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 2	Combo 3	Combo 6	Combo 6a	8 Metals	PAHs	TRH/BTEX	BTEX	Asbestos (500mL)			
14/06/2023	52	TP119	0.5-0.6	G, A	2	F: Silty Clay		X							X			
14/06/2023	53	TP120	0-0.1	G, A	1.3	F: Silty Clay			X						X			
14/06/2023	54	TP120	0.6-0.7	G, A	1.2	F: Silty Clay		X							X			
14/06/2023	55	TP120	1-1.1	G, A	2.1	Silty Clay												
14/06/2023	56	TP121	0-0.1	G, A	1.1	F: Silty Clay			X						X			
14/06/2023	57	TP121	0.6-0.7	G, A	0.9	Silty Clay		X										
14/06/2023	58	TP122	0-0.1	G, A	1.1	F: Silty Clay			X						X			
14/06/2023	59	TP122	0.7-0.8	G, A	0.9	Silty Clay		X										
14/06/2023	60	TP123	0-0.1	G, A	1.4	F: Silty Clay			X						X			
14/06/2023	61	TP123	0.4-0.5	G, A	1.2	F: Silty Clay		X							X			
15/06/2023	62	BH124	0-0.1	G, A	2.8	F: Silty Clay			X						X			
15/06/2023	63	BH124	0.7-1	G, A	2.7	Silty Clay		X										
15/06/2023	64	BH124	1.5-1.6	G	0	Silty Clay												
15/06/2023	65	BH124	1.8-1.95	G	0	Silty Clay												
15/06/2023	66	BH124	3-3.15	G	0	Silty Clay												
15/06/2023	67	BH124	4-4.1	G	0.2	XW Siltstone												
15/06/2023	68	BH124	5.6-5.7	G	0.3	XW Siltstone												
14/06/2023	69	BH125	0-0.1	G, A	1.1	F: Silty Clay			X						X			
14/06/2023	70	BH125	0.1-0.2	G, A	1	Silty Clay		X										
14/06/2023	71	TP126	0-0.1	G, A	1.4	F: Silty Clay			X						X			
14/06/2023	72	TP126	0.6-0.7	G, A	2.2	F: Silty Clay		X							X			
14/06/2023	73	TP126	1.3-1.4	G, A	2.9	Silty Clay												
14/06/2023	74	TP127	0-0.1	G, A	1.4	F: Silty Clay			X						X			
14/06/2023	75	TP127	0.9-1	G, A	1.4	F: Silty Sandy Clay		X							X			
14/06/2023	76	TP127	1.4-1.5	G, A	1.7	Silty Clay												

Remarks (comments/detection limits required):		Sample Containers: G - 250mg Glass Jar G1 - 500mL Amber Glass Bottle V - BTEX Vial H - HNO3 Wash PVC A - Ziplock Asbestos Bag		
Relinquished By: Thore	Date: 20/6/23	Time: 2pm	Received By: EW 326037.	Date: 20/6

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:
ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	JKE Job Number: E35432P Date Results Required: STANDARD Page: 4 of 5	JKEnvironments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Thore@jkenvironments.com.au

Location: Frenchs Forest

Sampler: OB

Sample Preserved in Esky on Ice

Tests Required

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 2	Combo 3	Combo 6	Combo 6a	8 Metals	PAHs	TRH/BTEX	BTEX	Asbestos (500mL)	TOC		
15/06/2023	77	SM101	0.5-0.6	G, A	1.3	F: Silty Clay			X						X			
15/06/2023	78	SM102	0.4-0.5	G, A	1.4	Silty Clay			X						X			
15/06/2023	79	SM103	0.2-0.3	G, A	1.5	F: Silty Clay			X						X			
15/06/2023	80	SM104	0.35-0.45	G, A	1	F: Silty Clay			X						X			
15/06/2023	81	SM105	0.5-0.6	G, A	1.6	F: Silty Clay			X						X			
16/06/2023	82	SS1	0.1-0.2	G, A	0.5	Silty Clay			X							X		
16/06/2023	83	SS2	0.1-0.2	G, A	1	Silty Clay			X							X		
15/06/2023	84	SS3	0.1-0.2	G, A	0.5	Silty Clay			X							X		
16/06/2023	85	SS4	0.1-0.2	G, A	0.3	Silty Clay			X							X		
14/06/2023	86	SDUP1	0-0.1	G	2.3	F: Silty Clay			X									
14/06/2023	87	SDUP2	0-0.1	G	2.2	F: Silty Clay			X									
14/06/2023	88	SDUP3	0-0.1	G	1	F: Silty Clay			X									
14/06/2023	89	SDUP4	0-0.1	G	1.9	F: Silty Clay			X									
14/06/2023	90	SDUP5	0-0.1	G	1	F: Silty Clay			X									
14/06/2023	91	SDUP6	0-0.1	G	1.3	F: Silty Clay			X									
14/06/2023	92	SDUP7	0-0.1	G	1.1	F: Silty Clay			X									
14/06/2023	93	SDUP8	0-0.1	G	1.1	F: Silty Clay		X										
14/06/2023	94	SDUP9	0-0.1	G	1.4	F: Silty Clay		X										
14/06/2023	95	SDUP10	0-0.1	G	1.1	F: Silty Clay		X										
14/06/2023	96	SDUP11	0-0.1	G	1.4	F: Silty Clay		X										
16/06/2023	97	TB1	-	G	-			X										
16/06/2023	98	TB2	-	G	-			X										
16/06/2023	99	TB3	-	G	-			X										
16/06/2023	100	TB4	-	G	-			X										
16/06/2023	101	TS1	-	V	-									X				

Remarks (comments/detection limits required):

Sample Containers:
G - 250mg Glass Jar G1 - 500mL Amber Glass Bottle
V - BTEX Vial H - HNO3 Wash PVC
A - Ziplock Asbestos Bag

Relinquished By:	Date:	Time:	Received By:	Date:
Thore	20/6/23	2pm	EW 326037.	20/6

SAMPLE AND CHAIN OF CUSTODY FORM

TO: ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	JKE Job Number: E35432P Date Results Required: STANDARD Page: 5 of 5	**FROM:** JKEnvironments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Thore@jkenvironments.com.au

Location:	Frenchs Forest	Sample Preserved in Esky on Ice
Sampler:	OB	Tests Required

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 2	Combo 3	Combo 6	Combo 6a	8 Metals	PAHs	TRH/BTEX	BTEX	Asbestos (500mL)			
16/06/2026	102	TS2	-	V										X				
16/06/2029	103	TS3	-	V										X				
16/06/2032	104	TS4	-	V										X				
16/06/2023	105	FR1 - AUGER	-	G1, V, H		Water		X										
16/06/2023	106	FR2 - SHOVEL	-	G1, V, H		Water		X										

Remarks (comments/detection limits required):	Sample Containers: G - 250mg Glass Jar G1 - 500mL Amber Glass Bottle V - BTEX Vial H - HNO3 Wash PVC A - Ziplock Asbestos Bag

Relinquished By: Thore	Date: 20/6/23	Time: 2pm	Received By: EW 326037	Date: 20/6.

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CERTIFICATE OF ANALYSIS 326037-A

Client Details

Client	JK Environments
Attention	Todd Hore
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E35432P, Frenchs Forest**
Number of Samples	additional analysis
Date samples received	21/06/2023
Date completed instructions received	28/06/2023

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	06/07/2023
Date of Issue	06/07/2023

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diego Bigolin, Inorganics Supervisor
Loren Bardwell, Development Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil						
Our Reference		326037-A-22	326037-A-39	326037-A-49	326037-A-82	326037-A-83
Your Reference	UNITS	BH108	BH116	BH118	SS1	SS2
Depth		0-0.1	0-0.1	0-0.1	0.1-0.2	0.1-0.2
Date Sampled		16/06/2023	16/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/07/2023	03/07/2023	03/07/2023	03/07/2023	03/07/2023
Date analysed	-	03/07/2023	03/07/2023	03/07/2023	03/07/2023	03/07/2023
pH 1:5 soil:water	pH Units	6.2	4.9	6.1	3.8	4.1

Misc Inorg - Soil		
Our Reference		326037-A-85
Your Reference	UNITS	SS4
Depth		0.1-0.2
Date Sampled		16/06/2023
Type of sample		Soil
Date prepared	-	03/07/2023
Date analysed	-	03/07/2023
pH 1:5 soil:water	pH Units	5.5

CEC						
Our Reference		326037-A-22	326037-A-39	326037-A-49	326037-A-82	326037-A-83
Your Reference	UNITS	BH108	BH116	BH118	SS1	SS2
Depth		0-0.1	0-0.1	0-0.1	0.1-0.2	0.1-0.2
Date Sampled		16/06/2023	16/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/07/2023	06/07/2023	06/07/2023	06/07/2023	06/07/2023
Date analysed	-	06/07/2023	06/07/2023	06/07/2023	06/07/2023	06/07/2023
Exchangeable Ca	meq/100g	13	IS	23	0.4	1.6
Exchangeable K	meq/100g	0.4	IS	0.3	0.2	0.2
Exchangeable Mg	meq/100g	1.8	IS	2.8	0.6	2.1
Exchangeable Na	meq/100g	0.1	IS	0.3	<0.1	0.3
Cation Exchange Capacity	meq/100g	15	IS	26	1.2	4.1

CEC		
Our Reference		326037-A-85
Your Reference	UNITS	SS4
Depth		0.1-0.2
Date Sampled		16/06/2023
Type of sample		Soil
Date prepared	-	06/07/2023
Date analysed	-	06/07/2023
Exchangeable Ca	meq/100g	8.2
Exchangeable K	meq/100g	0.2
Exchangeable Mg	meq/100g	2.1
Exchangeable Na	meq/100g	0.3
Cation Exchange Capacity	meq/100g	11

Clay 50-120g						
Our Reference		326037-A-22	326037-A-39	326037-A-49	326037-A-82	326037-A-83
Your Reference	UNITS	BH108	BH116	BH118	SS1	SS2
Depth		0-0.1	0-0.1	0-0.1	0.1-0.2	0.1-0.2
Date Sampled		16/06/2023	16/06/2023	16/06/2023	16/06/2023	16/06/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/06/2023	30/06/2023	30/06/2023	30/06/2023	30/06/2023
Date analysed	-	03/07/2023	03/07/2023	03/07/2023	03/07/2023	03/07/2023
Clay in soils <2µm	% (w/w)	43	INS	31	42	22

Clay 50-120g		
Our Reference		326037-A-85
Your Reference	UNITS	SS4
Depth		0.1-0.2
Date Sampled		16/06/2023
Type of sample		Soil
Date prepared	-	30/06/2023
Date analysed	-	03/07/2023
Clay in soils <2µm	% (w/w)	30

Method ID	Methodology Summary
AS1289.3.6.3	Particle Size Distribution using in house method INORG-107 by way of sieving and/or hydrometer sedimentation testing. Clay fraction at <2µm reported.
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.
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-OES analytical finish.

QUALITY CONTROL: Misc Inorg - Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			03/07/2023	[NT]	[NT]	[NT]	[NT]	03/07/2023	[NT]
Date analysed	-			03/07/2023	[NT]	[NT]	[NT]	[NT]	03/07/2023	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	99	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			06/07/2023	22	06/07/2023	06/07/2023		06/07/2023	[NT]
Date analysed	-			06/07/2023	22	06/07/2023	06/07/2023		06/07/2023	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	22	13	13	0	112	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	22	0.4	0.4	0	93	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	22	1.8	1.8	0	115	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	22	0.1	0.1	0	94	[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.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

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

#39 Insufficient sample to conduct Clay analysis.

Samples were out of the recommended holding time for this analysis pH in soil.

CEC - Sample results annotated as IS (insufficient sample) in the CoA

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SAMPLE RECEIPT ADVICE

Client Details	
Client	JK Environments
Attention	Todd Hore

Sample Login Details	
Your reference	E35432P, Frenchs Forest
Envirolab Reference	326037-A
Date Sample Received	21/06/2023
Date Instructions Received	28/06/2023
Date Results Expected to be Reported	05/07/2023

Sample Condition	
Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	additional analysis
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	8
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

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Sample ID	Misc Inorg - Soil	CEC	Clay 50-120g	On Hold
BH101-0-0.1				✓
BH101-0.3-0.5				✓
BH101-0.8-1				✓
BH101-1.8-1.95				✓
BH101-3-3.15				✓
BH101-4.5-4.6				✓
BH101-5.5-5.6				✓
TP102-0-0.1				✓
TP102-0.6-0.7				✓
TP102-1.1-1.2				✓
BH103-0-0.1				✓
BH103-0.6-0.8				✓
BH103-1.1-1.4				✓
BH103-1.7-1.95				✓
BH104-0-0.1				✓
BH104-0.1-0.3				✓
BH105-0-0.1				✓
BH105-0.3-0.4				✓
TP106-0-0.1				✓
TP106-0.5-0.6				✓
BH107-0-0.1				✓
BH108-0-0.1	✓	✓	✓	
BH108-0.4-0.5				✓
BH109-0-0.1				✓
BH109-0.3-0.4				✓
TP110-0-0.1				✓
TP110-0.2-0.3				✓
TP110-0.7-0.8				✓
BH111-0-0.1				✓
BH111-0.3-0.5				✓
BH112-0-0.1				✓
BH112-0.5-0.7				✓

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Sample ID	Misc Inorg - Soil	CEC	Clay 50-120g	On Hold
BH113-0-0.1				✓
BH113-0.15-0.35				✓
TP114-0-0.1				✓
TP114-0.7-0.8				✓
BH115-0-0.1				✓
BH115-0.1-0.4				✓
BH116-0-0.1	✓	✓	✓	
BH116-0.4-0.7				✓
BH117-0-0.1				✓
BH117-0.3-0.5				✓
BH117-0.7-1				✓
BH117-1.8-2				✓
BH117-3.2-3.45				✓
BH117-3.8-3.9				✓
BH117-4.5-4.6				✓
BH117-5.6-5.7				✓
BH118-0-0.1	✓	✓	✓	
BH118-0.15-0.5				✓
TP119-0-0.1				✓
TP119-0.5-0.6				✓
TP120-0-0.1				✓
TP120-0.6-0.7				✓
TP120-1-1.1				✓
TP121-0-0.1				✓
TP121-0.6-0.7				✓
TP122-0-0.1				✓
TP122-0.7-0.8				✓
TP123-0-0.1				✓
TP123-0.4-0.5				✓
BH124-0-0.1				✓
BH124-0.7-1				✓
BH124-1.5-1.6				✓

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Sample ID	Misc Inorg - Soil	CEC	Clay 50-120g	On Hold
BH124-1.8-1.95				✓
BH124-3-3.15				✓
BH124-4-4.1				✓
BH124-5.6-5.7				✓
BH125-0-0.1				✓
BH125-0.1-0.2				✓
TP126-0-0.1				✓
TP126-0.6-0.7				✓
TP126-1.3-1.4				✓
TP127-0-0.1				✓
TP127-0.9-1				✓
TP127-1.4-1.5				✓
SM101-0.5-0.6				✓
SM102-0.4-0.5				✓
SM103-0.2-0.3				✓
SM104-0.35-0.45				✓
SM105-0.5-0.6				✓
SS1-0.1-0.2	✓	✓	✓	
SS2-0.1-0.2	✓	✓	✓	
SS3-0.1-0.2				✓
SS4-0.1-0.2	✓	✓	✓	
SDUP1-0-0.1				✓
SDUP2-0-0.1				✓
SDUP3-0-0.1				✓
SDUP4-0-0.1				✓
SDUP5-0-0.1				✓
SDUP6-0-0.1				✓
SDUP7-0-0.1				✓
SDUP8-0-0.1				✓
SDUP9-0-0.1				✓
SDUP10-0-0.1				✓
SDUP11-0-0.1				✓

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Sample ID	Misc Inorg - Soil	CEC	Clay 50-120g	On Hold
TB1				✓
TB2				✓
TB3				✓
TB4				✓
TS1				✓
TS2				✓
TS3				✓
TS4				✓
FR1 - AUGER				✓
FR2 - SHOVEL				✓

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.

Ming To

Subject: FW: 326037

Ref: 326037-A.
TAT: Standard.
Due: 05/07/2023
MT.

From: Todd Hore <THore@jkenvironments.com.au>
Sent: Wednesday, June 28, 2023 9:11 AM
To: Aileen Hie <AHie@envirolab.com.au>
Subject: 326037

CAUTION: This email originated from outside of the organisation. Do not act on instructions, click links or open attachments unless you recognise the sender and know the content is authentic and safe.

Hey Aileen,
Can you please undertake the following additional analyses for E35432PH, Frenchs Forest:

- 22 326037-22 – pH, CEC, clay content
- 39 326037-39 – pH, CEC, clay content
- 49 326037-49 – pH, CEC, clay content
- 82 326037-82 – pH, CEC, clay content
- 83 326037-83 – pH, CEC, clay content
- 85 326037-85 – pH, CEC, clay content

Please undertake the above on a standard turnaround.

Regards
Todd Hore
Senior Associate | Environmental Engineer

T: +612 9888 5000
D: 0414 863 307
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JKEnvironments

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CERTIFICATE OF ANALYSIS 326446

Client Details

Client	JK Environments
Attention	Todd Hore
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E35432P**
Number of Samples	12 Water
Date samples received	26/06/2023
Date completed instructions received	26/06/2023

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	03/07/2023
Date of Issue	30/06/2023

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Results Approved By
Hannah Nguyen, Metals Supervisor
Kyle Gavrily, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water						
Our Reference		326446-1	326446-2	326446-3	326446-4	326446-5
Your Reference	UNITS	MW101	MW117	MW124	SW1	SW2
Date Sampled		23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Date analysed	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	106	110	109	110	107
Surrogate toluene-d8	%	96	97	96	97	97
Surrogate 4-BFB	%	106	105	107	105	106

vTRH(C6-C10)/BTEXN in Water						
Our Reference		326446-6	326446-7	326446-8	326446-9	326446-10
Your Reference	UNITS	SW3	SW4	GWDUP1	SWDUP1	TB1
Date Sampled		23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Date analysed	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	111	110	105	111	107
Surrogate toluene-d8	%	95	97	96	95	96
Surrogate 4-BFB	%	107	105	107	105	105

vTRH(C6-C10)/BTEXN in Water		
Our Reference		326446-11
Your Reference	UNITS	TS1
Date Sampled		23/06/2023
Type of sample		Water
Date extracted	-	27/06/2023
Date analysed	-	28/06/2023
Benzene	µg/L	107%
Toluene	µg/L	109%
Ethylbenzene	µg/L	117%
m+p-xylene	µg/L	105%
o-xylene	µg/L	110%
Surrogate Dibromofluoromethane	%	110
Surrogate toluene-d8	%	105
Surrogate 4-BFB	%	97

svTRH (C10-C40) in Water						
Our Reference		326446-1	326446-2	326446-3	326446-4	326446-5
Your Reference	UNITS	MW101	MW117	MW124	SW1	SW2
Date Sampled		23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Date analysed	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	85	82	85	85	86

svTRH (C10-C40) in Water						
Our Reference		326446-6	326446-7	326446-8	326446-9	326446-10
Your Reference	UNITS	SW3	SW4	GWDUP1	SWDUP1	TB1
Date Sampled		23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Date analysed	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	160	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	160	<50	<50	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	200	<100	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	200	<50	<50	<50	<50
Surrogate o-Terphenyl	%	84	87	80	86	72

PAHs in Water						
Our Reference		326446-1	326446-2	326446-3	326446-4	326446-5
Your Reference	UNITS	MW101	MW117	MW124	SW1	SW2
Date Sampled		23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Date analysed	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Naphthalene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	101	95	94	95	95

PAHs in Water						
Our Reference		326446-6	326446-7	326446-8	326446-9	326446-10
Your Reference	UNITS	SW3	SW4	GWDUP1	SWDUP1	TB1
Date Sampled		23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	27/06/2023	27/06/2023	27/06/2023	27/06/2023	27/06/2023
Date analysed	-	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Naphthalene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	102	86	83	92	83

HM in water - dissolved						
Our Reference		326446-1	326446-2	326446-3	326446-4	326446-5
Your Reference	UNITS	MW101	MW117	MW124	SW1	SW2
Date Sampled		23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023
Date analysed	-	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023
Arsenic-Dissolved	µg/L	<1	<1	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	1	2	<1	<1	<1
Copper-Dissolved	µg/L	<1	1	<1	7	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	11	2	2	<1	3
Zinc-Dissolved	µg/L	68	18	35	32	40

HM in water - dissolved						
Our Reference		326446-6	326446-7	326446-8	326446-9	326446-10
Your Reference	UNITS	SW3	SW4	GWDUP1	SWDUP1	TB1
Date Sampled		23/06/2023	23/06/2023	23/06/2023	23/06/2023	23/06/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023
Date analysed	-	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023
Arsenic-Dissolved	µg/L	5	3	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	0.2	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	2	<1	1	<1	<1
Copper-Dissolved	µg/L	1	3	<1	7	<1
Lead-Dissolved	µg/L	5	3	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	24	4	11	<1	<1
Zinc-Dissolved	µg/L	120	140	67	34	<1

Method ID	Methodology Summary
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements.
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-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-023	Water samples are analysed directly 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.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			27/06/2023	1	27/06/2023	27/06/2023		27/06/2023	[NT]
Date analysed	-			28/06/2023	1	28/06/2023	28/06/2023		28/06/2023	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	1	<10	<10	0	118	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	1	<10	<10	0	118	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	115	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	120	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	120	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	113	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	120	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	105	1	106	107	1	101	[NT]
Surrogate toluene-d8	%		Org-023	99	1	96	96	0	103	[NT]
Surrogate 4-BFB	%		Org-023	104	1	106	105	1	98	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	10	27/06/2023	27/06/2023		[NT]	[NT]
Date analysed	-			[NT]	10	28/06/2023	28/06/2023		[NT]	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	[NT]	10	<10	<10	0	[NT]	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	[NT]	10	<10	<10	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	[NT]	10	<2	<2	0	[NT]	[NT]
o-xylene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Naphthalene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	[NT]	10	107	96	11	[NT]	[NT]
Surrogate toluene-d8	%		Org-023	[NT]	10	96	95	1	[NT]	[NT]
Surrogate 4-BFB	%		Org-023	[NT]	10	105	107	2	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	326446-2
Date extracted	-			27/06/2023	1	27/06/2023	27/06/2023		27/06/2023	27/06/2023
Date analysed	-			28/06/2023	1	28/06/2023	28/06/2023		28/06/2023	28/06/2023
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	1	<50	<50	0	95	119
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	1	<100	<100	0	89	109
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	1	<100	<100	0	71	95
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	1	<50	<50	0	95	119
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	1	<100	<100	0	89	109
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	1	<100	<100	0	71	95
Surrogate o-Terphenyl	%		Org-020	104	1	85	83	2	79	82

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			27/06/2023	1	27/06/2023	27/06/2023		27/06/2023	[NT]
Date analysed	-			28/06/2023	1	28/06/2023	28/06/2023		28/06/2023	[NT]
Naphthalene	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	92	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	98	[NT]
Fluorene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	[NT]
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	95	[NT]
Anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	99	[NT]
Pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	101	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	103	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	111	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	88	1	101	93	8	104	[NT]

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	326446-2
Date prepared	-			29/06/2023	1	29/06/2023	29/06/2023		29/06/2023	29/06/2023
Date analysed	-			29/06/2023	1	29/06/2023	29/06/2023		29/06/2023	29/06/2023
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	97	100
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	101	104
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	1	2	67	95	95
Copper-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	94	96
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	101	95
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	87	108
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	11	11	0	98	99
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	68	68	0	89	89

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.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

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

SAMPLE RECEIPT ADVICE

Client Details	
Client	JK Environments
Attention	Todd Hore

Sample Login Details	
Your reference	E35432P
Envirolab Reference	326446
Date Sample Received	26/06/2023
Date Instructions Received	26/06/2023
Date Results Expected to be Reported	03/07/2023

Sample Condition	
Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	12 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	10
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
extra TB vial received.

