Remediation Action Plan

46-52 Raymond Avenue, Matraville NSW

March 2021

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Remediation Action Plan

46-52 Raymond Avenue, Matraville NSW

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Client

Epsom Enterprises

Date

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Prepared by	**Approved by**
	
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Table of Contents

1 Introduction 1

1.1 Background 1

1.2 Objectives 1

1.3 Scope of work 1

1.4 Regulatory and legislative requirements 3

1.5 Summary 4

2 Site setting 6

2.1 Site Identification 6

2.2 Environmental setting 10

2.3 Site history 10

3 Previous site investigations 11

3.1 JBS&G Preliminary Site Investigation (PSI) and limited Detailed Site Investigation (DSI) (JBS&G 2019a) 11

3.2 Hazardous Building Materials Survey (HBMS) (JBS&G 2019b) 11

3.3 Friable Asbestos Removal – Conditional Partial Clearance Certificates (Units 1 – Unit 4) (Pickford and Rhyder, 2020a, 2020b, 2020c, 2020d, 2020e) 11

3.4 EMM Detailed Site Investigation (EMM, 2020) 12

4 Environmental site status 17

4.1 Nature and extent of contamination 17

4.2 Geotechnical conditions 17

5 Conceptual site model 18

5.1 Sources of contamination and contaminants of potential concern 18

5.2 Migration and exposure pathways 20

5.3 Sensitive receptors 20

5.4 Conceptual site model 21

6 Remediation strategy 26

6.1 Data quality objectives 26

6.2 Remedial options assessment 29

6.3 Preferred remedial strategy 30

7 Remediation strategy implementation 32

7.1 Step 1: stakeholder consultation 32

7.2 Step 2: site establishment 32
7.3 Step 3: remediation works 32
8 Contingencies 37
8.1 Excavation contingencies 37
8.2 Remediation contingencies 38
9 Waste management 39
9.1 Waste classification 39
9.2 Imported soils 39
9.3 Materials handling 39
10 Validation 40
10.1 Validation sampling and analysis plan 40
10.2 Validation criteria 41
10.3 Quality assurance and quality control 44
10.4 Validation report 45
11 Site environmental management plan 46
11.1 Health and safety 46
11.2 Erosion and sediment control 47
11.3 Stockpile management 47
11.4 Soil haulage 47
11.5 Noise 47
11.6 Odour and dust 48
11.7 Communication 48
12 Approvals and licences 49
13 Conclusions 50
References 51

Appendices

Appendix A Historical data
Appendix B Supporting information

Tables

Table 2.1 Site identification 6
Table 2.2 UPSS infrastructure 7

Table 2.3	Environmental setting	10
Table 3.1	Summary of Former UPSS Analytical Results	12
Table 5.2	Conceptual site model	21
Table 6.1	Data quality objectives	26
Table 6.2	Data quality indicators	28
Table 6.3	Soil remediation options assessment	29
Table 6.4	Tank remediation strategy	30
Table 7.1	Excavated material characterisation	35
Table 8.1	Summary of remediation contingencies	38
Table 10.1	Validation and characterisation sampling	40
Table 10.2	Soil validation criteria	42
Table 10.3	Groundwater validation criteria	43

Figures

Figure 1.1	Site location	2
Figure 2.1	Site layout	8
Figure 2.2	Layout of identified UPSS infrastructure	9
Figure 3.1	Soil analytical results (EMM, 2020)	15
Figure 3.2	Groundwater elevation and analytical results (EMM, 2020)	16

1 Introduction

1.1 Background

EMM Consulting Pty Limited (EMM) was engaged by Epsom Enterprises (Epsom) to prepare this Remediation Action Plan (RAP) to inform the removal of redundant underground petroleum storage system (UPSS) infrastructure and remediate surrounding soils at a property known as 42-52 Raymond Avenue, Matraville, NSW (the Site). The Site location is provided in Figure 1.1.

Epsom intends to divest the Site, which is comprised of approximately 1.98 hectares (ha) of land in an industrial area of Matraville in southern Sydney. The Site was previously occupied by a warehouse building which has recently been demolished.

A preliminary site investigation and limited detailed site investigation (JBS&G 2019a) and a Hazardous Building Materials Survey (HBMS) (JBS&G 2019b) were completed at the Site in 2019. A former 3,000-gallon underground storage tank (UST), a 1,000-gallon UST and related infrastructure was identified in a Safe Work NSW Dangerous Goods records search. These search results were not received before field work was undertaken for JBS&G (2019a).

EMM was engaged by Epsom to undertake a detailed site investigation (DSI) at the Site to address data gaps identified in the previous investigations and to support divestment of the Site. The DSI field works were completed in September 2020 and are reported under a separate cover (EMM, 2020). During the September 2020 DSI fieldworks, UPSS infrastructure was identified in the western portion of the Site. This RAP details the proposed remediation of this UPSS infrastructure and surrounding soils.

1.2 Objectives

The objective of this RAP is to present a plan which documents the proposed remedial works at the Site which would render the site suitable for redevelopment in accordance with the current zoning (general industrial) at the time of preparation of this report (Section 2.1). This RAP sets specific remediation goals and documents management procedures and mitigation measures for end uses consistent with the National Environment Protection (Assessment of Site Contamination) Amendment Measure 1999, amended 2013 (NEPC, 2013) (herein referred to as the ASC NEPM (2013)).