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

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 Water	svTRH (C10-C40) in Water	PAHs in Water	HM in water - dissolved	On Hold
MW101	✓	✓	✓	✓	
MW117	✓	✓	✓	✓	
MW124	✓	✓	✓	✓	
SW1	✓	✓	✓	✓	
SW2	✓	✓	✓	✓	
SW3	✓	✓	✓	✓	
SW4	✓	✓	✓	✓	
GWDUP1	✓	✓	✓	✓	
SWDUP1	✓	✓	✓	✓	
TB1	✓	✓	✓	✓	
TS1	✓				
TB					✓

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.

SAMPLE AND CHAIN OF CUSTODY FORM

TO: ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	JKE Job Number: E35432P Date Results Required: STANDARD Page: 1 of 1	**FROM:** JKEnvironments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Thore@jkenvironments.com.au

Location: Frenchs Forest

Sampler: OB

Sample Preserved in Esky on Ice

Tests Required

Date Sampled	Lab Ref:	Sample Number	Sample Containers	PID	Sample Description	Combo 2	Combo 3L	VOCs	pH / EC	8 Metals	PAHs	TRH/BTEX	BTEX	Combo 3			
23/06/2023	1	MW101	G1, V, H, PVC		Water		X										
23/06/2023	2	MW117	G1, V, H, PVC		Water		X										
23/06/2023	3	MW124	G1, V, H, PVC		Water		X										
23/06/2023	4	SW1	G1, V, H, PVC		Water		X										
23/06/2023	5	SW2	G1, V, H, PVC		Water		X										
23/06/2023	6	SW3	G1, V, H, PVC		Water		X										
23/06/2023	7	SW4	G1, V, H, PVC		Water		X										
23/06/2023	8	GWDUP1	G1, V, H		Water		X										
23/06/2023	~~9~~	GWDUP2	G1, V, H		Water		X										
23/06/2023	9	SWDUP1	G1, V, H		Water		X										
23/06/2023	~~11~~	SWDUP2	G1, V, H		Water		X										
23/06/2023	10	TB1	G1, V, H		Water									X			
23/06/2023	11	TS1	V		Water								X				
	12	TB extra SD															

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
ENVIROLAB
Job No: 326446
Date Received: 26/6
Time Received: 1448
Received By: SD
Temp: Cool/Ambient
Cooling: Ice/Icepack 10°C
Security: Intact/Broken/None

Remarks (comments/detection limits required):

All analysis PQLs to ANZECC (2000) Detection Limits Please
Please forward GWDUP2 and SWDUP2 to Melbourne

Sample Containers:
G1 - 500mL Amber Glass Bottle
V - BTEX Vial H - HNO3 Wash PVC
PVC - HDPE Plastic Bottles

Relinquished By: OB	Date: 26/06/23	Time: 1pm	Received By: Sherry	Date: 26/6/23

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 38162

Client Details

Client	JK Environments
Attention	Todd Hore
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E35432P**
Number of Samples	2 Water
Date samples received	28/06/2023
Date completed instructions received	28/06/2023

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	04/07/2023
Date of Issue	04/07/2023

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Suk Lee, Organic Supervisor
Tara White, Metals Team Leader
Tianna Milburn, Senior Chemist

Authorised By
Pamela Adams, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water			
Our Reference		38162-1	38162-2
Your Reference	UNITS	GWDUP2	SWDUP2
Date Sampled		23/06/2023	23/06/2023
Type of sample		Water	Water
Date extracted	-	01/07/2023	01/07/2023
Date analysed	-	01/07/2023	01/07/2023
TRH C_6 - C_9	µg/L	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10
TRH C_6 -C_{10} less BTEX (F1)	µg/L	<10	<10
Benzene	µg/L	<1	<1
Toluene	µg/L	<1	<1
Ethylbenzene	µg/L	<1	<1
m+p-xylene	µg/L	<2	<2
o-xylene	µg/L	<1	<1
Naphthalene	µg/L	<1	<1
Total +ve Xylenes	µg/L	<1	<1
Total BTEX in water	µg/L	<1	<1
Surrogate Dibromofluoromethane	%	104	103
Surrogate toluene-d8	%	98	98
Surrogate 4-BFB	%	92	92

TRH Water(C10-C40) NEPM			
Our Reference		38162-1	38162-2
Your Reference	UNITS	GWDUP2	SWDUP2
Date Sampled		23/06/2023	23/06/2023
Type of sample		Water	Water
Date extracted	-	29/06/2023	29/06/2023
Date analysed	-	29/06/2023	29/06/2023
TRH C_{10} - C_{14}	µg/L	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50
Surrogate o-Terphenyl	%	83	94

PAHs in Water			
Our Reference		38162-1	38162-2
Your Reference	UNITS	GWDUP2	SWDUP2
Date Sampled		23/06/2023	23/06/2023
Type of sample		Water	Water
Date extracted	-	29/06/2023	29/06/2023
Date analysed	-	29/06/2023	29/06/2023
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
Total +ve PAH's	µg/L	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5
Surrogate p-Terphenyl-d_{14}	%	83	92

HM in water - dissolved			
Our Reference		38162-1	38162-2
Your Reference	UNITS	GWDUP2	SWDUP2
Date Sampled		23/06/2023	23/06/2023
Type of sample		Water	Water
Date prepared	-	30/06/2023	30/06/2023
Date analysed	-	30/06/2023	30/06/2023
Arsenic-Dissolved	μg/L	<1	<1
Cadmium-Dissolved	μg/L	<0.2	<0.2
Chromium-Dissolved	μg/L	2	<1
Copper-Dissolved	μg/L	<2	<2
Lead-Dissolved	μg/L	<1	<1
Nickel-Dissolved	μg/L	2	3
Zinc-Dissolved	μg/L	24	55
Mercury-Dissolved	μg/L	<0.05	<0.05

Method ID	Methodology Summary
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-022 ICP-MS	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements.
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-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-023	Water samples are analysed directly 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. 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.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			01/07/2023	[NT]	[NT]	[NT]	[NT]	01/07/2023	[NT]
Date analysed	-			01/07/2023	[NT]	[NT]	[NT]	[NT]	01/07/2023	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	101	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	101	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	80	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	91	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	111	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	112	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	113	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Surrogate Dibromofluoromethane	%		Org-023	99	[NT]	[NT]	[NT]	[NT]	102	[NT]
Surrogate toluene-d8	%		Org-023	98	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate 4-BFB	%		Org-023	91	[NT]	[NT]	[NT]	[NT]	95	[NT]

QUALITY CONTROL: TRH Water(C10-C40) NEPM					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			29/06/2023	[NT]	[NT]	[NT]	[NT]	29/06/2023	[NT]
Date analysed	-			29/06/2023	[NT]	[NT]	[NT]	[NT]	29/06/2023	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	96	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	118	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	120	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	96	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	118	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	120	[NT]
Surrogate o-Terphenyl	%		Org-020	94	[NT]	[NT]	[NT]	[NT]	77	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			29/06/2023	[NT]	[NT]	[NT]	[NT]	29/06/2023	[NT]
Date analysed	-			29/06/2023	[NT]	[NT]	[NT]	[NT]	29/06/2023	[NT]
Naphthalene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	87	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Fluorene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Benzo(b,j&k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d_{14}	%		Org-022/025	92	[NT]	[NT]	[NT]	[NT]	86	[NT]

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	38162-2
Date prepared	-			30/06/2023	1	30/06/2023	30/06/2023		30/06/2023	30/06/2023
Date analysed	-			30/06/2023	1	30/06/2023	30/06/2023		30/06/2023	30/06/2023
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	1	<1	1	0	95	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	1	<0.2	<0.2	0	94	[NT]
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	1	2	2	0	94	[NT]
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	1	<2	<2	0	93	[NT]
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	1	<1	<1	0	89	[NT]
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	1	2	2	0	94	[NT]
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	1	24	25	4	96	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	1	<0.05	<0.05	0	105	106

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.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

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

METALS: The PQL has been raised for Cadmium and Copper due to the sample matrix requiring dilution.

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	JK Environments
Attention	Todd Hore

Sample Login Details	
Your reference	E35432P
Envirolab Reference	38162
Date Sample Received	28/06/2023
Date Instructions Received	28/06/2023
Date Results Expected to be Reported	05/07/2023

Sample Condition	
Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	2 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	9.1
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Nil

Please direct any queries to:

Pamela Adams	Chris De Luca
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: cdeluca@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Water	TRH Water(C10-C40) NEPM	PAHs in Water	HM in water - dissolved
GWDUP2	✓	✓	✓	✓
SWDUP2	✓	✓	✓	✓

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.

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:
ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	JKE Job Number: E35432P Date Results Required: STANDARD Page: 1 of 1	JKEnvironments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Thore@jkenvironments.com.au

Location: Frenchs Forest

Sampler: OB

Sample Preserved in Esky on Ice

Tests Required

Date Sampled	Lab Ref:	Sample Number	Sample Containers	PID	Sample Description	Combo 2	Combo 3L	VOCs	pH / EC	8 Metals	PAHs	TRH/BTEX	BTEX	Combo 3			
23/06/2023	1	MW101	G1, V, H, PVC		Water		X										
23/06/2023	2	MW117	G1, V, H, PVC		Water		X										
23/06/2023	3	MW124	G1, V, H, PVC		Water		X										
23/06/2023	4	SW1	G1, V, H, PVC		Water		X										
23/06/2023	5	SW2	G1, V, H, PVC		Water		X										
23/06/2023	6	SW3	G1, V, H, PVC		Water		X										
23/06/2023	7	SW4	G1, V, H, PVC		Water		X										
23/06/2023	8	GWDUP1	G1, V, H		Water		X										
1 23/06/2023	~~9~~	GWDUP2	G1, V, H		Water		X										
23/06/2023	9	SWDUP1	G1, V, H		Water		X										
2 23/06/2023	~~11~~	SWDUP2	G1, V, H		Water		X										
23/06/2023	10	TB1	G1, V, H		Water									X			
23/06/2023	11	TS1	V		Water								X				
	12	TB extra SD															

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 326426
Date Received: 26/6
Time Received: 1448
Received By: SD
Temp: Cool/Ambient
Cooling: Ice/Icepack 10.2
Security: Intact/Broken/None

Remarks (comments/detection limits required):

All analysis PQLs to ANZECC (2000) Detection Limits Please
Please forward GWDUP2 and SWDUP2 to Melbourne

Sample Containers:
G1 - 500mL Amber Glass Bottle
V - BTEX Vial H - HNO3 Wash PVC
PVC - HDPE Plastic Bottles

Relinquished By: OB	Date: 26/06/23	Time: 1pm	Received By:	Date: 26/6/23

Relinquished by : ELS SYD
Da Hyun Lee
27/6/23 @ 1140

Envirolab Services
25 Research Drive
Croydon South VIC 3136
Ph: (03) 9763 2500
Job No: 88162
Date Received: 28/6/23
Time Received: 12:00pm
Received By: AG
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

9.1°C

Appendix F: Report Explanatory Notes

QA/QC Definitions

The QA/QC terms used in this report are defined below. The definitions are in accordance with US EPA publication SW-846, entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (1994)[13] methods and those described in *Environmental Sampling and Analysis, A Practical Guide,* (1991)[14]. The NEPM (2013) is consistent with these documents.

A. Practical Quantitation Limit (PQL), Limit of Reporting (LOR) & Estimated Quantitation Limit (EQL)

These terms all refer to the concentration above which results can be expressed with a minimum 95% confidence level. The laboratory reporting limits are generally set at ten times the standard deviation for the Method Detection Limit for each specific analyte. For the purposes of this report the LOR, PQL, and EQL are considered to be equivalent.

When assessing laboratory data it should be borne in mind that values at or near the PQL have two important limitations: *"The uncertainty of the measurement value can approach, and even equal, the reported value. Secondly, confirmation of the analytes reported is virtually impossible unless identification uses highly selective methods. These issues diminish when reliably measurable amounts of analytes are present. Accordingly, legal and regulatory actions should be limited to data at or above the reliable detection limit*" (Keith, 1991).

B. Precision

The degree to which data generated from repeated measurements differ from one another due to random errors. Precision is measured using the standard deviation or Relative Percent Difference (RPD).

C. Accuracy

Accuracy is a measure of the agreement between an experimental result and the true value of the parameter being measured (i.e. the proximity of an averaged result to the true value, where all random errors have been statistically removed). The assessment of accuracy for an analysis can be achieved through the analysis of known reference materials or assessed by the analysis of surrogates, field blanks, trip spikes and matrix spikes. Accuracy is typically reported as percent recovery.

D. Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is primarily dependent upon the design and implementation of the sampling program. Representativeness of the data is partially ensured by the avoidance of contamination, adherence to sample handing and analysis protocols and use of proper chain-of-custody and documentation procedures.

E. Completeness

Completeness is a measure of the number of valid measurements in a data set compared to the total number of measurements made and overall performance against DQIs. The following information is assessed for completeness:

- Chain-of-custody forms;
- Sample receipt form;
- All sample results reported;
- All blank data reported;

[13] US EPA, (1994). *SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* (US EPA SW-846)
[14] Keith., H, (1991). *Environmental Sampling and Analysis, A Practical Guide*

- All laboratory duplicate and RPDs calculated;
- All surrogate spike data reported;
- All matrix spike and lab control spike (LCS) data reported and RPDs calculated;
- Spike recovery acceptable limits reported; and
- NATA stamp on reports.

F. <u>Comparability</u>

Comparability is the evaluation of the similarity of conditions (e.g. sample depth, sample homogeneity) under which separate sets of data are produced. Data comparability checks include a bias assessment that may arise from the following sources:

- Collection and analysis of samples by different personnel; Use of different techniques;
- Collection and analysis by the same personnel using the same methods but at different times; and
- Spatial and temporal changes (due to environmental dynamics).

G. <u>Blanks</u>

The purpose of laboratory and field blanks is to check for artefacts and interferences that may arise during sampling, transport and analysis.

H. <u>Matrix Spikes</u>

Samples are spiked with laboratory grade standards to detect interactive effects between the sample matrix and the analytes being measured. Matrix Spikes are reported as a percent recovery and are prepared for 1 in every 20 samples. Sample batches that contain less than 20 samples may be reported with a Matrix Spike from another batch. The percent recovery is calculated using the formula below. Acceptable recovery limits are 70% to 130%.

$$\frac{(\text{Spike Sample Result} - \text{Sample Result}) \times 100}{\text{Concentration of Spike Added}}$$

I. <u>Surrogate Spikes</u>

Samples are spiked with a known concentration of compounds that are chemically related to the analyte being investigated but unlikely to be detected in the environment. The purpose of the Surrogate Spikes is to check the accuracy of the analytical technique. Surrogate Spikes are reported as percent recovery.

J. <u>Duplicates</u>

Laboratory duplicates measure precision, expressed as Relative Percent Difference. Duplicates are prepared from a single field sample and analysed as two separate extraction procedures in the laboratory. The RPD is calculated using the formula where D1 is the sample concentration and D2 is the duplicate sample concentration:

$$\frac{(D1 - D2) \times 100}{\{(D1 + D2)/2\}}$$

Appendix G: Data (QA/QC) Evaluation

Data (QA/QC) Evaluation

A. INTRODUCTION

This Data (QA/QC) Evaluation forms part of the validation process for the DQOs documented in Section 5.1 of this report. Checks were made to assess the data in terms of precision, accuracy, representativeness, comparability and completeness. These 'PARCC' parameters are referred to collectively as DQIs and are defined in the Report Explanatory Notes attached in the report appendices.

1. Field and Laboratory Considerations

The quality of the analytical data produced for this project has been considered in relation to the following:

- Sample collection, storage, transport and analysis;
- Laboratory PQLs;
- Field QA/QC results; and
- Laboratory QA/QC results.

2. Field QA/QC Samples and Analysis

The results for the field QA/QC samples are detailed in the laboratory summary tables (Table S7 and Table G4) attached to the investigation report and are discussed in the subsequent sections of this Data (QA/QC) Evaluation report. A summary of the field QA/QC samples collected and analysed for this investigation is provided in the following table:

Sample Type	Number Analysed	Frequency (of Sample Type)
Intra-laboratory duplicate (soil)	11	Approximately 18% of primary samples
Intra-laboratory duplicate (groundwater)	1	Approximately 33% of primary samples
Inter-laboratory duplicate (groundwater)	1	As above
Intra-laboratory duplicate (surface water)	1	Approximately 25% of primary samples
Inter-laboratory duplicate (surface water)	1	As above
Trip spikes Soil Water	 4 1	One per day of soil and water sampling to demonstrate adequacy of preservation, storage and transport methods
Trip blanks Soil Water	 4 1	One per day of soil and water sampling to demonstrate adequacy of storage and transport methods

Sample Type	Number Analysed	Frequency (of Sample Type)
Rinsate (soil SPT)	2	Two for the investigation (one hand auger and one shovel) to demonstrate adequacy of decontamination methods

3. Data Assessment Criteria

JKE adopted the following criteria for assessing the field and laboratory QA/QC analytical results:

Field Duplicates

Acceptable targets for precision of field duplicates in this report will be 30% or less, consistent with NEPM (2013). RPD failures will be considered qualitatively on a case-by-case basis taking into account factors such as the concentrations used to calculate the RPD (i.e. RPD exceedance where concentrations are close to the PQL are typically not as significant as those where concentrations are reported at least five or 10 times the PQL), sample type, collection methods and the specific analyte where the RPD exceedance was reported.

Field/Trip Blanks and Rinsates

Acceptable targets for field blank and rinsate samples in this report will be less than the PQL for organic analytes. Metals will be considered on a case-by-case basis with regards to typical background concentrations in soils and published drinking water guidelines for waters.

Trip Spikes

Acceptable targets for trip spike samples in this report will be 70% to 130%.

Laboratory QA/QC

The suitability of the laboratory data is assessed against the laboratory QA/QC criteria which is outlined in the laboratory reports. These criteria were developed and implemented in accordance with the laboratory's NATA accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

A summary of the acceptable limits adopted by the primary laboratory (Envirolab) is provided below:

RPDs

- Results that are <5 times the PQL, any RPD is acceptable; and
- Results >5 times the PQL, RPDs between 0-50% are acceptable.

Laboratory Control Samples (LCS) and Matrix Spikes

- 70-130% recovery acceptable for metals and inorganics;
- 60-140% recovery acceptable for organics; and
- 10-140% recovery acceptable for VOCs.

Surrogate Spikes

- 60-140% recovery acceptable for general organics; and
- 10-140% recovery acceptable for VOCs.

Method Blanks

- All results less than PQL.

B. <u>DATA EVALUATION</u>

1. <u>Sample Collection, Storage, Transport and Analysis</u>

Samples were collected by trained field staff in accordance with our standard sampling procedures. Field sampling procedures were designed to be consistent with relevant guidelines, including NEPM (2013) and other guidelines made under the CLM Act 1997.

Appropriate sample preservation, handling and storage procedures were adopted. Laboratory analysis was undertaken within specified holding times in generally accordance with Schedule B(3) of NEPM (2013) and the laboratory NATA accredited methodologies. Envirolab noted that the asbestos results were reported to be consistent with the recommendations in NEPM (2013), however this level of reporting is outside the scope of their NATA accreditation. In the absence of other available analytical methods for asbestos, this was found to be acceptable for the purpose of this investigation.

JKE note that the temperature on receipt of soil samples was reported to be up to 10°C. JKE understand that the temperature is measured at the laboratory using an infrared temperature probe by scanning the outside of the sample container (i.e. one sample jar/container at the time of registering the samples). This procedure is not considered to be robust as there is a potential for the outside of the jar to warm to ambient temperature, or at least to increase from that of the internal contents, relatively quickly. On this basis, JKE is of the opinion that the temperatures reported on the Sample Receipts are unlikely to be reliable or representative of the overall batch. This is further supported by the trip spike recovery results (discussed further below) which reported adequate recovery in the range of 91% to 117%.

Review of the project data also indicated that:

- COC documentation was adequately maintained;
- Sample receipt advice documentation was provided for all sample batches;
- All analytical results were reported; and
- Consistent units were used to report the analysis results.

2. <u>Laboratory PQLs</u>

Appropriate PQLs were adopted for the analysis and all PQLs were below the SAC, with the exception of the anthracene PQL for groundwater analysis which was 10 times greater than the ecological SAC. In light of the PAH concentrations reported for soil and groundwater, JKE is of the opinion that this is not significant, and it does not affect the quality of the dataset as a whole or the outcome of the investigation.

3. Field QA/QC Sample Results

Field Duplicates

Due to a scheduling error, all soil field duplicates were sent as intra-laboratory duplicates and none were analysed as inter-laboratory duplicates. Due to the consistency of results across the site and generally low contaminant concentrations, this is considered unlikely to have impacted the reliability of the data set.

The results indicated that field precision was acceptable. RPD non-conformances were reported for some analytes as discussed below:

- Elevated RPDs were reported for several heavy metals in SDUP101/TP102 (0-0.1m);
- Elevated RPDs were reported for TRH F2 to F2 and several heavy metals in SDUP102/TP106 (0-0.1m);
- Elevated RPDs were reported for several PAH compounds and several heavy metals in SDUP103/TP126 (0-0.1m);
- Elevated RPDs were reported for TRH F3, benzo(g,h,i)perylene, chromium and nickel in SDUP104/TP110 (0-0.1m);
- Elevated RPDs were reported for TRH F3 and F4, several PAH compounds and nickel in SDUP105/TP114 (0-0.1m);
- Elevated RPDs were reported for TRH F3 and Benzo(a)anthracene in SDUP106/TP127 (0-0.1m);
- Elevated RPDs were reported for TRH F3 and F4 in SDUP107/TP120 (0-0.1m);
- Elevated RPDs were reported for TRH F3, several PAH compounds, arsenic and chromium in SDUP108/TP119 (0-0.1m);
- Elevated RPDs were reported for TRH F3 and F4, arsenic and chromium in SDUP109/TP121 (0-0.1m);
- Elevated RPDs were reported for TRH F4, Benzo(a)pyrene and several heavy metals in SDUP110/TP123 (0-0.1m);
- Elevated RPDs were reported for TRH F3 and several PAH compounds in SDUP111/TP122 (0-0.1m);
- Elevated RPDs were reported for toluene in GWDUP1/MW101;
- Elevated RPDs were reported for copper in GWDUP2/MW117; and
- Elevated RPDs were reported for zinc in SWDUP2/SW2.

Values outside the acceptable limits in soil samples have been attributed to sample heterogeneity and the difficulties associated with obtaining homogenous duplicate samples of heterogeneous matrices, and also results that are close to the PQLs. As both the primary and duplicate sample results were less than the SAC, the exceedances are not considered to have had an adverse impact on the data set as a whole.

Values outside the acceptable limits in water samples have been attributed to very low concentrations of analytes in the samples. With the exception of zinc, both the primary and duplicate sample results were less than the SAC and, therefore, the exceedances are not considered to have had an adverse impact on the data set as a whole.

Field/Trip Blanks

During the investigation, four soil trip blanks and one water trip blank were placed in the esky during sampling and transported back to the laboratory. The results in the water blank were all less than the PQLs, therefore cross contamination between samples that may have significance for data validity did not occur.

The soil trip blank analysis results were all less than the PQLs with the exception of trace concentrations of chromium, copper, lead and zinc with reported concentrations of up to 14mg/kg. Low level metals concentrations are typical in washed sand which is utilised as blank material. In JKE's experience, the concentrations reported were consistent with background concentrations in a sand matrix and were not indicative of cross-contamination. On this basis, cross contamination between samples that may have significance for data validity did not occur.

We note that soil blanks were all dated the same date. This is due to the fact all four blanks were taken to site on each day of fieldwork. This is not considered to impact the reliability of the blank data.

Rinsates
All results were below the PQL, with the exception of light fraction TRH and copper.

The detectable concentration of light fraction TRH is most likely attributed to trihalomethanes. These compounds are breakdown products from the chlorination process and are common in potable water at the concentration reported (the Australian drinking water guideline for total trihalomethanes is 250µg/L). Similarly, the trace concentrations of copper are likely to be associated with potable water. The results were consistent across both rinsate samples, which further supported the source of TRHs being the potable water itself.

This indicated that cross-contamination artefacts associated with sampling equipment were not present and the potential for cross-contamination to have occurred was low.

Trip Spikes
The results ranged from 91% to 117% and indicated that field preservation methods were appropriate.

We note that soil spikes were all dated the same date. This is due to the fact all four spikes were taken to site on each day of fieldwork. Although, not ideal for establishing possible preservation issues on any particular day, the consistency of the spike data has indicated that preservation methods were appropriate on all days of fieldwork.

4. Laboratory QA/QC

The analytical methods implemented by the laboratory were performed in accordance with their NATA accreditation and were consistent with Schedule B(3) of NEPM (2013). The frequency of data reported for the laboratory QA/QC (i.e. duplicates, spikes, blanks, LCS) was considered to be acceptable for the purpose of this investigation.

A review of the laboratory QA/QC data identified the following minor non-conformances:
- Percent recovery for the matrix spike for TRH was not possible to report as the high concentration of analytes in samples BH112 (0-0.1m) and TP119 (0-0.1m) caused interference;
- The PQL for some BTEX compounds was raised due to the high moisture content in samples BH115 (0-0.1m), BH116 (0-0.1m), SS1 and SS2, resulting in a high dilution factor;
- Several asbestos samples were below the minimum recommended volume of 500mL;

- Percent recovery for heavy metal analysis was not possible to report in some matrix spikes due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the Laboratory Control Sample (LCS);
- The PQL for some PAHs, OCP, OPP and PCBs were raised due to the high moisture content in samples BH115 (0-0.1m), BH116 (0-0.1m), SS1 and SS2, resulting in a high dilution factor;
- Insufficient sample quantity was provided to conduct Clay content and CEC analysis on the BH116 (0-0.1m) sample; and
- Samples scheduled for additional analysis were out of the recommended holding time for the analysis of pH in soil.

The above non-conformances are considered to be sporadic and minor and are unlikely to have impacted the reliability of the data set.

C. DATA QUALITY SUMMARY

JKE is of the opinion that the data are adequately precise, accurate, representative, comparable and complete to serve as a basis for interpretation to achieve the investigation objectives.

Non-conformances were reported for some field QA/QC samples and laboratory QA/QC analysis. These non-conformances were considered to be sporadic and minor, and were not considered to be indicative of systematic sampling or analytical errors. On this basis, these non-conformances are not considered to materially impact the report findings.

The water and 'sediment' data collected for the DSI is considered to provide a snapshot of conditions and is not likely to be comparable over time as the site receives runoff/stormwater from up-gradient areas. Contaminant characteristics in the sediment load within stormwater, together with the stormwater quality itself, is expected to vary.

Appendix H: Field Work Documents

JKEnvironments

WATER QUALITY METER CALIBRATION FORM

Client:	Complete Urban		
Project:	Public Park Upgrade		
Location:	Brick Pit Reserve, FRENCHS FOREST, NSW		
Job Number:	E35432P		
DISSOLVED OXYGEN			
Make: YSI		Model: 4	
Date of calibration: 19/6/23		Name of Calibrator: OB	
Span value: 70% to 130%			
Measured value: 102 %			
Measured reading Acceptable (Yes/No): Yes			
pH			
Make: YSI		Model: 4	
Date of calibration: 19/6/23		Name of Calibrator: OB	
Buffer 1: Theoretical pH = 7.01± 0.01		Expiry date: 19/12/23	Lot No: PK 100123
Buffer 2: Theoretical pH = 4.01± 0.01		Expiry date: 05/24	Lot No: CD030223
Measured reading of Buffer 1: 7.01			
Measured reading of Buffer 2: 4.11			
Slope:		Measured reading Acceptable (Yes/No): Yes	
EC			
Make: YSI		Model: 4	
Date: 19/6/23	Name of Calibrator: OB		Temperature: 16 °C
Calibration solution: AR		Expiry date: 02/25	Lot No: 1C195A8
Theoretical conductivity at temperature (see solution container): 1170 µS/cm			
Measured conductivity: 1185 µS/cm		Measured reading Acceptable (Yes/No): Yes	
REDOX			
Make: YSI		Model: 4	
Date of calibration: 19/6/23		Name of Calibrator: OB	
Calibration solution: HANNA		Expiry date: 09/27	Lot No: 8169
Theoretical redox value: 240mV			
Measured redox reading: 239.1 mV		Measured reading Acceptable (Yes/No): Yes	

JKEnvironments

Client:	Complete Urban	**Job No.:**	E35432P
Project:	Public Park Upgrade	**Well No.:**	mw101
Location:	Brick Pit Reserve, FRENCHS FOREST, NSW	**Depth (m):**	6

WELL FINISH DETAILS

	Gatic Cover ☒	Standpipe ☐	Other (describe) ☐

WELL DEVELOPMENT DETAILS

Method:	Development	**SWL – Before (m):**	4.62 m
Date:	19/6/23	**Time – Before:**	09:31
Undertaken By:	OB	**SWL – After (m):**	5.50
Total Vol. Removed:	2.5L	**Time – After:**	09:46
PID Reading (ppm):	15.3		

Comments:

DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
1	17.2	0.7	1257	5.42	220.7
2	17.4	11.7	1209	5.36	204.2
2.5	17.2	1.5	1190	5.56	172.5

well pumped effectively dry

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO), Steady State Achieved (YES / NO)

YSI Used: 4

high silt load. brown, turbid, slow recharge

Tested By:	OB	**Remarks:** - Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductiveity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
Date Tested:	19/6/23	
Checked By:	TH	
Date:	7/7/23	

JKEnvironments

Client:	Complete Urban	Job No.:	E35432P
Project:	Public Park Upgrade	Well No.:	MW117
Location:	Brick Pit Reserve, FRENCHS FOREST, NSW	Depth (m):	6

WELL FINISH DETAILS

Gatic Cover [x] Standpipe [ ] Other (describe) [ ]

WELL DEVELOPMENT DETAILS

Method:	Development	SWL – Before (m):	4.32
Date:	19/6/23	Time – Before:	10:24
Undertaken By:	OB	SWL – After (m):	~~[illegible]~~ 5.50
Total Vol. Removed:	3 L	Time – After:	10:45
PID Reading (ppm):	3.6		

Comments:

DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
1	16.2	6.0	263.1	4.84	129.0
2	17.4	5.1	487.9	4.67	135.1
3	17.8	7.8	517	4.74	136.8

well pumped effectively dry

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO), Steady State Achieved (YES / NO)

YSI Used: 4

low silt load, low turbidity, slow recharge

Tested By:	OB	**Remarks:**
Date Tested:	19/6/23	- Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductiveity less than 10% and SWL stable/not in drawdown
Checked By:	TH	- Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
Date:	7/7/23	

JKEnvironments

Client:	Complete Urban	Job No.:	E35432P
Project:	Public Park Upgrade	Well No.:	mw124
Location:	Brick Pit Reserve, FRENCHS FOREST, NSW	Depth (m):	6

WELL FINISH DETAILS

Gatic Cover ☒ Standpipe ☐ Other (describe) ☐

WELL DEVELOPMENT DETAILS

Method:	Development	SWL – Before (m):	2.50
Date:	19/6/23	Time – Before:	11:15
Undertaken By:	OB	SWL – After (m):	5.65
Total Vol. Removed:	10 L	Time – After:	11:36
PID Reading (ppm):	1.6		

Comments:

DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
1	16.3	6.4	761	5.26	147.4
3	17.0	8.4	776	5.23	149.5
7	17.7	7.9	779	5.18	150.3
10	17.8	10.0	785	5.16	150.9

well pumped effectively dry

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO), Steady State Achieved (YES / NO)

YSI Used: 4

L-M silt load, L-M turbidity, slow recharge

Tested By:	19/6/23	**Remarks:** - Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductiveity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
Date Tested:	OB	
Checked By:	TH	
Date:	7/7/23	

JKEnvironments

WATER QUALITY METER CALIBRATION FORM

Client:	Complete Urban		
Project:	Public Park Upgrade		
Location:	Brick Pit Reserve, FRENCHS FOREST, NSW		
Job Number:	E35432P		
DISSOLVED OXYGEN			
Make: YSI		Model: 5	
Date of calibration: 23/6/23		Name of Calibrator: OB	
Span value: 70% to 130%			
Measured value: 104 %			
Measured reading Acceptable (Yes/No): Yes			
pH			
Make: YSI		Model: 5	
Date of calibration: 23/6/23		Name of Calibrator: OB	
Buffer 1: Theoretical pH = 7.01± 0.01		Expiry date: 19/12/23	Lot No: DK100123
Buffer 2: Theoretical pH = 4.01± 0.01		Expiry date: 05/24	Lot No: CB2665
Measured reading of Buffer 1: 6.95			
Measured reading of Buffer 2: 3.91			
Slope:		Measured reading Acceptable (Yes/No): Yes	
EC			
Make: YSI		Model: 5	
Date: 23/6/23	Name of Calibrator: OB		Temperature: 16.7 °C
AR Calibration solution: Conductivity solution		Expiry date: 02/25	Lot No: CJ210223
Theoretical conductivity at temperature (see solution container): 1197 µS/cm			
Measured conductivity: 1302 µS/cm		Measured reading Acceptable (Yes/No): Yes	
REDOX			
Make: YSI		Model: 5	
Date of calibration: 23/6/23		Name of Calibrator: OB	
HANNA Calibration solution: ORP Test Solution		Expiry date: 09/27	Lot No: 8169
Theoretical redox value: 240 240mV			
Measured redox reading: 236.6 mV		Measured reading Acceptable (Yes/No): Yes	

JKEnvironments

Client:	Complete Urban	Job No.:	E35432P
Project:	Public Park Upgrade	Well No.:	MW101
Location:	Brick Pit Reserve, FRENCHS FOREST, NSW	Depth (m):	6

WELL FINISH

X	Gatic Cover		Standpipe		Other (describe)

WELL PURGE DETAILS:

Method:	Peristaltic Pump	SWL – Before:	4.66
Date:	23/6/23	Time – Before:	07:42
Undertaken By:	OB	Total Vol Removed:	0.6 L
Pump Program No:	Low	PID (ppm):	28.4

PURGING / SAMPLING MEASUREMENTS

Time (min)	SWL (m)	Vol (L)	Notes	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
07 59	4.72	0.25		16.8	3.2	594	5.17	-22.9
08:02	4.76	0.30	(pump on slowest setting)	15.8	3.1	623	5.19	-60.9
08:05	4.77	0.35		15.6	3.5	1059	5.21	-80.9
08 08	4.77	0.40		15.1	3.9	1058	5.57	-113.9
08:11	4.78	0.45		14.5	3.4	1058	5.71	-130.9
08:14	4.79	0.50		14.5	3.4	1049	5.25	-112.9
08:17	4.80	0.55		14.5	3.3	1041	5.16	-109.3
08.20	4.82	0.60		14.4	3.2	1037	5.15	-110.1

Start sampling - threat of losing water

well pumped dry

SWL 5.50m

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO), Steady State Achieved (YES / NO)

↳ organic smell / fuel like smell

Sampling Containers Used: 4 x glass amber, 4 x BTEX vials, 2 x HNO3 plastic, x H2SO4 plastic, x unpreserved plastic

YSI used: 5 slow recharge, 1-m silt load. GWDUP1

Tested By: Todd Hore	**Remarks:**
Date Tested: 23/6/23	- Steady state conditions
Checked By: TH	- difference in the pH less than 0.2 units, difference in conductivity less than 10%
Date: 7/7/23	10% and SWL stable/not in drawdown

JKEnvironments

Client:	Complete Urban	**Job No.:**	E35432P
Project:	Public Park Upgrade	**Well No.:**	SW1
Location:	Brick Pit Reserve, FRENCHS FOREST, NSW	**Depth (m):**	–

WELL FINISH

	Gatic Cover		Standpipe	✓	Other (describe) surface water

WELL PURGE DETAILS:

Method:	Grab	**SWL – Before:**	–
Date:	23/6/23	**Time – Before:**	–
Undertaken By:	OB	**Total Vol Removed:**	0.5L
Pump Program No:	–	**PID (ppm):**	–

PURGING / SAMPLING MEASUREMENTS

Time (min)	SWL (m)	Vol (L)	Notes	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
9:00	–	0.5		12.9	13.7	99.8	6.85	-128.8

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO), Steady State Achieved (YES / NO)

Sampling Containers Used: 4 x glass amber, 4 x BTEX vials, 2 x HNO3 plastic, x H2SO4 plastic, x unpreserved plastic

YSI used: 5   L-m silt load   SW DUP1

Tested By: Todd Hore	**Remarks:**
Date Tested:	- Steady state conditions
Checked By: TH	- difference in the pH less than 0.2 units, difference in conductivity less than 10%
Date: 7/7/23	10% and SWL stable/not in drawdown

JKEnvironments

Client:	Complete Urban	Job No.:	E35432P
Project:	Public Park Upgrade	Well No.:	SW2
Location:	Brick Pit Reserve, FRENCHS FOREST, NSW	Depth (m):	—

WELL FINISH

	Gatic Cover		Standpipe	x	Other (describe)

Surface grab

WELL PURGE DETAILS:

Method:	Grab	SWL – Before:	—
Date:	23/6/23	Time – Before:	9:30
Undertaken By:	OB	Total Vol Removed:	0.5
Pump Program No:	–	PID (ppm):	—

PURGING / SAMPLING MEASUREMENTS

Time (min)	SWL (m)	Vol (L)	Notes	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
9.30am	/	0.5		11.2	4.9	207.8	5.23	-131.1

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO), Steady State Achieved (YES / NO)

faint organic smell

Sampling Containers Used: 4 x glass amber, 4 x BTEX vials, 2 x HNO3 plastic, x H2SO4 plastic, x unpreserved plastic

YSI used: 5

SW PUP2

Tested By: Oisin Butler		**Remarks:**
Date Tested:	23/6/23	- Steady state conditions - difference in the pH less than 0.2 units, difference in conductivity less than 10% 10% and SWL stable/not in drawdown
Checked By:	TH	
Date:	7/7/23	

JKEnvironments

Client:	Complete Urban	Job No.:	E35432P
Project:	Public Park Upgrade	Well No.:	SW3
Location:	Brick Pit Reserve, FRENCHS FOREST, NSW	Depth (m):	0.1

WELL FINISH

	Gatic Cover		Standpipe	x	Other (describe)

surface grab

WELL PURGE DETAILS:

Method:	Surface Grab	SWL – Before:	/
Date:	23/6/23	Time – Before:	/
Undertaken By:	DS	Total Vol Removed:	0.5
Pump Program No:	/	PID (ppm):	–

PURGING / SAMPLING MEASUREMENTS

Time (min)	SWL (m)	Vol (L)	Notes	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
10.14am		0.5		13.3	3.1	243.7	6.06	-17.4
			No surface water	present	– dug	0.1m	down	

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO), Steady State Achieved (YES / NO)

faint organic / fuel smell

Sampling Containers Used: 2 x glass amber, 2 x BTEX vials, 1 x HNO3 plastic, x H2SO4 plastic, x unpreserved plastic

YSI used: 5 moderate – high silt load

Tested By: Todd Hore		**Remarks:**
Date Tested:	23/3/23	- Steady state conditions
Checked By:	TH	- difference in the pH less than 0.2 units, difference in conductivity less than 10%
Date:	7/7/23	10% and SWL stable/not in drawdown

JKEnvironments

Client:	Complete Urban	**Job No.:**	**E35432P**
Project:	Public Park Upgrade	**Well No.:**	MW117
Location:	Brick Pit Reserve, FRENCHS FOREST, NSW	**Depth (m):**	6

WELL FINISH

✓	**Gatic Cover**		**Standpipe**		**Other (describe)**

WELL PURGE DETAILS:

Method:	Peristaltic Pump	**SWL – Before:**	4.52
Date:	23/6/23	**Time – Before:**	10.35
Undertaken By:	OR	**Total Vol Removed:**	1.4l
Pump Program No:	Low	**PID (ppm):**	2.8

PURGING / SAMPLING MEASUREMENTS

Time (min)	SWL (m)	Vol (L)	Notes	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
10:42 (0)	4.73	0.6		17.5	4.5	439.2	4.08	-108.5
10:45 (3)	4.74	0.7		16.9	6.5	432.2	4.14	-124.0
10:48 (6)	4.78	0.9	(pump slowed)	16.0	5.5	426.9	4.13	-131.4
10:51 (9)	4.81	1.0		16.1	5.2	426.3	4.14	-136.2
10:54 (12)	4.82	1.1	(pump on slowest sett.)	16.1	5.7	423.8	4.15	-138.7
10:57 (15)	4.82	1.2		16.0	5.5	421.8	4.16	-142.9
11:00 (18)	4.83	1.3		15.8	4.6	421.2	4.15	-143.2
11:03 (21)	4.84	1.4		15.7	4.4	420.9	4.15	144.4

Start sampling - threat of losing water

SWL 5.20m after

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO), Steady State Achieved (YES / NO)

Sampling Containers Used: 4 **x glass amber,** 4 **x BTEX vials,** 2 **x HNO3 plastic, x H2SO4 plastic, x unpreserved plastic**

YSI used: 5 l-m silt load, slow recharge GWDUP2

Tested By: Todd Hore	**Remarks:**
Date Tested: 23/6/23	- Steady state conditions
Checked By: **TH**	- difference in the pH less than 0.2 units, difference in conductivity less than 10% 10% and SWL stable/not in drawdown
Date: **7/7/23**	

JKEnvironments

Client:	Complete Urban	**Job No.:**	E35432P
Project:	Public Park Upgrade	**Well No.:**	SW4
Location:	Brick Pit Reserve, FRENCHS FOREST, NSW	**Depth (m):**	0.1

WELL FINISH

	Gatic Cover		Standpipe	✓	Other (describe)

surface grab

WELL PURGE DETAILS:

Method:	Grab	**SWL – Before:**	–
Date:	23/6/23	**Time – Before:**	12:06
Undertaken By:	OB	**Total Vol Removed:**	0.5
Pump Program No:	–	**PID (ppm):**	–

PURGING / SAMPLING MEASUREMENTS

Time (min)	SWL (m)	Vol (L)	Notes	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
12:06	–	0.5		14.2	7.5	299.6	5.26	-47.8

no surface water in area

dug 0.1m below surface to water

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO), Steady State Achieved (YES / NO)

Sampling Containers Used: 2 **x glass amber,** 2 **x BTEX vials,** 1 **x HNO3 plastic, x H2SO4 plastic, x unpreserved plastic**

YSI used: 5 M-H silt load

Tested By: Todd Hore		**Remarks:**
Date Tested:	23/6/23	- Steady state conditions - difference in the pH less than 0.2 units, difference in conductivity less than 10% 10% and SWL stable/not in drawdown
Checked By:	**TH**	
Date:	**7/7/23**	

JKEnvironments

Client:	Complete Urban	**Job No.:**	E35432P
Project:	Public Park Upgrade	**Well No.:**	MW124
Location:	Brick Pit Reserve, FRENCHS FOREST, NSW	**Depth (m):**	6

WELL FINISH

X	**Gatic Cover**		**Standpipe**		**Other (describe)**

WELL PURGE DETAILS:

Method:	Peristaltic Pump	**SWL – Before:**	2.98
Date:	23/6/23	**Time – Before:**	12.36
Undertaken By:	OB	**Total Vol Removed:**	1.7
Pump Program No:	low	**PID (ppm):**	0.5

PURGING / SAMPLING MEASUREMENTS

Time (min)	SWL (m)	Vol (L)	Notes	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
12.50 (0)	3.21	1.0		18.6	17.1	792	4.59	-122.6
12.53 (3)	3.24	1.1		20.0	5.3	833	4.70	-125.6
12.56 (6)	3.28	1.2	pump at lowest setting	19.4	5.5	832	4.65	-123.9
12.59 (9)	3.29	1.3		19.5	4.5	827	4.67	-143.2
1.02 (12)	3.29	1.4		19.9	4.3	839	4.69	-149.8
1.05 (15)	3.30	1.5		20.4	4.3	849	4.66	-147.3
1.08 (18)	3.30	1.6		20.9	4.6	856	4.70	-145.3
1.11 (21)	3.30	1.7		21.5	4.8	866	4.70	-140.7
			steady state achieved start sampling					

Comments: Odours (YES / NO), NAPL/PSH (YES / NO) Sheen (YES / NO) Steady State Achieved (YES / NO)

Sampling Containers Used: 2 **x glass amber,** 2 **x BTEX vials,** 1 **x HNO3 plastic, x H2SO4 plastic, x unpreserved plastic**

YSI used: 5 low silt load

Tested By: Todd Hore	**Remarks:**
Date Tested: 23/6/23	- Steady state conditions
Checked By: **TH**	- difference in the pH less than 0.2 units, difference in conductivity less than 10% 10% and SWL stable/not in drawdown
Date: **7/7/23**	

Appendix I: Guidelines and Reference Documents

Acid Sulfate Soils Management Advisory Committee (ASSMAC), (1998). Acid Sulfate Soils Manual

Australian and New Zealand Environment Conservation Council (ANZECC), (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality

Canadian Council of Ministers of the Environment, (1999). Canadian soil quality guidelines for the protection of environmental and human health: Benzo(a)Pyrene (1997)

CRC Care, (2011). Technical Report No. 10 – Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document

Contaminated Land Management Act 1997 (NSW)

Department of Land and Water Conservation, (1997). 1:25,000 Acid Sulfate Soil Risk Map Series

Managing Land Contamination, Planning Guidelines SEPP55 – Remediation of Land (1998)

National Health and Medical Research Council (NHMRC), (2021). National Water Quality Management Strategy, Australian Drinking Water Guidelines 2011

NSW Department of Environment and Conservation, (2007). Guidelines for the Assessment and Management of Groundwater Contamination

NSW EPA, (2014). Waste Classification Guidelines - Part 1: Classifying Waste

NSW EPA, (2015). Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997

NSW EPA, (2017). Guidelines for the NSW Site Auditor Scheme, 3rd Edition

NSW EPA, (2020). Consultants Reporting on Contaminated Land, Contaminated Land Guidelines

NSW EPA, (2022). *Sampling design part 1 - application*, Contaminated Land Guidelines

National Environment Protection Council (NEPC), (2013). National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)

Olszowy, H., Torr, P., and Imray, P., (1995). Trace Element Concentrations in Soils from Rural and Urban Areas of Australia. Contaminated Sites Monograph Series No. 4. Department of Human Services and Health, Environment Protection Agency, and South Australian Health Commission

Protection of the Environment Operations Act 1997 (NSW)

State Environmental Planning Policy (Resilience and Hazards) 2021 (NSW)

World Health Organisation (WHO), (2008). Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality

Western Australia Department of Health, (2021). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia

Appendix J: SAQP

REPORT TO

COMPLETE URBAN

ON

SAMPLING, ANALYSIS AND QUALITY PLAN (SAQP)

FOR

DETAILED SITE INVESTIGATION (DSI)

AT

BRICK PIT RESERVE, BANTRY ROAD, FRENCHS FOREST, NSW

Date: 13 June 2023
Ref: E35432PW-SAQP

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DOCUMENT REVISION RECORD

Report Reference	Report Status	Report Date
E35432PW-SAQP	Final Report	13 June 2023

This Report (which includes all attachments and annexures) has been prepared by JKE for the Client, and is intended for the use only by that Client.

This Report has been prepared pursuant to a contract between JKE and the Client and is therefore subject to:
a) JKE's proposal in respect of the work covered by the Report;
b) The limitations defined in the client's brief to JKE; and
c) The terms of contract between JKE and the Client, including terms limiting the liability of JKE.

If the Client, or any person, provides a copy of this Report to any third party, such third party must not rely on this Report, except with the express written consent of JKE which, if given, will be deemed to be upon the same terms, conditions, restrictions and limitations as apply by virtue of (a), (b), and (c) above.

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Abbreviations

Asbestos Fines/Fibrous Asbestos	**AF/FA**
Asbestos Containing Material	**ACM**
Area of Environmental Concern	**AEC**
Australian Height Datum	**AHD**
Acid Sulfate Soil	**ASS**
Below Ground Level	**BGL**
Bureau of Meteorology	**BOM**
Benzene, Toluene, Ethylbenzene, Xylene	**BTEX**
Cation Exchange Capacity	**CEC**
Contaminated Land Management	**CLM**
Contaminant(s) of Potential Concern	**CoPC**
Chain of Custody	**COC**
Conceptual Site Model	**CSM**
Development Application	**DA**
Before You Dig Australia	**BYDA**
Data Quality Indicator	**DQI**
Data Quality Objective	**DQO**
Detailed Site Investigation	**DSI**
Environment Protection Authority	**EPA**
Fibre Cement Fragment(s)	**FCF**
International Organisation of Standardisation	**ISO**
JK Environments	**JKE**
Lab Control Spike	**LCS**
National Association of Testing Authorities	**NATA**
National Environmental Protection Measure	**NEPM**
Organochlorine Pesticides	**OCP**
Organophosphate Pesticides	**OPP**
Polycyclic Aromatic Hydrocarbons	**PAH**
Polychlorinated Biphenyls	**PCBs**
Photo-ionisation Detector	**PID**
Practical Quantitation Limit	**PQL**
Quality Assurance	**QA**
Quality Control	**QC**
Remediation Action Plan	**RAP**
Relative Percentage Difference	**RPD**
Site Assessment Criteria	**SAC**
Sampling, Analysis and Quality Plan	**SAQP**
State Environmental Planning Policy	**SEPP**
Site Specific Assessment	**SSA**
Source, Pathway, Receptor	**SPR**
Trip Blank	**TB**
Total Organic Content	**TOC**
Total Recoverable Hydrocarbons	**TRH**
Trip Spike	**TS**
Upper Confidence Limit	**UCL**
Volatile Organic Compounds	**VOC**
World Health Organisation	**WHO**
Work Health and Safety	**WHS**

Units

Litres	**L**
Metres BGL	**mBGL**
Metres	**m**

Millivolts	**mV**
Millilitres	**ml or mL**
Milliequivalents	**meq**
micro Siemens per Centimetre	**µS/cm**
Micrograms per Litre	**µg/L**
Milligrams per Kilogram	**mg/kg**
Milligrams per Litre	**mg/L**
Parts Per Million	**ppm**
Percentage	**%**
Percentage weight for weight	**%w/w**

1 INTRODUCTION

Complete Urban ('the client'), commissioned JK Environments (JKE) to prepare a Sampling, Analysis and Quality Plan (SAQP) for the proposed Detailed Site Investigation (DSI) at Brick Pit Reserve, Bantry Road, Frenchs Forest, NSW ('the site').

The DSI is to be undertaken with regards to Chapter 4 of the State Environmental Planning Policy (Resilience and Hazards) 2021[1] (formerly known as SEPP55), in order to establish whether remediation of site contamination is required. We understand that the DSI is required for the preparation of a Review of Environmental Factors (REF) to support the concept design stage of the proposed Brick Pit Reserve upgrade works for Northern Beaches Council.

The site is shown on Figure 1 and the SAQP is confined to the site boundaries as shown on Figure 2 attached in the appendices.

JKE has previously prepared a Preliminary (Stage 1) Site Investigation (PSI) (Ref: E35432Prpt, dated 9 November 2022)[2] for the project. A summary of the PSI is presented in Section 2.

1.1 Proposed Development Details

The proposed development includes the upgrade of the existing Brick Pit Reserve to enable multi-use and enhance public recreational spaces. Based on the concept design plans (Ref: BP-CD-01, dated July 2018) prepared by Thompson Berril Landscape Design, we understand that the concept design includes the construction of a passive public recreation space including a wetland for the enhancement of indigenous flora and fauna. The concept design features include:

- Landscaped gateway features;
- Passive recreational spaces with outdoor seating, shade and grassed areas;
- Regeneration of existing native vegetation;
- Playground with natural play features and local heritage theme and materials;
- New elevated boardwalks over stormwater swale;
- Outdoor furniture in open and sheltered areas throughout the site;
- Retain and enhance existing mountain bike track;
- Rocked and planted stormwater swale;
- Elevated lookout deck over proposed wetland;
- Wetland to improve community amenity, stormwater quality and habitat;
- Concrete pathways of 2m wide;
- Crushed sandstone surfaced access trials across the site;
- Shared bridge crossing; and
- Installation of lighting along proposed pathways.

[1] *State Environmental Planning Policy (Resilience and Hazards) 2021* (NSW) (referred to as SEPP Resilience and Hazards 2021)
[2] JKE, (2022). *Report to Complete Urban on Preliminary (Stage 1) Site Investigation (PSI) for Proposed Brick Pit Reserve Upgrade at Brick Pit Reserve, Bantry Road, Frenchs Forest, NSW* (referred to as the PSI)

Earthwork details have not yet been finalised, however, we understand that excavation is required for the construction of the proposed wetland, site levelling and new services installation purposes. We expect that excavation to be in the order of approximately 3m (maximum) below ground surface (BGL) for such works.

The preliminary concept development plan issued to JKE is attached in the appendices.

1.2 Aim and Objectives

The primary aim of the DSI is to characterise the soil, sediment, groundwater and surface water contamination conditions in accessible areas in order to assess site risks in relation to contamination and establish whether remediation is required.

The DSI objectives are to:

- Supplement the PSI data by completing the DSI, including soil, sediment, groundwater and surface water investigation;
- Assess the potential risks posed by contamination to the receptors identified in the Conceptual Site Model (CSM) via a Tier 1 risk assessment;
- Assess whether the site is suitable or can be made suitable for the proposed development (from a contamination viewpoint); and
- Assess whether further intrusive investigation and/or remediation is required.

1.3 Scope of Work

This SAQP was prepared generally in accordance with a JKE proposal (Ref: EP58368PWRev1) of 29 March 2023 and written acceptance from the client dated 5 May 2023.

The scope of work included review of the previous PSI report and preparation of an SAQP with regards to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[3] and other relevant guidelines. A list of reference documents/guidelines is included in the appendices.

[3] National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)

2 SITE INFORMATION

2.1 Summary of PSI

JKE undertook a PSI for the site in November 2022. The PSI included a review of site information, including background and site history information, site walkover inspection and soil sampling from six boreholes (BH1, BH2, BH4, BH5, BH6 and BH8). The PSI borehole locations are shown on Figure 2 attached in Appendix A.

The PSI indicated that the site has historically been used for quarrying/extractive activities, primarily for clay mining which was associated with a brickworks prior to 1930, then as a public reserve thereafter. The site history information and site walkover inspection identified the following AEC: fill material; historical quarrying/extractive activities; use of pesticides; and hazardous building materials.

The boreholes drilled for the PSI generally encountered fill material to depths of approximately 0.2m below ground level (BGL) to 1mBGL, underlain by residual silty clay soils. However, several of the boreholes were terminated in fill, so the fill depths are not known at all borehole locations. The fill typically comprised silty clay, sandy clay, silty sand, gravelly clayey sand and sandy gravel with inclusions of sandstone, ironstone and igneous gravel, brick fragments and root fibres.

Total recoverable hydrocarbons (TRHs) F3 was detected in fill above the ecological-based site assessment criteria (SAC). The source of the TRHs was unknown and further investigation is required to confirm source and characterise risks.

Historical information indicated that the site was formerly occupied by a quarry associated with a historical brickwork. Quarrying/extractive industry is listed in Table 1 of the DUAP/EPA Managing Land Contamination Planning Guidelines SEPP55-Remediation of Land (1998)[4] as an activity that may cause contamination. On this basis, a DSI is required.

The PSI has not identified contamination that would preclude the proposed development/use of the site. However, a DSI is required to characterise the risks and establish whether remediation is necessary in the context of the proposed development. The following was recommended:

- Undertake a DSI to characterise the site contamination conditions and establish whether remediation is required. A SAQP is to be prepared prior to commencement of the DSI; and
- Where required based on the outcome of the DSI, prepare and implement a Remediation Action Plan (RAP) for the proposed development.

[4] EPA/DUAP, (1998). *Managing Land Contamination Planning Guidelines SEPP55-Remediation of Land.* (referred to as SEPP55 Planning Guidelines)

2.2 Site Identification

Table 2-1: Site Identification

Current Site Owner (certificate of title):	The Council of The Shire of Warringah
Site Address:	Brick Pit Reserve, Bantry Road, Frenchs Forest, NSW
Lot & Deposited Plan:	Lot 103 in DP 1214166 and Lot 1B in DP 417447
Current Land Use:	Public reserve/vacant
Proposed Land Use:	Continue use as a public reserve with additional wetlands and amenities
Local Government Area (LGA):	Northern Beaches Council
Current Zoning:	RE1 – Public Recreation
Site Area (ha) (approx.):	1.4
RL (AHD in m) (approx.):	141-151
Geographical Location (decimal degrees) (approx. centre of site):	Latitude: -33.75334 Longitude: 151.23338

2.3 Site Description Summary

The site is located in a predominantly residential area of Frenchs Forest and is bound by Bantry Road to the west and Warringah Road to the north. The site is located approximately 400m to the south-west of Trefoil Creek, although the nearest down-gradient water body is Manly Creek located approximately 800m to the south-east. Northern Beaches Hospital is located approximately 140m to the north of the site.

The regional topography is characterised by a broad ridgeline the roughly follows Warringah Road in an east-west direction. The regional topography slopes to the south-east. The site slopes towards the east at approximately 1-2°, with the site levels influenced by historical quarrying operations (which we understand were associated with brick making). Parts of the site appear to have been cut to form existing ponds/swampy water bodies which consists of steep localised declines along the sloped batters.

The most recent walkover inspection was undertaken by JKE as part of the PSI on 27 September 2022. Key observations are summarised below:

- At the time of the inspection, the majority of the site was vacant, vegetated and used as a public reserve (Brick Pit Reserve). Indicators of former site uses such extractive activities (i.e. quarrying) were observed and included ponds and depressions observed within the site;
- An outdoor shelter and seating were located within the north-western portion of the site, no other buildings/structures were observed at the site. The shelter and outdoor seating were constructed of metal and timber and appeared in a reasonable condition;

- The site was fenced by metal wire fencing along the northern and eastern boundaries, and was unfenced along the western and southern boundaries. Areas of exposed soil were observed at the ground surface along the walking and bike trails and along the edges of the onsite ponds. No significant areas of soil erosions were observed onsite during the PSI inspection;
- Numerous mounds were observed within the northern area of the site. The mounds appeared to consist of fill soil and were exposed. Based on anecdotal information from Northern Beaches Council, the mounds were constructed for use as mountain bike obstacles along the walking trail. Historical cut earthworks appeared to have undertaken within parts of the site which now form the existing ponds;
- A disused drum (presumably empty) was buried within the northern portion of the site. It is unclear whether the onsite mounds contain waste;
- Discarded vinyl, wood, metal, tile, concrete and bricks were observed along the walking trail located within the southern portion of the site. Some of these materials are considered as building demolition waste (bricks, tile and concrete) and could be an indicator of contamination from fly-tipping or historical filling;
- A creek extended southwards from the stormwater discharge point to the north of the site. The creek was unlined and vegetated, and surface water was observed in the creek during the inspection. The onsite creek is assumed to receive surface water flow from the up-gradient stormwater infrastructure; and
- The majority of the site was occupied by vegetation. The onsite vegetation included native canopy trees up to 10m in height and native and exotic shrubbery and grass throughout the understory. No dieback or phyto-toxic stress were observed from the onsite vegetation based on a cursory inspection.

We note that the site area for the DSI has been amended slightly compared to the PSI to include the car parking bays along the western side of the site.

During the PSI, JKE observed the following land uses in the immediate surrounds:

- North – Stormwater discharge infrastructure, Warringah Road and Northern Beaches Hospital further to the north;
- South – Single-storey residences and Frenchs Forest Anglican Church further to the south;
- East – Vacant Roads and Maritime Services (RMS) road buffer, Wakehurst Parkway and a commercial precinct including technology companies (Stanfield IT, SkyMax Australia and Honey Gem Computer Repair), gym (Anytime Fitness), childcare centre (Mindchamps Early Learning), coffee supplier (Little Italy Coffee Roasters), medical centre (Northern Beaches Endocrinology) and retail shops (Parke Piano Strings and Materials and Gift Basket Store); and
- West – Bantry Bay Road and residential properties.

JKE did not observe any land uses in the immediate surrounds that were identified as potential contamination sources for the site during the PSI inspection.

2.4 Underground Services

The 'Before You Dig Australia' (BYDA) (known as 'Dial Before You Dig' (DBYD) at the time of the PSI) plans were reviewed for the PSI in order to establish whether any major underground services exist at the site or in the immediate vicinity that could act as a preferential pathway for contamination migration. Major services were not identified that would be expected to act as preferential pathways for contamination migration.

2.5 Summary of Geology and Hydrogeology

2.5.1 Regional Geological and Soil/Bedrock Conditions

Regional geological information reviewed for the PSI indicated that the site is underlain by Hawkesbury Sandstone (mudstone), which typically consists of laminated mudstone and siltstone.

The boreholes drilled for the PSI are shown on Figure 2 attached in Appendix A and a summary of the subsurface conditions encountered during the PSI is presented in the following table.

Table 2-2: Summary of Subsurface Conditions Encountered during the PSI

Profile	Description
Fill	With the exception of BH1, fill was encountered at the surface or beneath the pavement in all boreholes and extended to depths of approximately 0.2mBGL to 1mBGL. BH4 to BH8 were terminated in the fill at a maximum depth of approximately 1mBGL. The fill typically comprised silty clay, sandy clay, silty sand, gravelly clayey sand and sandy gravel with inclusions of sandstone, ironstone and igneous gravel, brick fragments and root fibres. Staining or odours were not observed in the fill during sampling.
Natural Soil	Silty clay natural (residual) soil was encountered at the surface in BH1 and beneath the fill in BH2 and BH3 and extended to the termination of the boreholes at a maximum depth of approximately 1.3mBGL. The natural soil was typically brown, orange brown and grey mottled orange brown. The natural soil contained inclusions of root fibres. Staining or odours were not observed in the natural soil during sampling.
Groundwater	Groundwater seepage was not encountered in the boreholes during drilling. All boreholes remained dry on completion of drilling and a short time after.

2.5.2 Acid Sulfate Soil (ASS) Risk and Planning

The PSI identified that the site is not located in an ASS risk area according to the risk maps prepared by the Department of Land and Water Conservation (1997)[5].

2.5.3 Hydrogeology and Groundwater

Hydrogeological information reviewed for the PSI indicated that the regional aquifer on-site and in the areas immediately surrounding the site includes porous, extensive aquifers of low to moderate productivity. There was a total of 60 registered bores within the report buffer of 2,000m. In summary:

[5] Department of Land and Water Conservation, (1997). *1:25,000 Acid Sulfate Soil Risk Map – Hornsby Mona Vale (Series 9130S13, Ed 2)*

- The nearest registered bore was located approximately 80m from the site. This was utilised for monitoring purposes;
- The majority of the bores were registered for monitoring purposes;
- There were four nearby bores (i.e. within 1,000m) registered for domestic and water supply purposes. However, these were all over 500m from the site and generally up or cross gradient; and
- The drillers log information from the closest registered bores typically identified fill and/or clay soil to depths of 1mBGL-2mBGL, underlain by siltstone and sandstone bedrock. Standing water levels (SWLs) in the bores ranged from 2mBGL to 30mBGL.

The information reviewed for the PSI indicates that the subsurface conditions at the site are likely to consist of relatively low permeability (residual) soils overlying shallow bedrock. The potential for viable groundwater abstraction and use of groundwater under these conditions is considered to be low. There is a reticulated water supply in the area and consumption of groundwater is not expected to occur. Use of groundwater is not proposed as part of the development and there are no nearby registered groundwater users.

Considering the local topography and surrounding land features, JKE anticipate groundwater to flow towards the south.

The onsite creek is expected to receive stormwater from up-gradient area to the north via the off-site stormwater discharge point. The nearest down-gradient water body is the Manly Creek located approximately 800m to the south-east of the site. Manly Creek is a tributary of the Manly Reservoir (also known as Manly Dam) which is a freshwater ecosystem and is used for recreational purposes.

2.6 Summary of Site History

A time line summary of the historical land uses and activities is presented in the table below. The information is based on a weight of evidence assessment of the site history documentation and observations made by JKE during the PSI.

Table 2-3: Summary of Historical Land Uses / Activities

Year(s)	On-site - Potential Land Use / Activities	Off-site - Potential Land Use / Activities
Pre-1930s	Land-based extractive activities likely associated with a brickwork.	Primarily residential. A brickworks was located in the surrounds, primarily to the east of the site as indicated by the historical map of 1917.
1930-present	The site was largely vacant and used as a public reserve.	Residential and commercial. A motor garage and service station located approximately 65m to the north-west of the site had commenced operations prior to 1965. This land use ceased some time after 2016.

3 SITE CHARACTERISATION AND CONCEPTUAL SITE MODEL

3.1 Potential Contamination Sources/AEC and CoPC

The potential contamination sources/AEC and CoPC are presented in the following table:

Table 3-1: Potential (and/or known) Contamination Sources/AEC and Contaminants of Potential Concern

Source / AEC	CoPC
Fill material – The site appears to have been historically filled to achieve the existing levels as part of the historical clay mining activities associated with a brickworks. It is possible that the fill was imported and could be contaminated. Building waste, possibly associated with fill or fly-tipping, was also observed in the south-eastern section of the site as shown on Figure 2. During the PSI inspection, a number of mounds were observed within the site as shown on Figure 2. The composition of the mounds were unknown and anthropogenic inclusions including used drums and trollies were observed to be buried within the mounds.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.
Historical Quarry/Extractive Industry – Available internet and site history information suggest that the site had operated as a clay quarry prior to the 1930s. The main sources of contamination from potential quarrying activities are considered to be associated with the operational aspects of mining. These potentially contaminating activities include the use of machinery and plant (i.e. re-fuelling, spills, leaks etc). Potential historical fuel storage/depots could have also existed at the site or in the surrounds.	Heavy metals, TRHs and PAHs.
Use of pesticides – Pesticides may have been used around the site.	Heavy metals and OCPs.
Hazardous Building Material – Hazardous building materials may be present as a result of former building and demolition activities. These materials may be buried within the sub-surface. Building waste, possibly associated with fill or fly-tipping, was also observed in the south-eastern section of the site as shown on Figure 2. Historical building demolition activities had occurred within the north-western corner of the site as observed from the aerial photographs between 1943 and 1951.	Asbestos, lead and PCBs.

The PSI identified a historical motor garage and service station located up-gradient of the site. The property had operated from 1965 until at least 2016 as indicated in the historical business records and aerial photographs reviewed for the PSI. We note that regulations were in place in 2016 regulating the monitoring and clean-up/decommissioning of service stations with underground fuel storage systems. On this basis, and in light of the absence of any EPA records relating to contaminated land in the surrounds, we consider that this historical off-site land use is unlikely to represent an off-site source of contamination for the site.

JKE note that bulk hazardous ground gases (HGG) such as methane and carbon dioxide have not been included as a CoPC associated with the historical filling of the site. This is due to the relatively shallow fill identified within the boreholes drilled across the site and the lack of putrescible landfill material (i.e. household waste) or significant organic inclusions in fill. Based on this, the site is unlikely to have been extensively filled that would contribute to the generation of unacceptable levels of HGG.

3.2 Mechanism for Contamination, Affected Media, Receptors and Exposure Pathways

The mechanisms for contamination, affected media, receptors and exposure pathways relevant to the potential contamination sources/AEC are outlined in the following CSM table:

Table 3-2: Conceptual Site Model

Potential mechanism for contamination	The potential mechanisms for contamination are most likely to include 'top-down' impacts and spills. There is a potential for sub-surface releases to have occurred if deep fill (or other buried industrial infrastructure) is present, although this is considered to be the least likely mechanism for contamination. Contamination could also occur via stormwater from off-site areas flowing into the creek located onsite, particularly any stormwater from road run off which can be impacted by oil/fuel from motor vehicles.
Affected media	Soil, sediment, surface water and groundwater have been identified as potentially affected media.
Receptor identification	Human receptors include site occupants/users (including adults and children), construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users and recreational water users within Manly Creek and Manly Reservoir. Ecological receptors include terrestrial organisms and plants within unpaved areas and within accessible surface water within the onsite creek and ponds Off-site receptors include freshwater ecology in Manly Creek and Manly Reservoir.
Potential exposure pathways	Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants) and vapours (volatile TRH, naphthalene and BTEX). The potential for exposure would typically be associated with the construction and excavation works, and future use of the site. Potential exposure pathways for ecological receptors include primary/direct contact and ingestion. Exposure during future site use could occur via direct contact with soil in unpaved areas, inhalation of airborne asbestos fibres during soil disturbance, or inhalation of vapours within enclosed spaces such as buildings (construction of any amenity buildings in the future). Enclosed structures are not currently proposed, therefore vapour intrusion into buildings on site is not likely to occur. However, this potential exposure pathway will be considered in the context of the DSI for completeness given the project is still in the early design stages.

	Exposure to surface water could occur within the onsite creek, ponds and the proposed wetland through direct and ingestion. Surface water is expected to migrate to the site through the off-site stormwater outlet from up-gradient areas. Surface water was observed within the onsite creek and ponds during the PSI inspection. Exposure to groundwater could occur in the Manly Creek and Manly Reservoir through direct migration. Hyporheic exchange between groundwater and surface water within the onsite creek and ponds could occur at the sediment interphase, especially given the onsite water bodies were unlined and vegetated. Direct migration of groundwater to the onsite creek could occur and transported to the down-gradient Manly Creek.
Potential exposure mechanisms	The following have been identified as potential exposure mechanisms for site contamination: • Vapour intrusion into service trenches, excavations or any future proposed buildings (either from soil contamination or volatilisation of contaminants from groundwater); • Contact (dermal, ingestion or inhalation) during construction, or with exposed soils in landscaped areas and/or unpaved areas; and • Migration of surface water and groundwater off-site and into nearby water bodies, including aquatic ecosystems and those being used for recreation.
Presence of preferential pathways for contaminant movement	The discharge of stormwater from up-gradient areas is a preferential pathway for contaminant migration. The onsite water bodies are potential preferential pathway for contaminant migrations. This could occur via groundwater seepage (hyporheic exchange) if present, or via direct migration of stormwater from up-gradient areas. The onsite surface water is expected to be discharged into Manly Creek and ultimately, into Manly Reservoir located to the south-east.

4 SAMPLING, ANALYSIS AND QUALITY PLAN

4.1 Data Quality Objectives (DQO)

Data Quality Objectives (DQOs) were developed to define the type and quality of data required to achieve the project objectives outlined in Section 1.2. The DQOs were prepared with reference to the process outlined in Schedule B2 of NEPM (2013). The seven-step DQO approach for this project is outlined in the following sub-sections.

4.1.1 Step 1 - State the Problem

The PSI identified potential sources of contamination/AEC at the site that may pose a risk to human health and the environment. Investigation data is required to assess the contamination status of the site, assess the risks posed by the contaminants in the context of the proposed development/intended land use, and assess whether remediation is required. This information will be considered by the determining authority in exercising its planning functions in relation to the development proposal.

4.1.2 Step 2 - Identify the Decisions of the Study

The objectives of the investigation are outlined in Section 1.2. The decisions to be made reflect these objectives and are as follows:

- Are any results above the SAC?
- Do potential risks associated with contamination exist, and if so, what are they?
- Is further investigation/remediation required?
- Is the site suitable for the proposed development, or can the site be made suitable subject to further characterisation and/or remediation?

4.1.3 Step 3 - Identify Information Inputs

The primary information inputs required to address the decisions outlined in Step 2 include the following:

- Existing site information from the PSI, including site observations, site history documentation and relevant environmental data;
- Sampling of potentially affected media, including soil, sediments, groundwater and surface water;
- Observations of sub-surface variables such as soil and sediment type, photo-ionisation detector (PID) concentrations, odours and staining, and groundwater and surface water physiochemical parameters;
- Laboratory analysis of soils, sediments, fibre cement (if identified), groundwater and surface water for the CoPC identified in the CSM; and
- Field and laboratory QA/QC data.

4.1.4 Step 4 - Define the Study Boundary

The sampling will be confined to the site boundaries as shown in Figure 2 and will be limited vertically to: the upper 0.5-1m of natural soil or to a maximum nominated sampling depth of 3mBGL (or prior refusal), whichever is shallower for soil; 0.5m towards the centre of the onsite stockpiles; and at the surface of the sediment material and the onsite surface water body (spatial boundary). Groundwater sampling will be limited to the proposed depth of the monitoring wells which is 6mBGL. At this stage, the sampling is proposed to be completed between 16 and 21 June 2023 (temporal boundary). The assessment of potential risk to adjacent land users will be made based on the data collected within the site boundary.

4.1.5 Step 5 - Develop an Analytical Approach (or Decision Rule)

4.1.5.1 Tier 1 Screening Criteria

The laboratory data will be assessed against relevant Tier 1 screening criteria (referred to as SAC), as outlined for each media in Section 4.2. Exceedances of the SAC do not necessarily indicate a requirement for remediation or a risk to human health and/or the environment. Exceedances are considered in the context of the CSM and valid source-pathway-receptor (SPR) linkages.

For this investigation, the individual results will be assessed as either above or below the SAC. Statistical evaluation of the dataset via calculation of mean values and/or 95% upper confidence limit (UCL) values will likely not be undertaken due to the spatial distribution of the data associated with the sampling access constraints.

Sediment, groundwater and surface water data will be compared directly to the SAC and evaluated with regards to valid or complete SPR-linkages for human health and ecological risks. Groundwater and surface water data for volatile compounds will be considered with other lines of evidence such as soil results and current/proposed land use.

4.1.5.2 Field and Laboratory QA/QC

Field QA/QC will include analysis of inter-laboratory duplicates (minimum of 5% of primary samples), intra-laboratory duplicates (minimum of 10% of primary samples), trip spike (for volatiles) and trip blank samples. However, field QA/QC is not proposed for the sediment analysis.

The suitability of the laboratory data is assessed against the laboratory QA/QC criteria which will be outlined in the laboratory reports attached to the DSI report. These criteria are developed and implemented in accordance with the laboratory's National Association of Testing Authorities, Australia (NATA) accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

In the event that acceptable limits are not met by the laboratory analysis, other lines of evidence are reviewed (e.g. field observations of samples, preservation, handling etc) and, where required, consultation with the laboratory will be undertaken in an effort to establish the cause of the non-conformance. Where uncertainty exists, the most conservative concentration reported are to be adopted.

4.1.5.3 Appropriateness of Practical Quantitation Limits (PQLs)

The PQLs of the analytical methods are considered in relation to the SAC to confirm that the PQLs are less than the SAC. In cases where the PQLs are greater than the SAC, a discussion of this will be provided.

4.1.6 Step 6 – Specify Limits on Decision Errors

To limit the potential for decision errors, a range of quality assurance processes are adopted. A quantitative assessment of the potential for false positives and false negatives in the analytical results is undertaken with reference to Schedule B(3) of NEPM (2013) using the data quality assurance information collected.

Decision errors can be controlled through the use of hypothesis testing. The test can be used to show either that the baseline condition is false or that there is insufficient evidence to indicate that the baseline condition is false. The null hypothesis is an assumption that is assumed to be true in the absence of contrary evidence.

It is not anticipated to apply statistical tests to soil data due to the spatial distribution of the sampling locations (i.e. we expect that the overall sampling plan will not be probabilistic) and we anticipate that the results will be assessed as either above or below the SAC and in the context of the valid SPR-linkages. However, if it is deemed appropriate to apply statistical analysis based on the final sampling outcome, for this investigation, the null hypothesis (H_0) is that the 95% UCL for the CoPC is greater than the SAC. The alternative hypothesis (H_A) is that the 95% UCL for the CoPC (along with other considerations for asbestos and surface water) are less than the SAC.

Potential outcomes include Type I and Type II errors as follows:

- Type I error of determining that the soil is acceptable for the proposed land use when it is not (wrongly rejects true H_0), includes an alpha (α) risk of 0.05; and
- Type II error of determining that the soil is unacceptable for the proposed land use when it is (wrongly accepts false H_0), includes beta (β) risk of 0.2.

Statistical analysis will not apply to sediment, asbestos, groundwater or surface water data, therefore these data will be assessed based on a multiple lines of evidence and risk-based approach.

Data Quality Indicators (DQI) for field and laboratory QA/QC samples are defined in the QA/QC Data Evaluation in the appendices. An assessment of the DQI's was made in relation to precision, accuracy, representativeness, completeness and comparability.

Field Duplicates

Acceptable targets for precision of soil, groundwater and surface water field duplicates will be 30% or less, consistent with NEPM (2013). RPD failures will be considered qualitatively on a case-by-case basis taking into account factors such as the concentrations used to calculate the RPD (i.e. RPD exceedance where concentrations are close to the PQL are typically not as significant as those where concentrations are reported at least five or 10 times the PQL), sample type, collection methods and the specific analyte where the RPD exceedance was reported.

Trip Blanks

Acceptable targets for trip blank samples will be less than the PQL.

Trip Spikes
Acceptable targets for trip spike samples will be 70% to 130%.

Laboratory QA/QC
The suitability of the laboratory data will be assessed against the laboratory QA/QC criteria. These criteria are developed and implemented in accordance with the laboratory's NATA accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

A summary of the typical limits is provided below:

RPDs
- Results that are <5 times the PQL, any RPD is acceptable; and
- Results >5 times the PQL, RPDs between 0-50% are acceptable.

Laboratory Control Samples (LCS) and Matrix Spikes
- 70-130% recovery acceptable for metals and inorganics; and
- 60-140% recovery acceptable for organics.

Surrogate Spikes
- 60-140% recovery acceptable for general organics.

Method Blanks
- All results less than PQL.

In the event that acceptable limits are not met by the laboratory analysis, other lines of evidence will be reviewed (e.g. field observations of samples, preservation, handling etc) and, where required, consultation with the laboratory is to be undertaken in an effort to establish the cause of the non-conformance. Where uncertainty exists, we will adopt the most conservative concentration reported.

4.1.7 Step 7 - Optimise the Design for Obtaining Data

The most resource-effective design will be used in an optimum manner to achieve the investigation objectives. Adjustment of the investigation design can occur following consultation or feedback from project stakeholders. For the DSI, the design will be optimised via consideration of the various lines of evidence used to select the sample locations, the media being sampled, and also by the way in which the data will be collected.

The sampling plan and methodology are outlined in the following sub-sections.

4.2 Site Assessment Criteria (SAC)

4.2.1 Soil/Sediment

Soil and sediment data will be compared to relevant Tier 1 screening criteria in accordance with NEPM (2013) as outlined below.

4.2.1.1 Human Health

- Health Investigation Levels (HILs) will be based on a 'public open space' exposure scenario land use exposure scenario (HIL-C);
- HSLs for assessing hydrocarbon risks from vapour intrusion will be based on a 'commercial/industrial' exposure scenario (HSL-D), as HSL-C does not account for vapour intrusion for in-door environments. HSL-D will be adopted to assess for the potential of vapour risks within buildings such as public amenities, or possibly a small shop or canteen, if required in the future (though we note these structures are not currently proposed). HSLs will be calculated conservatively using a 'sand' soil type and a depth interval of 0m to 1m for the initial data screening. The HSLs may be adjusted for depth and soil type where deemed appropriate;
- HSLs for direct contact will be compared to the CRC Care Technical Report No. 10 – Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document (2011)[6]; and
- Health Screening Levels (HSLs) for asbestos will also be based on land use Type C. A summary of the proposed asbestos criteria is provided in the table below:

Table 4-1: Details for Asbestos SAC

Guideline	Applicability
Asbestos in Soil	The HSL-C criteria will be adopted for the assessment of asbestos in soil. The SAC adopted for asbestos were derived from the NEPM 2013 and are based on the Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2021)[7]. The SAC include the following: • No visible asbestos at the surface/in the top 10cm of soil; • <0.02% w/w bonded asbestos containing material (ACM) in soil; and • <0.001% w/w asbestos fines/fibrous asbestos (AF/FA) in soil. Concentrations for bonded ACM concentrations in soil are based on the following equation which is presented in Schedule B1 of NEPM (2013): $\textbf{\% w/w asbestos in soil} = \dfrac{\textbf{\% asbestos content x bonded ACM (kg)}}{\text{Soil volume (L) x soil density (kg/L)}}$ However, we are of the opinion that the actual soil volume in a 10L bucket varies considerably due to the presence of voids, particularly when assessing cohesive soils. Therefore, each bucket sample will be weighed using electronic scales and the above equation will be adjusted as follows (we note that the units have also converted to grams):

[6] Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC Care), (2011). Technical Report No. 10 - *Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document*

[7] Western Australian (WA) Department of Health (DoH), (2021). *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*. (referred to as WA DoH 2021)

Guideline	Applicability
	$\%\ \text{w/w asbestos in soil} = \dfrac{\%\ \text{asbestos content x bonded ACM (g)}}{\text{Soil weight (g)}}$

4.2.1.2 Environmental (Ecological)

- Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) will be based on an 'urban residential and public open space' (URPOS) exposure scenario. These are only to be applied to the top 2m of soil as outlined in the NEPM (2013). The criterion for benzo(a)pyrene will be increased from the value presented in the NEPM (2013) based on the Canadian Soil Quality Guidelines[8];
- ESLs are to be adopted based on the soil type; and
- EILs for selected metals will be calculated using the ambient background concentration (ABC) values presented in the document titled Trace Element Concentrations in Soils from Rural and Urban Areas of Australia (1995)[9] and using site specific physiochemical data for soil pH, clay content and Cation Exchange Capacity (CEC) to select the Added Contaminant Limit (ACL) values in Schedule B(1) of NEPM (2013).

4.2.1.3 Management Limits for Petroleum Hydrocarbons

Management limits for petroleum hydrocarbons (as presented in Schedule B1 of NEPM 2013) will also be considered following evaluation of human health and ecological risks, and risks to groundwater and surface water bodies.

4.2.2 Groundwater

Groundwater data will be compared to relevant Tier 1 screening criteria in accordance with NEPM (2013) and the Management of Groundwater Contamination (2007)[10] for the assessment of environmental values, including aquatic ecosystems and human uses. Surface water data will not be assessed against the NEPM (2013) criteria for vapour intrusion.

4.2.2.1 Human Health

- HSLs for a 'commercial/industrial' exposure scenario (HSL-D). HSLs will be calculated based on the soil type and the observed depth to groundwater;
- In the event that the groundwater levels are recorded to be less than 2mBGL, then a site-specific assessment (SSA) will be used for the Tier 1 screening of human health risks posed by volatile contaminants in groundwater. The assessment will include a selection of alternative Tier 1 criteria that are considered suitably protective of human health. These criteria are based on drinking water guidelines and have been referred to as HSL-SSA. The criteria are to be based on the following:

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[8] Canadian Council of Ministers of the Environment, (1999). *Canadian soil quality guidelines for the protection of environmental and human health: Benzo(a)Pyrene (1997)* (referred to as the Canadian Soil Quality Guidelines)

[9] Olszowy, H., Torr, P., and Imray, P., (1995), *Trace Element Concentrations in Soils from Rural and Urban Areas of Australia. Contaminated Sites Monograph Series No. 4*. Department of Human Services and Health, Environment Protection Agency, and South Australian Health Commission

[10] NSW Department of Environment and Conservation, (2007). *Guidelines for the Assessment and Management of Groundwater Contamination.*

- Australian Drinking Water Guidelines 2011 (updated 2021)[11] for BTEX compounds and selected VOCs;
- World Health Organisation (WHO) document titled Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality (2008)[12] for petroleum hydrocarbons. We have conservatively adopted the value of 100µg/L for TRH F1 and F2;
- USEPA Region 9 screening levels for naphthalene (threshold value for tap water); and
- The use of the laboratory PQLs for other contaminants where there were no Australian guidelines.

- The ADWG 2011 multiplied by a factor of 10 will be used to assess the potential risks associated with incidental/recreational-type exposure to groundwater (e.g. within down-gradient water bodies). These have been deemed as 'recreational' SAC.

4.2.2.2 Surface Water

Surface water data will be compared to relevant Tier 1 screening criteria in accordance with NEPM (2013). It is considered appropriate to adopt the Guidelines for the Assessment and Management of Groundwater Contamination (2007) for the assessment of environmental values, including aquatic ecosystems and human uses. Surface water data will not be assessed against the NEPM (2013) criteria for vapour intrusion.

Surface water data will be compared against the ADWG 2011 criteria multiplied by a factor of 10 to assess potential risks associated with incidental/recreational-type exposure to surface water (e.g. within onsite and down-gradient water bodies for incidental exposure during development works, and primary and secondary contact during recreational exposure). These have been deemed as 'recreational' SAC.

4.2.3 Environment (Ecological - aquatic ecosystems) – Groundwater and Surface Water

The Groundwater Investigation Levels (GILs) for 95% protection of freshwater species are to be adopted based on the Default Guideline Values in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018)[13]. This is considered to be appropriate for the assessment of contamination risks to aquatic ecosystems (e.g. within onsite and down-gradient water bodies). The 99% trigger values are to be utilised, where required, to account for bioaccumulation. Low and moderate reliability trigger values are also to be adopted for some contaminants where high-reliability trigger values do not exist.

4.3 Soil Sampling Plan and Methodology

The soil sampling plan and methodology adopted for the DSI is outlined in the table below:

Table 4-2: Soil/Sediment Sampling Plan and Methodology

[11] National Health and Medical Research Council (NHMRC), (2021). *National Water Quality Management Strategy, Australian Drinking Water Guidelines 2011* (referred to as ADWG 2011)

[12] World Health Organisation (WHO), (2008). *Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality* (referred to as WHO 2008)

[13] Australian and New Zealand Governments (ANZG), (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia (referred to as ANZG 2018)

Aspect	Input
Sampling Density	Samples will be obtained from 27 locations (BH101 to BH127 inclusive) consisting of boreholes and test pits inaccessible areas of the site. Two of the sampling locations (BH126 and BH127) will be placed along the site boundaries along the road verge of the existing Bantry Road parking area. The proposed sampling locations are on the attached Figure 2 attached in Appendix A. Soil samples are to be collected from up to a selection of five onsite mounds/stockpiles. One sample is to be collected from approximately 0.5m into or towards the centre of the stockpiles using hand tools. Sediment samples will be obtained using hand tools from up to four locations across the site. The locations will be determined during site works, based on access (therefore these locations are not shown on the attached Figure 2 at this stage). The number of sampling locations meets the minimum sampling density as outlined in the NSW EPA Sampling Design Part 1 – Application (2022)[14] contaminated land guidelines. However, it is noted that a systematic sampling plan is unlikely to be possible due to site access constraints associated with existing vegetation, ponds, slopes and other site features. Hence, the requirements for hotspot identification , which is based on a positioning the sampling locations on a square grid-based plan, are unlikely to be met.
Sampling Plan	Where practicable, samples are to be positioned on a square grid plan of approximately 24m between sampling locations. However, this will not be achievable in all areas. Therefore, the plan overall will be considered to be judgemental. The sampling locations will be broadly positioned for site coverage, taking into consideration of the identified AEC, and areas that are not easily accessible due to onsite obstructions (either above or below ground).
Set-out and Sampling Equipment	Sampling locations will be set out using a tape measure or hand-held GPS. A margin of error in the range of ±5m is expected using the hand-held GPS. In-situ sampling locations will be checked for underground services by an external contractor prior to sampling. Samples will be collected using a mechanical excavator (directly from the bucket), using a drill rig (sampling from the SPT, where possible) or using a hand auger in areas not accessible by machines.
Sample Collection and Field QA/QC	Soil samples will be obtained between 16 and 21 June 2023 in accordance with our standard field procedures. Soil samples will be collected from the fill and natural profiles based on field observations. Sediment samples will be collected from accessible areas at the sediment surface. The sample depths for soil will be shown on the logs to be attached in the DSI appendices. Samples will be placed in glass jars with plastic caps and Teflon seals with minimal headspace. Samples for asbestos analysis will be placed in zip-lock plastic bags. During sampling, soil at selected depths was split into primary and duplicate samples for field QA/QC analysis. The field splitting procedure includes alternately filling the sampling containers to obtain a representative split sample.

[14] NSW EPA, (2022). *Sampling design part 1 - application.* (referred to as EPA Sampling Design Guidelines 2022)

Aspect	Input
Field Screening	A portable Photoionisation Detector (PID) fitted with a 10.6mV lamp will be used to screen the samples for the presence of volatile organic compounds (VOCs). PID screening for VOCs will be undertaken on soil samples using the soil sample headspace method. VOC data is to be obtained from partly filled zip-lock plastic bags following equilibration of the headspace gases. PID calibration records will be maintained on file by JKE. The field screening for asbestos quantification will include the following: • A representative bulk sample will be collected from fill at 1m intervals, or from each distinct fill profile. The quantity of material for each sample can be variable based on whatever return could be achieved if using an auger, however, we will aim to obtain a full 10L soil volume from test pit locations. The bulk sample intervals will be shown on the borehole logs to be attached in the DSI report; • Each sample will be weighed using an electronic scale; • Each bulk sample will be passed through a sieve with a 7.1mm aperture and inspected for the presence of fibre cement. For cohesive soils (i.e. clays), each sample will be placed on a contrasting support (blue tarpaulin) and inspected for the presence of fibre cement. Any soil clumps/nodules are to be disaggregated; • The condition of fibre cement or any other suspected asbestos materials will be noted on the field records; and • If observed, any fragments of fibre cement in the bulk sample will be collected, placed in a zip-lock bag and assigned a unique identifier. Calculations for asbestos content will be undertaken based on the requirements outlined in Schedule B1 of NEPM (2013). A calibration/check of the accuracy of the scale used for weighing the fibre cement fragments will be undertaken using a set of calibration weights. Calibration/check records are maintained on file by JKE. The scale used to weigh the 10L samples will not calibrated, however this is not considered significant as this method of providing a weight for the bulk sample is considered to be considerably more accurate than applying a nominal soil density conversion.
Decontami-nation and Sample Preservation	Sampling personnel will use disposable nitrile gloves during sampling activities. Re-usable sampling equipment are to be decontaminated using potable water and Decon 90. Soil samples will be preserved by immediate storage in an insulated sample container with ice or ice bricks. On completion of the fieldwork, the samples may be temporarily stored in the JKE warehouse prior to delivery in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody (COC) procedures.

4.4 Groundwater Sampling Plan and Methodology

The groundwater sampling plan and methodology is outlined in the table below:

Table 4-3: Groundwater Sampling Plan and Methodology

Aspect	Input
Sampling Plan	Groundwater monitoring wells will be installed in BH101 (MW101), BH117 (MW117) and BH125 (MW125). The wells will be positioned to gain a snap-shot of the groundwater conditions. Considering the topography and the location of the nearest down-gradient water body, MW101 will be in the up-gradient area of the site and would be expected to provide an indication of groundwater flowing onto (beneath) the site from the north. MW117 and MW125 are considered to be in the intermediate to down-gradient area of the site and would be expected to provide an indication of groundwater flowing across (beneath) the site and beyond the down-gradient site boundary. The proposed groundwater monitoring well locations are shown on Figure 2.
Monitoring Well Installation Procedure	The monitoring well construction details will be documented on the appropriate borehole logs attached in to the DSI report. The monitoring wells will be installed to depths of approximately 6mBGL. The wells will be generally constructed as follows: • 50mm diameter Class 18 PVC (machine slotted screen) will be installed in the lower section of the well to intersect groundwater; • 50mm diameter Class 18 PVC casing will be installed in the upper section of the well (screw fixed); • A 2mm sand filter pack will be installed around the screen section for groundwater infiltration; • A hydrated bentonite seal/plug will be installed on top of the sand pack to seal the well; and • A gatic cover will be installed at the surface with a concrete plug to limit the inflow of surface water. The monitoring well installation, including the screen lengths, are considered suitable for assessment of general groundwater quality with regards to Table 5 in Schedule B2 of NEPM 2013.
Monitoring Well Development	The monitoring wells will be developed following installation using a submersible electrical pump or dedicated disposable plastic bailer. The monitoring wells will be developed until effectively dry if the hydrogeological conditions or if groundwater inflow into the wells is relatively low, or developed until steady state conditions are achieved. Steady state conditions will be considered to have been achieved when the difference in the pH measurements is less than 0.2 units, the difference in conductivity is less than 10%, and when the SWL is not in drawdown. The field monitoring records and calibration data will be attached to the DSI report appendices.
Groundwater Sampling	The monitoring wells will be allowed to recharge for approximately five to seven days after development. Prior to sampling, the monitoring wells will be checked for the presence of Light Non-Aqueous Phase Liquids (LNAPLs) using an inter-phase probe electronic dip meter and dedicated disposable plastic bailer. The monitoring well head space will be checked for VOCs using a calibrated PID unit. The samples will be obtained using a peristaltic pump or disposable plastic bailer. During sampling, the following parameters will be monitored using calibrated field instruments: • Standing water level (SWL) using an electronic dip meter; and • pH, temperature, electrical conductivity (EC), dissolved oxygen (DO) and redox potential (Eh) using a YSI or Hanna Instruments multi-probe water quality meter.

Aspect	Input
	Groundwater samples will be obtained directly from the single use PVC tubing and placed in the sample containers. Duplicate samples will be obtained by alternate filling of sample containers. This technique is to be adopted to minimise disturbance of the samples and loss of volatile contaminants associated with mixing of liquids in secondary containers, etc. Groundwater removed from the wells during development and sampling will be transported to JKE in jerry cans and stored in holding drums prior to collection by a licensed waste water contractor for off-site disposal. The field monitoring record and calibration data will be attached in the DSI report appendices.
Decontaminant and Sample Preservation	During development, the pump will be flushed between monitoring wells with potable water (single-use tubing is to be used for each well). The pump tubing is to be discarded after each sampling event and replaced therefore no decontamination procedure is considered necessary. The samples are to be preserved with reference to the analytical requirements and placed in an insulated container with ice or ice bricks. On completion of the fieldwork, the samples may be temporarily stored in a fridge at the JKE office, before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard COC procedures.

4.5 Surface Water Sampling Plan and Methodology

The surface water sampling plan and methodology is outlined in the table below:

Table 4-4: Surface Water Sampling Plan and Methodology

Aspect	Input
Sampling Plan	Surface water samples will be collected from four locations (SW1 to SW4 inclusive) within selected onsite water bodies (i.e. within the site boundaries). Three of the locations (SW1 to SW3) will be targeted along the length of the onsite creek and one location (SW4) will target the onsite ponds. The proposed surface water sampling locations are shown on Figure 2, however, the final sample locations will depend on site access. The locations are positioned to establish a baseline 'snap-shot' conditions of the surface water quality within the onsite creek and ponds. We acknowledge that the surface water quality will change overtime given the site receives surface water flows, stormwater and runoff from upgradient areas. Considering the direction of the surface water flow, SW1 is considered to be in the up-gradient of the site, SW2 is considered to be in the intermediate area of the site and SW3 is considered to be in the down-gradient of the site.
Surface Water Sampling	The water samples will be obtained as grab samples from the surface water body. Where access permits, the surface water samples will be obtained directly from the surface waters. Where direct access to the surface water is not possible, a bulk water sample will be collected in a new disposable PVC bailer from an onsite access point, and decanted into the laboratory supplied containers. Duplicate sampling will be obtained by alternate filling of sample containers. This technique will be adopted to minimise disturbance of the samples and loss of volatile contaminants associated with mixing liquids in secondary containers, etc.

Aspect	Input
	During sampling, one stabilised reading of the pH, temperature, electrical conductivity (EC), dissolved oxygen (DO) and redox potential (Eh) will be recorded using a calibrated YSI or Hanna Instruments multi-probe water quality meter. The field monitoring records will be attached in the DSI report appendices.
Decontaminant and Sample Preservation	The samples will be preserved with reference to the analytical requirements and placed in an insulated container with ice or ice bricks. On completion of the fieldwork, the samples may be temporarily stored in a fridge at the JKE office, before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard COC procedures.

4.6 Analytical Analysis and Analytical Rationale

Samples are to be analysed by an appropriate, NATA Accredited laboratory using the analytical methods detailed in Schedule B(3) of NEPM 2013 and other accredited field methods. The laboratory details are provided below:

Table 4-5: Laboratory Details

Samples	Laboratory
All primary soil, sediment, groundwater and surface water samples and field QA/QC samples, including intra-laboratory duplicates, trip blanks and trip spikes.	Envirolab Services Pty Ltd NSW, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)
Inter-laboratory soil, groundwater and surface water duplicates.	Envirolab Services Pty Ltd VIC, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)

An allowance has been made for the following analysis:

- Up to 36 selected soil samples (including from stockpiles and sediments) will be analysed for: heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc); PAHs; TRH; BTEX; OCPs and OPPs; and PCBs;
- Up to 27 selected deeper fill/natural soil/bedrock samples will be analysed for: heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc); PAHs; TRH; and BTEX;
- Up to 42 selected fill soil samples will be analysed for asbestos (500mL);
- Up to four sediment samples will be analysed for total organic carbon (TOC);
- Up to four selected fill/natural soil samples will be analysed for: pH; cation exchange capacity (CEC); and clay content (%);
- Up to six selected fibre cement fragments, if found on or in soil, will be analysed for asbestos;
- Up to three groundwater samples will be analysed for the following: heavy metals; TRH/BTEX; low level PAHs; pH; electrical conductivity (EC); and hardness;
- Up to four surface water samples will be analysed for the following: heavy metals; TRH/BTEX; low level PAHs; pH; EC; and hardness; and

- Collection and analysis of QA/QC samples (including intra- and inter-laboratory duplicates, trip blank/spike and rinsate blanks).

4.7 Reporting Requirements

A DSI report is to be prepared presenting the results of the investigation, generally in accordance with the NSW EPA Consultants Reporting on Contaminated Land, Contaminated Land Guidelines (2020)[15].

[15] NSW EPA, (2020). *Consultants Reporting on Contaminated Land, Contaminated Land Guidelines*

5 LIMITATIONS

The following limitation apply to this investigation:

- JKE accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the JKE proposal; and terms of contract between JKE and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- This report has been prepared in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, JKE has not undertaken any verification process, except where specifically stated in the report;
- JKE has not investigated off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- JKE accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- JKE have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. JKE should be contacted immediately in such circumstances; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

Important Information About This Report

These notes have been prepared by JKE to assist with the interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors:
This report has been prepared in response to specific project requirements as stated in the JKE proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

JKE will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by JKE to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions:
Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is based on Professional Interpretations of Factual Data:
Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Investigation Limitations:
Although information provided by an investigation can reduce exposure to the risk of the presence of contamination, no investigation can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Reports by Design Professionals:
Costly problems can occur when design professionals develop plans based on misinterpretation of the report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Report:
Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete report should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely:
As the investigation is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the report, and you are encouraged to read them closely.

SAQP

Appendix A: SAQP Figures

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

This plan should be read in conjunction with the Environmental report.

Title:	SITE LOCATION PLAN
Location:	BRICK PITT RESERVE, BANTRY BAY ROAD, FRENCHS FOREST, NSW
Project No: E35432P	Figure No: 1

JKEnvironments

PLOT DATE: 5/06/2023 11:38:30 AM DWG FILE: K:\5C EIS JOBS\35000'S\E35432P FRENCHS FOREST (BRICK PIT RESERVE)\CAD\E35432P.DWG

LEGEND

- - - -	APPROXIMATE SITE BOUNDARY
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE, 2022)
——	INDICATIVE LOCATION OF ONSITE CREEK
SW1	PROPOSED DSI SURFACE WATER SAMPLING LOCATION
BH102	PROPOSED DSI BOREHOLE/TEST PIT LOCATION AND NUMBER
BH/MW101	PROPOSED DSI BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION AND NUMBER
× SS1	PROPOSED DSI SEDIMENT SAMPLING LOCATION

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 10 20 30 40 50

SCALE 1:1000 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **PROPOSED DSI SAMPLE LOCATION PLAN**

Location: BRICK PITT RESERVE, BANTRY BAY ROAD, FRENCHS FOREST, NSW

Project No: E35432P

Figure No: 2

JKEnvironments

PLOT DATE: 6/06/2023 3:17:37 PM DWG FILE: K:\5C EIS JOBS\35000'S\E35432P FRENCHS FOREST (BRICK PIT RESERVE)\CAD\E35432P.DWG

Appendix B: Preliminary Concept Development Plans

DESIGN DESCRIPTION

- Create a **landmark public reserve** for Frenchs Forest
- Provide a space for integrated and varied **recreational amenity**
- Create a **valued open space** for local residents, future hospital staff and patients and the broader Northern Beaches community
- Rehabilitate and enhance **indigenous vegetation** to assist the regeneration of local flora and flora.
- Provide **landscape features** that celebrate and interpret the Frenchs Forest area site history

CONCEPT DESIGN FEATURES

1. Landscape gateway feature celebrating and interpreting Frenchs Forests past land uses
2. Passive recreational open space areas with seating, shade and grassed spaces
3. Revegetation and regeneration of existing indigenous vegetation
4. Community playground with natural play features and local heritage themes and materials. Cuttings from original pear trees from Holland's Farm to be incorporated.
5. New boardwalks for elevated passage over stormwater swale
6. Picnic tables and seating in sunny and sheltered areas throughout the reserve
7. Retain and enhance existing mountain bike track
8. Rocked and planted stormwater swale (by RMS)
9. Elevated lookout deck over proposed wetland
10. Lower viewing deck near proposed wetland for immersive experience
11. Colonnade of local tree species along street fronting with feature bricks within pavement
12. Proposed wetland to provide community ammenity, stormwater quality improvements, habitat and a central feature in the reserve
13. All ability access concrete loop path (2m wide) around wetland
14. Enhance existing access trail with (1.5m wide) crushed sandstone surface
15. Concrete shared path (3m wide) linking the reserve and providing access to the reserve features
16. Future shared path bridge crossing
17. P3 level lighting to 3m wide shared path

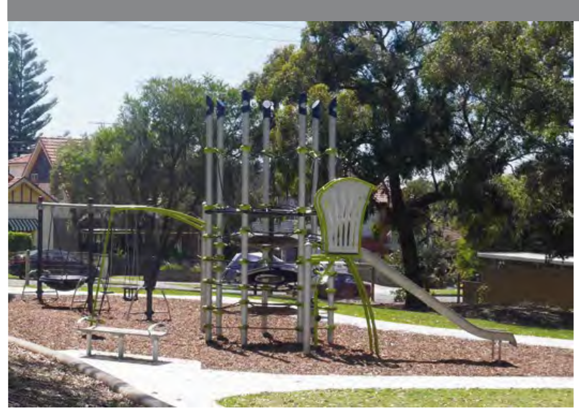
DRAWING KEY

Existing trees	Revegetation and regeneration of existing indiginious vegetation	Picnic bench and table
Proposed trees	Planted wetland edge	Outdoor exercise equipment
Proposed wetland and photomontage view point "refer"(BP-CD-03)	Turf open space	Viewing deck
Stormwater swale	Boardwalks	Community playground
P3 level lighting	(2m wide) concrete path	Property boundaries
Acoustic wall	(1.5m wide) crushed sandstone path	
	(3m wide) concrete path	

HISTORIC SITE IMAGES

Hews brickworks,1905 (reference Warringah Council Libary)

COMMUNITY DESIGN PRECEDENTS



Community playground

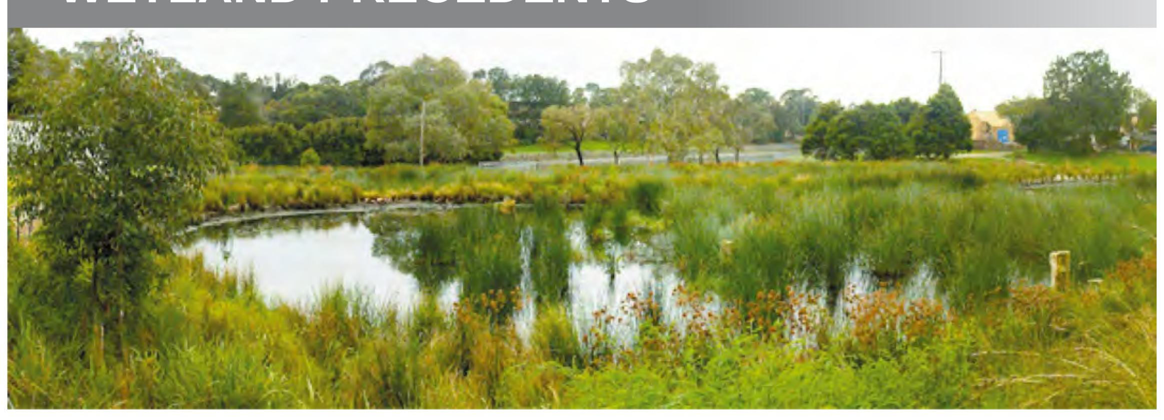
Welcoming community open spaces

DESIGN PRECEDENTS

Landscape gateway feature

Colonnade of local tree species

WETLAND PRECEDENTS



Proposed wetland ecosystem

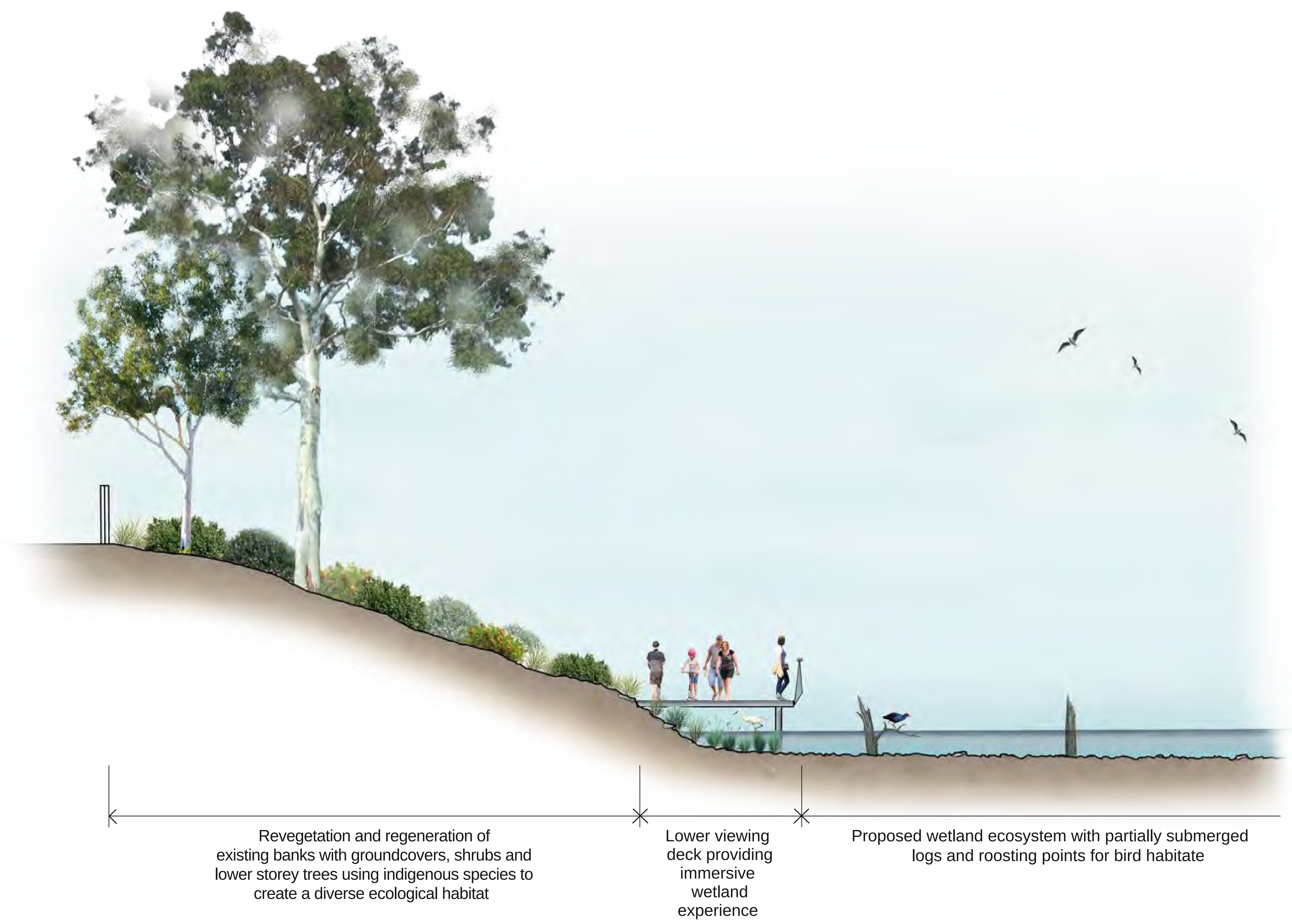
THOMPSON BERRILL LANDSCAPE DESIGN P/L

northern beaches council

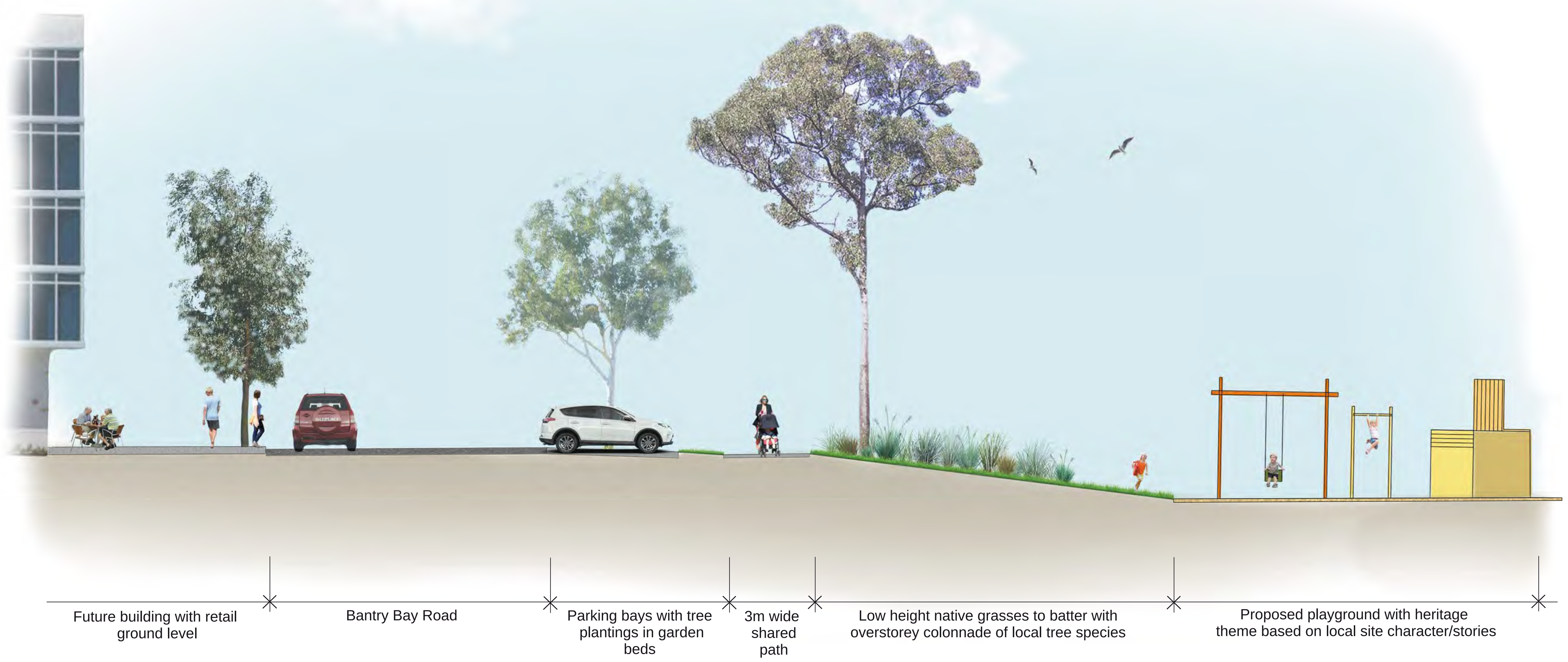
CONCEPT DESIGN
BRICK PIT RESERVE

JULY 2018
DWG No. BP-CD-01
SHEET 1
SCALE 1:500 @ A1
0 5 10 15 25m

A-A WETLAND CROSS SECTION SCALE: NTS



B-B LOWER VIEWING DECK CROSS SECTION SCALE: NTS



C-C BANTRY BAY RD STREETSCAPE CROSS SECTION SCALE: NTS

THOMPSON BERRILL LANDSCAPE DESIGN P/L

northern beaches council

CROSS SECTIONS
BRICK PIT RESERVE

JUNE 2018
DWG No. BP-CD-02
SHEET: 2
SCALE: NTS

Appendix C: Report Explanatory Notes

QA/QC Definitions

The QA/QC terms used in this report are defined below. The definitions are in accordance with US EPA publication SW-846, entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (1994)[16] methods and those described in *Environmental Sampling and Analysis, A Practical Guide,* (1991)[17]. The NEPM (2013) is consistent with these documents.

A. <u>Practical Quantitation Limit (PQL), Limit of Reporting (LOR) & Estimated Quantitation Limit (EQL)</u>

These terms all refer to the concentration above which results can be expressed with a minimum 95% confidence level. The laboratory reporting limits are generally set at ten times the standard deviation for the Method Detection Limit for each specific analyte. For the purposes of this report the LOR, PQL, and EQL are considered to be equivalent.

When assessing laboratory data it should be borne in mind that values at or near the PQL have two important limitations: *"The uncertainty of the measurement value can approach, and even equal, the reported value. Secondly, confirmation of the analytes reported is virtually impossible unless identification uses highly selective methods. These issues diminish when reliably measurable amounts of analytes are present. Accordingly, legal and regulatory actions should be limited to data at or above the reliable detection limit*" (Keith, 1991).

B. <u>Precision</u>

The degree to which data generated from repeated measurements differ from one another due to random errors. Precision is measured using the standard deviation or Relative Percent Difference (RPD).

C. <u>Accuracy</u>

Accuracy is a measure of the agreement between an experimental result and the true value of the parameter being measured (i.e. the proximity of an averaged result to the true value, where all random errors have been statistically removed). The assessment of accuracy for an analysis can be achieved through the analysis of known reference materials or assessed by the analysis of surrogates, field blanks, trip spikes and matrix spikes. Accuracy is typically reported as percent recovery.

D. <u>Representativeness</u>

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is primarily dependent upon the design and implementation of the sampling program. Representativeness of the data is partially ensured by the avoidance of contamination, adherence to sample handing and analysis protocols and use of proper chain-of-custody and documentation procedures.

E. <u>Completeness</u>

Completeness is a measure of the number of valid measurements in a data set compared to the total number of measurements made and overall performance against DQIs. The following information is assessed for completeness:

- Chain-of-custody forms;
- Sample receipt form;
- All sample results reported;

[16] US EPA, (1994). *SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* (US EPA SW-846)
[17] Keith., H, (1991). *Environmental Sampling and Analysis, A Practical Guide*

- All blank data reported;
- All laboratory duplicate and RPDs calculated;
- All surrogate spike data reported;
- All matrix spike and lab control spike (LCS) data reported and RPDs calculated;
- Spike recovery acceptable limits reported; and
- NATA stamp on reports.

F. Comparability

Comparability is the evaluation of the similarity of conditions (e.g. sample depth, sample homogeneity) under which separate sets of data are produced. Data comparability checks include a bias assessment that may arise from the following sources:

- Collection and analysis of samples by different personnel; Use of different techniques;
- Collection and analysis by the same personnel using the same methods but at different times; and
- Spatial and temporal changes (due to environmental dynamics).

G. Blanks

The purpose of laboratory and field blanks is to check for artefacts and interferences that may arise during sampling, transport and analysis.

H. Matrix Spikes

Samples are spiked with laboratory grade standards to detect interactive effects between the sample matrix and the analytes being measured. Matrix Spikes are reported as a percent recovery and are prepared for 1 in every 20 samples. Sample batches that contain less than 20 samples may be reported with a Matrix Spike from another batch. The percent recovery is calculated using the formula below. Acceptable recovery limits are 70% to 130%.

$$\frac{(\text{Spike Sample Result} - \text{Sample Result}) \times 100}{\text{Concentration of Spike Added}}$$

I. Surrogate Spikes

Samples are spiked with a known concentration of compounds that are chemically related to the analyte being investigated but unlikely to be detected in the environment. The purpose of the Surrogate Spikes is to check the accuracy of the analytical technique. Surrogate Spikes are reported as percent recovery.

J. Duplicates

Laboratory duplicates measure precision, expressed as Relative Percent Difference. Duplicates are prepared from a single field sample and analysed as two separate extraction procedures in the laboratory. The RPD is calculated using the formula where D1 is the sample concentration and D2 is the duplicate sample concentration:

$$\frac{(D1 - D2) \times 100}{\{(D1 + D2)/2\}}$$

Appendix D: Guidelines and Reference Documents

Australian and New Zealand Environment Conservation Council (ANZECC), (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality

Canadian Council of Ministers of the Environment, (1999). Canadian soil quality guidelines for the protection of environmental and human health: Benzo(a)Pyrene (1997)

CRC Care, (2011). Technical Report No. 10 – Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document

Contaminated Land Management Act 1997 (NSW)

Department of Land and Water Conservation, (1997). 1:25,000 Acid Sulfate Soil Risk Map Series

Managing Land Contamination, Planning Guidelines SEPP55 – Remediation of Land (1998)

National Health and Medical Research Council (NHMRC), (2021). National Water Quality Management Strategy, Australian Drinking Water Guidelines 2011

NSW Department of Environment and Conservation, (2007). Guidelines for the Assessment and Management of Groundwater Contamination

NSW EPA, (2015). Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997

NSW EPA, (2017). Guidelines for the NSW Site Auditor Scheme, 3rd Edition

NSW EPA, (2020). Consultants Reporting on Contaminated Land, Contaminated Land Guidelines

National Environment Protection Council (NEPC), (2013) National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)

Protection of the Environment Operations Act 1997 (NSW)

State Environmental Planning Policy (Resilience and Hazards) 2021 (NSW)

Appendix F

Heritage Impact Statement

Damian O'Toole Town Planning & Heritage Services

DRAFT
Heritage Impact Statement

Brick Pit Reserve, Frenchs Forest NSW 2086

Works to Council reserve to improve recreation facilities

March 2023

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1. Introduction

1.1. Overview

This Heritage Impact Statement (HIS) has been prepared to form part of a Review of Environmental Factors (REF) relating to revitalisation works at Brick Pit Reserve which is bound by Warringah Road, Bantry Bay Road and Fitzpatrick Avenue East in Frenchs Forest NSW 2086. The subject site is located in the Local Government Area (LGA) of Warringah Council. The proposed works include new pathways, a noise barrier wall, nature play area, stone steps, amenities block, drainage works, new plantings and garden beds, a picnic area with a shelter, sandstone retaining walls and seats, public art, interpretation signage, park furniture and new lighting.

The subject site does not have built heritage or historical archaeology statutory heritage protection and is therefore not included as an individual heritage item on any local, state, national, commonwealth or world statutory heritage registers. It is also not part of a Heritage Conservation Area (HCA). The subject property is not included on the National Trust (NSW) heritage register. There are no Aboriginal sites or places that have been declared in or near the location according to the Aboriginal Heritage Information Management System (AHIMS) register.

Council requires the submission of a HIS as part of the REF process, to understand the potential heritage impact of the works upon the former brick pit site. Although the site is not included in Schedule 5 Environmental Heritage on the Warringah Local Environmental Plan (LEP) 2011, this HIS considers the proposal against the relevant heritage planning objectives and controls contained within the Warringah LEP 2011. As there are no heritage controls included in the Warringah DCP 2011, an assessment against the DCP has not been undertaken. The report also provides a brief overview of potential Aboriginal cultural heritage as shown on the AHIMS database.

The format of this report follows the standard for the preparation of Heritage Assessments and Heritage Impact Statements as set out in the NSW Heritage Manual and other recognised conservation methodologies. The terminology used in this report is consistent with the *NSW Heritage Manual,* prepared by the NSW Heritage Office and *The Burra Charter: The Australian ICOMOS Charter for Places of Cultural Heritage 2013* (the Burra Charter).

Desktop based historical research has been undertaken utilising information and resources contained within Council historical resources (online), Trove and the State Library of New South Wales (NSW), as well as relevant consulting reports.

1.2. Authorship

This report has been prepared by Damian O'Toole. Damian has a Master's Degree in Town Planning and a Post-Graduate Diploma in Heritage Conservation obtained from the University of Sydney, and has been engaged by several Councils in Sydney.

1.3. Physical Evidence

A physical description of the site and surrounding area can be found in Section 2 of this report. Site visits were undertaken in February 2023.

2. Location and Site Description

Brick Pit Reserve is bordered by Warringah Road, Bantry Bay Road and Fitzpatrick Avenue East in Frenchs Forest NSW. The subject property is legally defined as Lot 103 in Deposited Plan (DP) 1214166 and Lot 1B DP417447. Frenchs Forest is located 13 kilometres north of the Sydney Central Business District (CBD) and is part of the Local Government Area of Warringah Council.

Brick Pit Reserve is largely inaccessible. The site is heavily overgrown with substantial trees along with a range of smaller trees and weeds. Ground visibility is very low in some areas. Some portions of the site are fenced off with cyclone wire fencing. The area surrounding the site is largely low scale residential.

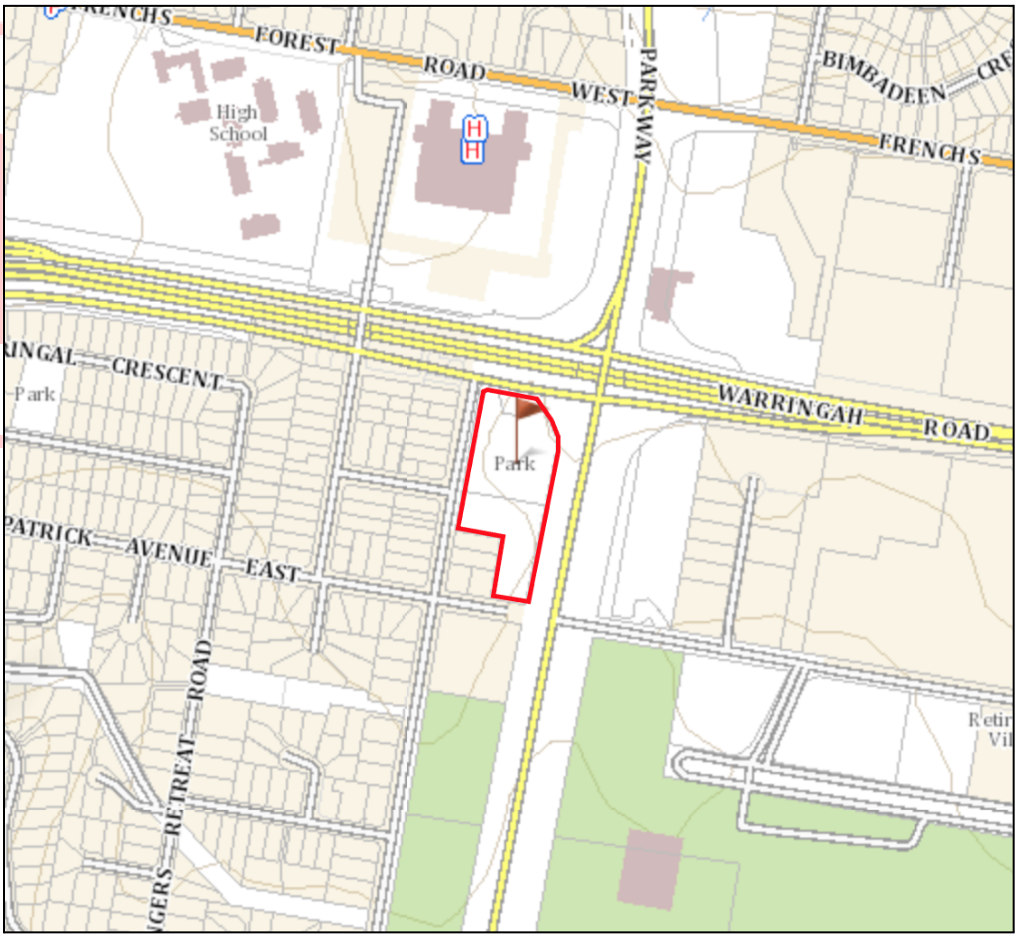


Figure 1: Location of the subject site within the wider area (Source: LPI SIX Maps Viewer).

Figure 2: Aerial view of the subject site (Source: LPI SIX Maps Viewer).

3. Heritage status and heritage in the vicinity

3.1. Statutory registers

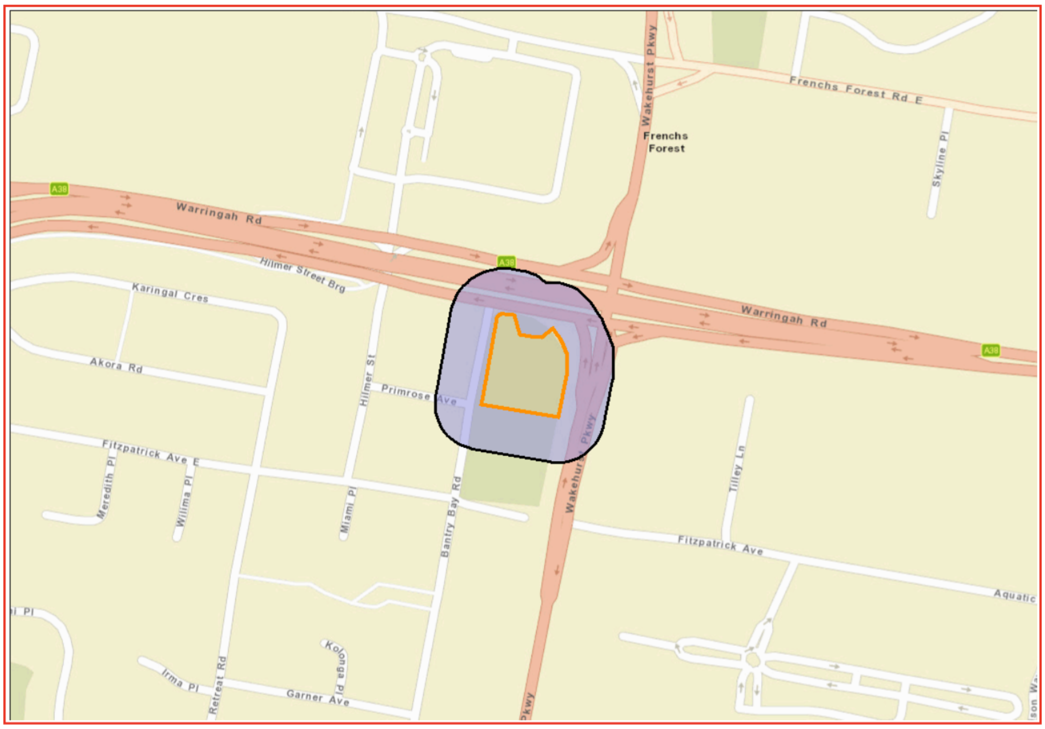
The subject site does not have built heritage or historical archaeology statutory heritage protection and is therefore not included as an individual heritage item on any local, state, national, commonwealth or world statutory heritage registers. It is also not part of a Heritage Conservation Area (HCA).

A 50m search buffer over the property and surrounds, using the Aboriginal Heritage Information Management System (AHIMS) register, shows that there are no Aboriginal sites or places that have been declared in or near the location.

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 103, DP:DP1214166, Section : - with a Buffer of 50 meters, conducted by Corinne Softley on 03 March 2023.

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:

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

Figure 3: Extract from AHIMS records identifying that there are no aboriginal places within the site or within close proximity to the site.

3.2. Non-statutory registers

The subject property is not included on the National Trust (NSW) heritage register.

In June 2015, RPS prepared a Statement of Heritage Impact for the Northern Beaches Hospital. The report identified an unlisted item within Brick Pit Reserve, a pit for the extraction of clay, used for brick manufacture from 1885. As quoted from the RPS report "Preliminary Heritage Assessment: Brick Pit Reserve" (2016):

> *The report concluded that due to the nature of the item, (i.e., a cavity formed through clay extraction), the erosion caused through water and soil slip, and no to low potential for archaeological relics associated with the use of the area for brick manufacturing due to erosion and subsequent land-use disturbance, the potential for the project to affect the significance of the item as low.*

3.3. Heritage in the vicinity

There is one heritage place located in the vicinity of the subject site, known as the *Former Holland's Orchard and Commemorative Grove* (I62) which is located adjacent to Warringah Road and within The Forest High School grounds.

The statement of significance for the item is as follows:

A rare remnant of an early orchard, which demonstrates that horticultural activities were carried out in the area at the turn of the 20th century. Provides evidence of the association of social, cultural & educational qualities in the locality.

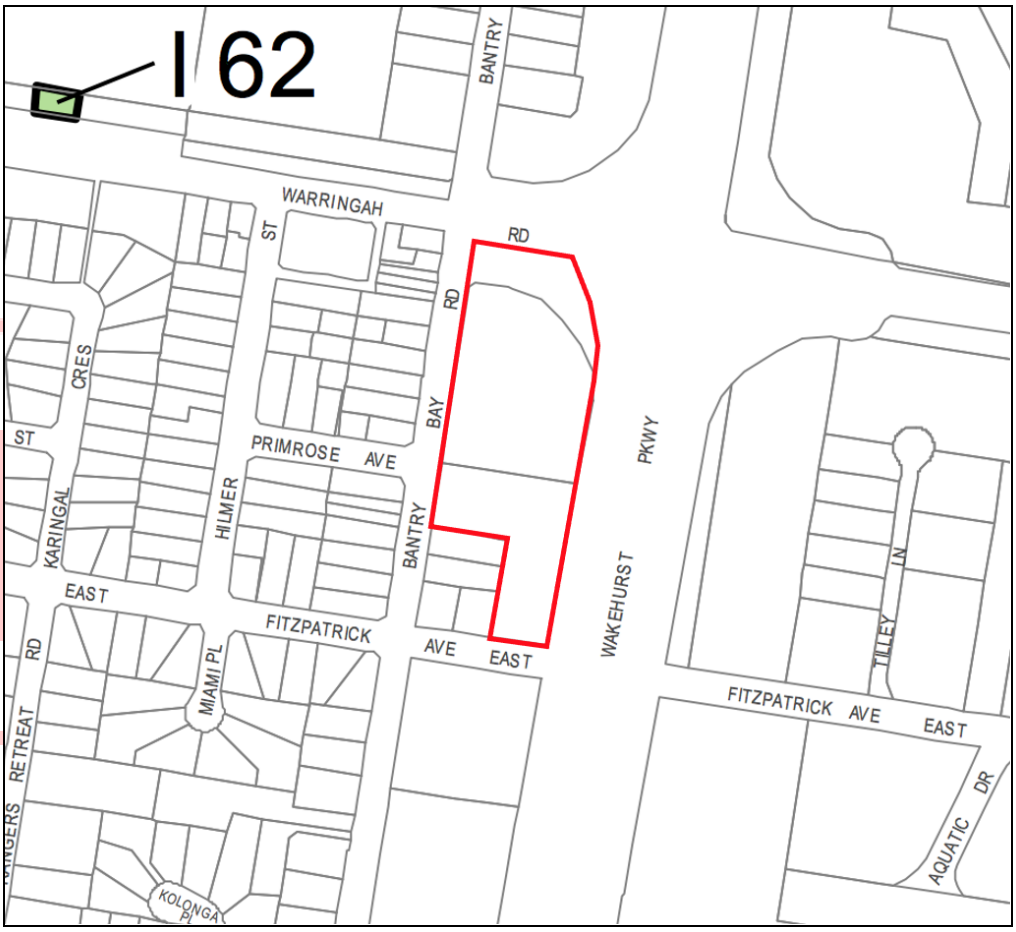


Figure 4: LEP heritage map showing the subject site (outlined in red) in the vicinity of I62 (Source: Warringah LEP 2011, HER_008).

Figure 4: Former Holland's Orchard and Commemorative Grove (source: NSW State Heritage Inventory).

4. Photographs of the Subject Site

Figure 5: Current view.

Figure 6: The reserve is largely overgrown and inaccessible.

Figure 7: The reserve is largely overgrown and inaccessible with some informal pathways created.

Figure 8: The reserve is largely overgrown and inaccessible with some informal pathways created.

Figure 9: The reserve is largely overgrown and inaccessible.

Figure 10: View from Bantry Bay Road. Looking towards the northern part of the reserve.

Figure 11: View from Bantry Bay Road. Looking towards the car parking area at the northern part of the reserve.

5. Historical Summary

Reference is made to the RPS report "Preliminary Heritage Assessment: Brick Pit Reserve" (2016) for relevant information regarding the early settlement of Frenchs Forest. As this HIS is specifically related to the Brick Pit Reserve, only relevant historical information concerning the site itself has been included below.

The following historical information has been quoted directly from the RPS Preliminary Heritage Assessment:

On 10 December 1994, William Hews purchased 10 acres from French for 200 (Champion 1988:14). He built a timber dwelling on the corner of Bantry Bay Road and Rodborough Road (now Warringah Road) and established brick manufacturing. Hews built the required infrastructure, and engaged and accommodated upwards of 40 people as part of his brick manufacturing operations (Plate 1 and Plat 2). In 1900, Hews built a permanent residence on the foundations of that of French's, at the intersection of Hilmer Street and Primrose Avenue.

Plate 1 Hews timber dwelling c. 1886 (Warringah Council Library)

Plate 2 Brick manufacturing within the project area c.1905 (Warringah Council Library)

Frenchs Forest developed from 1885, centred on Hews operations. When Warringah Council was incorporated in 1906, Hews was elected as a representative for C Riding and later served as President.

In addition to above, the Northern Beaches Library website includes the following historical overview called "Williams Hews and the bricks he made" which is of direct relevance to the subject property:

The workers were housed in small cottages, slab huts and dormitories. The Forest soon became a thriving community with the addition of a tennis court, cricket ground and pavilion.

Using his own bricks, Hews built a new home in 1890, near the corner of Hilmer Street and Primrose Avenue. Many of Manly's early homes were also reputedly built with Hews bricks.

Hews bricks were hand made in moulds and fired in kilns for about 72 hours, using timber from the nearby bush. One man could make 12 to 13 hundred bricks a day! The bricks were transported by horse and dray to Manly, Narrabeen and The Spit, where they were loaded onto a punt and shipped to Mosman and the city.

As the kilns consumed a huge amount of local timber, the brickworks impacted much of the surrounding bushland, already heavily logged by James French's sawmills. Hews Brickworks operated until World War I, when the essential clay was finally exhausted.

A small part of the Hews' family land is now the site of Brick Pit Reserve with most occupied by the Northern Beaches Hospital. A plaque in the reserve honours the Aboriginal inhabitants and also commemorates the pioneers of Frenchs Forest.

William Hews was also elected as a representative for C Riding and then served as Shire President of Warringah Shire Council. He passed away in 1917 and his wife, Hannah in 1928. Both were buried in Manly Cemetery.

Figure 12: Hews brickworks, Frenchs Forest, c. 1905 (Source: Northern Beaches Council Library).

Figure 13: Staff of Hews Brickworks, Frenchs Forest, c. 1905 (Source: Northern Beaches Council Library).

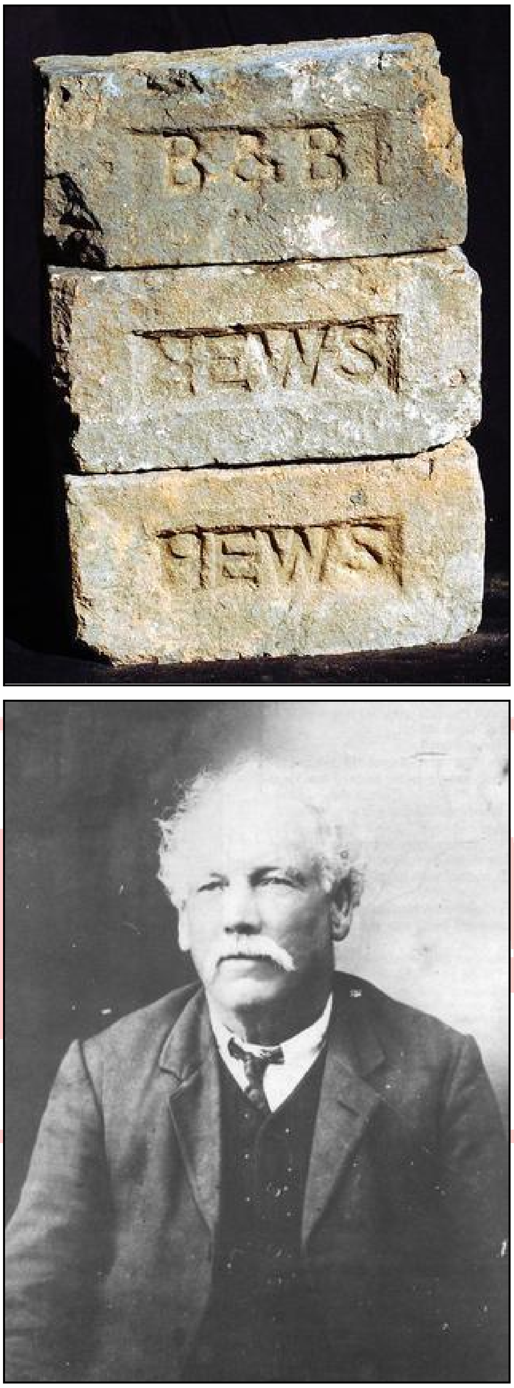


Figure 14: Example of Hews bricks (left) and photograph of William Hews (right) (source: Northern Beaches Library).

Figure 15: Extracted GIS plan from the RPS preliminary heritage assessment showing former drainage across the site. *NOTE: the red curtilage in this plan is __not__ the proposed development area but rather the project area relevant to the RPS report. Further, the original source map was not identified as no source reference is provided in the report.*

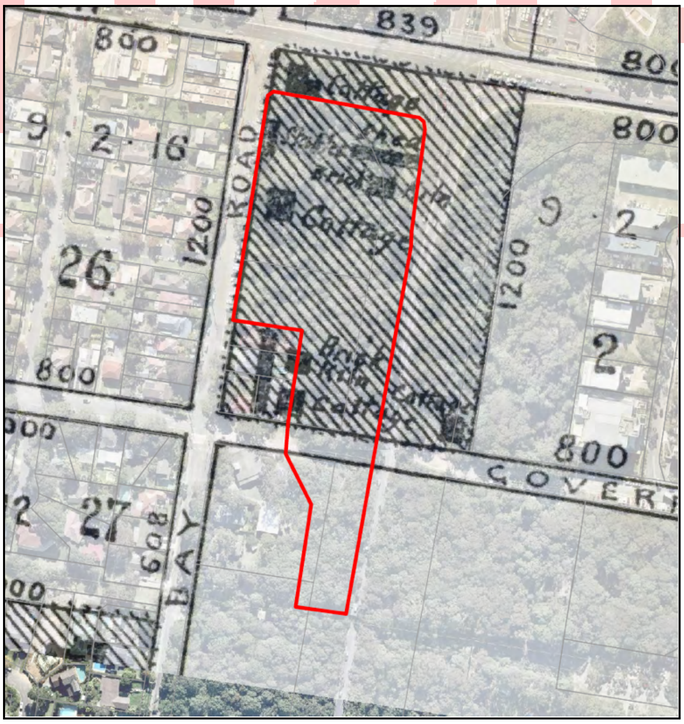


Figure 15: Extracted GIS plan from the RPS preliminary heritage assessment showing former structures on the site. *NOTE: the red curtilage in this plan is __not__ the proposed development area but rather the project area relevant to the RPS report. Further, the original source map was not identified as no source reference is provided in the report.*

Figure 16: 1943 aerial photograph showing the subject site outlined in red (Source: LPI SIX Maps Viewer).

6. Significance

6.1. Preliminary Significance Assessment Findings

With reference to specific the historical, associative and representative heritage criterion, the RPS preliminary heritage assessment notes the following:

- *The former Hews' Brick Pit is historically significant as the site of one of the first industries in Frenchs Forest. It is considered to satisfy this criterion at a local level.*
- *The former Hews' Brick Pit site is associated with William Hews who set up the works. Hews employed around 40 people at the works, and built a number of timber houses and communal huts in the area to accommodate his employees, who became the first permanent residents of the area. The former Hews' Brick Pit site is considered to satisfy this criterion at a local level.*
- *The former Hews' Brick Pit is a fair representative example of a brick pit in New South Wales and is considered to meet this criterion.*

In addition, it notes the following with regards to integrity and intactness:

The former Hews' Brick Pit was an element of a much larger brickworks complex, owned and operated by Williams Hews. No evidence of the larger operation was found during the visual inspection of the site, and it is expected that this is likely to have decayed over time. The brick pit was heavily overgrown and had mountain bike tracks and dumped rubbish in it at the time of inspection. The integrity and intactness of the brick pit is fair.

With regards to archaeological potential, the following is noted in the report:

The locations of the buildings comprising the brick pit complex are well documented as can be seen from Figure 3. No traces of these buildings are present in the landscape.

The dominant remaining feature of the brick pit complex is the clay extraction pit. Whilst it is possible that some machinery or parts may still be present, given the amount of refuse that has been deposited in the pit over the years it is unlikely that a connection will be evident between such deposits and the brick pit. Nonetheless, some machinery that may once have been used in the brick pit operations will still be useful for interpretative installations for public viewing. As noted below, the remaining clay extraction pit is extremely overgrown and some evidence may still be obscured by the vegetation.

In the unlikely event that any earthworks connected with development of the Proposal Area uncovers intact archaeological deposits evidencing the workings of the brick pit, it is recommended that these deposits be inspected and assessed by an experienced and qualified archaeologist. As any such remains within the brick pit would represent items of local significance, a plan for the mitigation and management of that archaeological resource should be developed before and further works taking place in that vicinity

The significance assessment outlined in this report in this report then concludes with the following Statement of Significance:

The former Hew's Brick Pit is considered to have local historical, associative and representative significance, and is strongly associated with the early development of industry, and by association, early residential development in Frenchs Forest.

6.2. Additional Comments

The historical background and physical survey of the Brick Pit Reserve shows that the subject property has historical and associative heritage value at the local level. The site is well documented as one of the first industries in Frenchs Forest, providing a place of employment and a source of bricks for many years to the local community. In addition, the site is associated with William Hews who was an important local figure both through this site and his wider involvement in the community through the local council of the time.

There is no evidence of the brick pit and associated structures / equipment visible above ground and any remains that may be present have been poorly maintained. Due to the low integrity of the place, this report does not agree that the site has representative value as a brick pit in NSW. There is no known fabric to represent this use, and any remains are likely to be buried and decayed rather than remain as extant structures or landscape features. It is not a good representative example of a brick pit in NSW, particularly as there are other former brick pit sites in Sydney that are better examples with extant structures / features.

It is agreed that the archaeological potential of the site is low. The former clay extraction pit is unlikely to yield any archaeological relics due to its historical use but also its later use for landfill and then as a water body. Further, the works are unlikely to impact this area in a significant way.

7. Proposed Development

7.1. Proposed Works – Concept Design

The concept design includes the following key works:

- new pathways;
- a noise barrier wall to match the existing;
- provision of a nature play area;
- stone steps;
- provision of an amenities block;
- drainage works;
- new trees, embankment plantings and garden beds;
- a picnic area with a shelter;
- sandstone retaining walls and seats;
- public art (yet to be designed);
- interpretation signage (yet to be designed);
- park furniture; and
- new lighting.

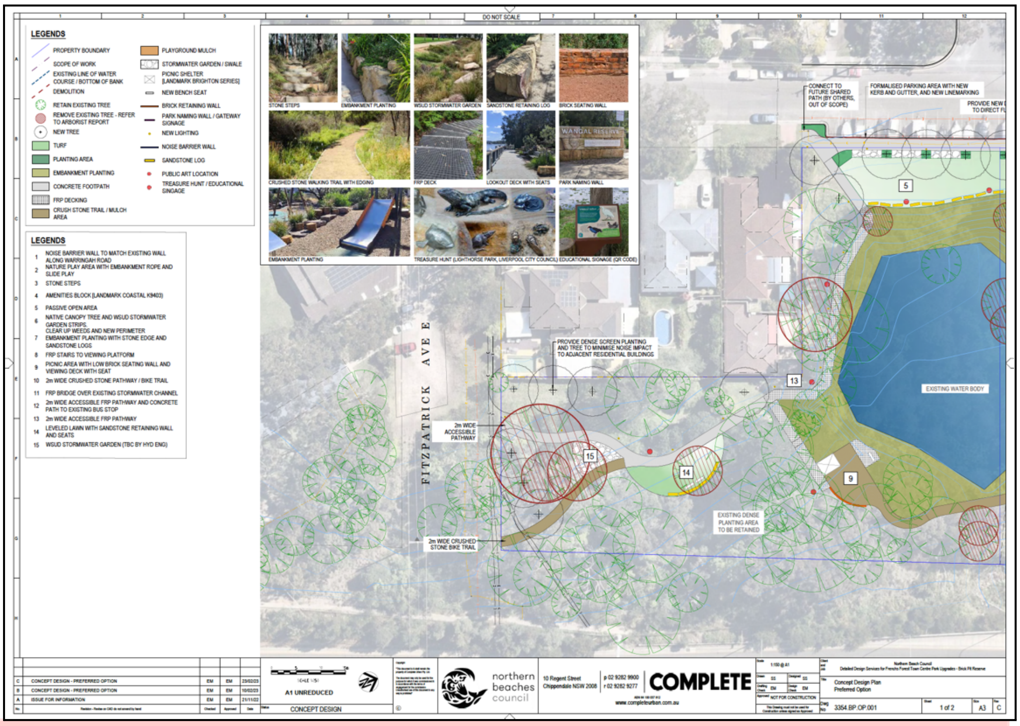


Figure 17: Sheet 1 of 2 showing the proposed concept design.

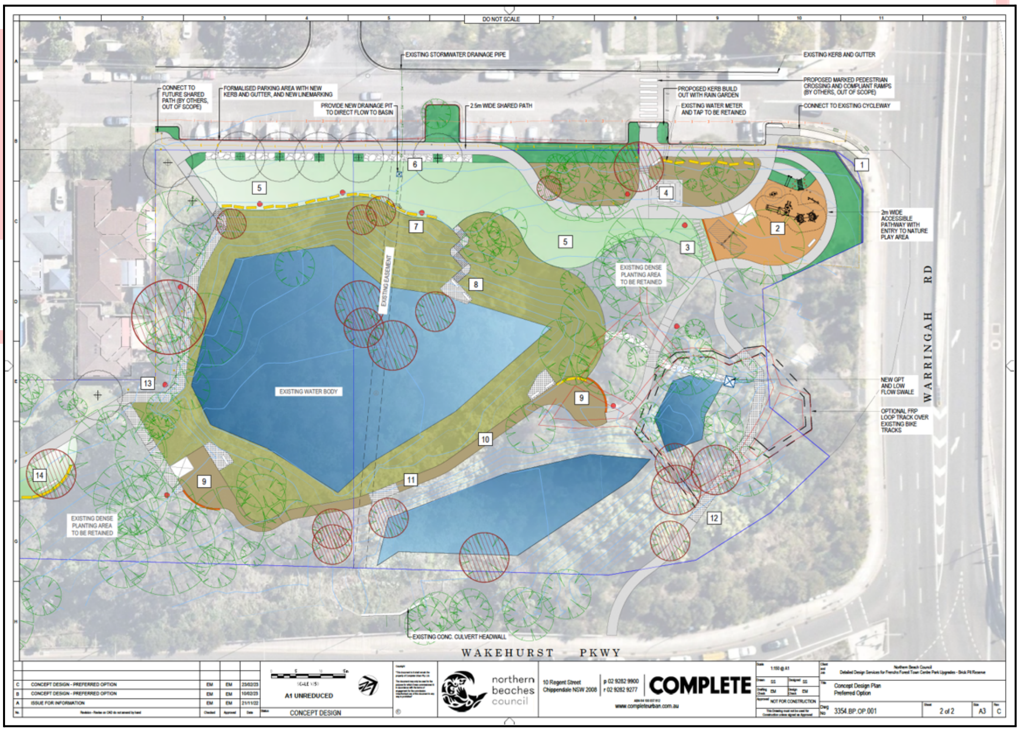


Figure 18: Sheet 2 of 2 showing the proposed concept design.

Figure 19: Detail of the proposed finishes.

7.2. Design Intent

The upgrade of Brick Pit Reserve will create a landmark public reserve for Frenchs Forest. The design intention is to create an open space for local residents, future hospital staff and patients and the broader Northern Beaches community. To rehabilitate and enhance indigenous vegetation, to assist the regeneration of local flora and flora, and to provide landscape features that celebrate and interpret the Frenchs Forest area site history.

As part of the Frenchs Forest 2041 Place Strategy, a larger block that sits on Warringah Road, in between Bantry Bay Road and Hilmer Street will offer new shops that will bring activity to Bantry Bay Road and Brick Pit Reserve and provide easy access for people living south of Warringah Road. Other renewal activity will bring ground floor retail uses on Bantry Bay Road and around Brick Pit Reserve.

The concept designs have been prepared based on the specific site conditions and the existing qualities of the reserve.

8. Heritage Impact Assessment

8.1. Summary of Heritage Impact

The proposed works will not have an adverse or unsympathetic heritage impact on the significance of the Brick Pit Reserve for the following reasons:

- The proposed concept design is made up of largely above ground works and excavation works will largely be minor.
- There is no known heritage fabric above ground that will be impacted by the works. The former structures associated with the brick pit have been cleared.

- There is low potential for sub-surface remains over the brick pit given the type of feature it is and its use post the closure of the brick pit. Further, the works are unlikely to impact this area in a significant way.
- As it currently stands, the historical and associative heritage values of the place are not connected to any physical evidence. As a result, our understanding of the site under this criterion will not be impacted by the works. The site will continue to have historical and associated heritage value as a former brick pit site established by William Hews.
- The proposal will provide public art and signage which can educate the community on the heritage values of the place.
- The proposal will vastly improve the visual setting of the place, and make it accessible / usable to the community which in turn extends the lifespan and relevance of the heritage place to the local community.
- There is no significant vegetation on the site.
- There are no documented Aboriginal sites or places on this property.
- There are no heritage impacts to heritage in the vicinity.

In light of the above comments, the following is recommended to manage the heritage values of the place:

- Prior to works commencing, all staff, contractors and sub-contractors should undergo a heritage induction presented by a qualified heritage consultant. The induction must identify their statutory obligations for heritage under the Heritage Act 1977 in relation to built heritage and archaeological relics and associated procedures to follow.
- If unexpected archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and the area cordoned off. A qualified archaeologist should be engaged to assess the significance of the remains and prepare a suitable management strategy. No works should recommence in the area until that strategy has been implemented.
- In the event that items related to the former site use, such as machinery, are identified it is recommended that an industrial heritage expert is engaged to assess the item(s) and their significance, prepare a suitable management strategy, and provide information which can be used as part of future on-site interpretation.
- Prepare a Heritage Interpretation Plan for the site that presents both the Aboriginal and non-Aboriginal history and heritage of the place. Refer to the NSW Heritage Office, "Heritage Information Series: Interpreting Heritage Places and Items Guideline" to assist in preparing this document. The Plan should include traditional interpretation such as signage but also include interpretation related to any objects found at the site, as well as consideration of esoteric interpretation such as landscape treatments and art. This Plan must be physically implemented prior to the closure of the project.

8.2. Warringah Local Environmental Plan 2011

Relevant provisions of the Warringah Local Environmental Plan (LEP) 2011 and the proposed works compliance are considered below.

5.10 Heritage Conservation		
(1) Objectives The objectives of this clause are as follows: (a) to conserve the environmental heritage of Warringah (b) to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views. (c) to conserve archaeological sites, (d) to conserve Aboriginal objects and Aboriginal places of heritage significance.	The subject property has no statutory heritage protection. However, this report finds that the proposal will have no adverse impact on the brick pit site in terms of its historical or associative heritage values.	N/A
(2) Requirement for consent **Development consent is required for any of the following:** (a) demolishing or moving any of the following or altering the exterior of any of the following (including, in the case of a building, making changes to its detail, fabric, finish or appearance): (i) a heritage item, (ii) an Aboriginal object, (iii) a building, work, relic or tree within a heritage conservation area. (b) altering a heritage item that is a building by making structural changes to its interior or by making changes to anything inside the item that is specified in Schedule 5 in relation to the item, exposed, moved, damaged or destroyed. (c) disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed, (d) disturbing or excavating an Aboriginal place of heritage significance, (e) erecting a building on land: (i) on which a heritage item is located or that is within a heritage conservation area.	The subject property has no statutory heritage protection on any local, state, national or commonwealth heritage lists, including Aboriginal cultural heritage. There is low potential for archaeological remains related to the brick pit. Further, the works are unlikely to impact this area in a significant way.	N/A

(4) Effect of proposed development on heritage significance The consent authority must, before granting consent under this clause in respect of a heritage item or heritage conservation area, consider the effect of the proposed development on the heritage significance of the item or area concerned. This subclause applies regardless of whether a heritage management document is prepared under subclause (5) or a heritage conservation management plan is submitted under subclause (6).	Although the subject property does not have any statutory heritage protection, this HIS meets this requirement as an assessment under the REF process.	N/A
(5) Heritage assessment The consent authority may, before granting consent to any development: (a) on land on which a heritage item is located, or (b) on land that is within a heritage conservation area, or (c) on land that is within the vicinity of land referred to in paragraph (a) or (b), require a heritage management document to be prepared that assesses the extent to which the carrying out of the proposed development would affect the heritage significance of the heritage item or heritage conservation area concerned.	As above	N/A

9. Conclusions and Recommendations

The proposed concept design will not have an adverse or unsympathetic heritage impact on the significance of the Brick Pit Reserve.

The following is recommended to manage the heritage values of the place:

- Prior to works commencing, all staff, contractors and sub-contractors should undergo a heritage induction presented by a qualified heritage consultant. The induction must identify their statutory obligations for heritage under the Heritage Act 1977 in relation to built heritage and archaeological relics and associated procedures to follow.
- If unexpected archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and the area cordoned off. A qualified archaeologist should be engaged to assess the significance of the remains and prepare a suitable management strategy. No works should recommence in the area until that strategy has been implemented.

- In the event that items related to the former site use, such as machinery, are identified it is recommended that an industrial heritage expert is engaged to assess the item(s) and their significance, prepare a suitable management strategy, and provide information which can be used as part of future on-site interpretation.
- Prepare a Heritage Interpretation Plan for the site that presents both the Aboriginal and non-Aboriginal history and heritage of the place. Refer to the NSW Heritage Office, "Heritage Information Series: Interpreting Heritage Places and Items Guideline" to assist in preparing this document. The Plan should include traditional interpretation such as signage but also include interpretation related to any objects found at the site, as well as consideration of esoteric interpretation such as landscape treatments and art. This Plan must be physically implemented prior to the closure of the project.

In light of the heritage impacts and recommendations for management of heritage values, it is recommended that consent be granted for the proposed concept design.