1.3 Scope of work

To meet the above remediation objectives, the scope of work for this RAP is to:

- summarise the environmental setting, Site investigation history and conceptual site model (CSM) to identify remediation options (Section 6.1.1);
- evaluate available remediation options and discuss the preferred remedial strategy which would render the Site suitable for the end uses consistent with the current zoning;
- identify remediation end points including soil validation criteria that are required to meet the remedial objectives (Section 10.2); and
- detail the procedures required to validate the proposed remedial works, specifically validation of soils from excavations resulting from the removal of the current UPSS.

Source: EMM (2020); Nearmap (2020); DFSI (2017); GA (2011); ASGC (2006)

0 100 200 m

GDA 1994 MGA Zone 56

N

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Site location

KEY

- Site boundary
- Major road
- Minor road
- Watercourse/drainage line

INSET KEY

- Main road
- NPWS reserve

42-52 Raymond Avenue, Matraville NSW
Remediation action plan
Figure 1.1

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1.4 Regulatory and legislative requirements

Relevant legislation and regulations that were used to guide this RAP are summarised below.

1.4.1 NSW Protection of the Environment Operations Act 1997

The NSW Protection of the *Environment Operations Act 1997* (POEO Act) is administered by the NSW Environment Protection Authority (EPA). It prohibits any person to cause pollution of waters, land or air and provides penalties for specified offences. The POEO Act enables the NSW Government to set out explicit protection of the environment policies and adopt more innovative approaches to reducing pollution. The POEO Act also requires "scheduled activities" listed at Schedule 1 to the POEO Act to be carried out in accordance with an Environment Protection Licence (EPL).

1.4.2 Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019 (UPSS Regulation)

The UPSS Regulation aims to minimise the risk to human health and the environment by requiring best practice design, installation, maintenance, and monitoring of UPSS in NSW.

Since 1 September 2019, most sites with UPSS in NSW are regulated by local councils, in accordance with legislation and guidance published or endorsed by NSW EPA (or their predecessor agencies). The Site is within the Randwick City Council local government area (LGA).

The NSW Department of Environment, Climate Change and Water NSW (DECCW) 2010 *UPSS Technical Note: Decommissioning, Abandonment and Removal of UPSS* provides information on legislative requirements for the decommissioning of underground tanks, including references to the relevant regulatory requirements.

1.4.3 Environmental Planning and Assessment Act (2000) and State Environmental Planning Policy (SEPP) no.55 – Remediation of Land

State Environmental Planning Policy 55 – Remediation of Land (SEPP 55) is a planning instrument under the *Environmental Planning and Assessment Act 2000* (EPA Act) that applies to State land. SEPP 55 also specifies when remediation works will require Development Consent from the Local Government Authority (LGA).

SEPP 55 provides guidance on the requirements for remediation works in NSW, including where remediation works require development consent (Category 1 remediation works) or not (Category 2 remediation works).

The proposed works are considered to be Category 2 works, which require:

- notification to Council at least 30 days prior to works commencing; and
- at least 14 days prior to works commencing, provide copies of investigations reports and a remediation action plan, plus contact details, to Council.

1.4.4 Heritage Act 1977 (NSW)

This act provides for the identification and registration of items of State or Local Heritage significance. The *Heritage Act 1977* provides for a State Heritage Register where items of State or Local Heritage significance can be listed and also provides for the issue of Heritage Orders by the Minister or the Heritage Council to control potential developments that may harm the heritage value of the item.

The proposed remediation area near the western edge of the Site is adjacent to a Sydney Water Corporation (SWC) stormwater drainage canal and is listed on the Sydney Water State Agency Section 170 Heritage and Conservation Register (discussed further in Section 12).

1.5 Summary

The following key legislation and guidelines are relevant to the works proposed as part of this RAP:

- POEO Act.
- UPSS Regulation.
- POEO (Waste) Regulation 2005.
- *Contaminated Land Management Act 1997* (CLM Act).
- Clean Air Regulation 2002.
- Work Health and Safety Regulation 2017 (WHS Regulation).
- *Work Health and Safety Act 2011* (WHS Act).
- NSW Protection of the Environment Operations (waste) Regulation 2014.
- Code of Practice: Demolition Work SafeWork New South Wales 2016.
- Code of Practice: How to Safely Remove Asbestos, SafeWork New South Wales 2016.
- Code of Practice: How to Manage and Control Asbestos in the Workplace, SafeWork New South Wales 2016.
- Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003(2005)].
- Relevant Codes of practice for working with lead including SafeWork Australia/NIOSH (1994) National Code of Practice for the Control and Safe Use of Inorganic Lead at Work and Demolition Work.
- *National Environment Protection (Assessment of Site Contamination) Measure 1999*, as amended on 16 May 2013 (*ASC NEPM*, 2013).
- CRC CARE, 2011. *Health Screening Levels for petroleum hydrocarbons in soil and groundwater.* CRC CARE, Technical report series No. 10. Friebel, E. and Nadebaum, P., 2011 (CRC CARE, 2011).
- NSW Department of Environment and Conservation (DEC) 2007. Guidelines for the Assessment and Management of Groundwater Contamination March 2007 (NSW DEC, 2007).
- NSW EPA 2017. Guidelines for the NSW Site Auditor Scheme (3rd Edition), October 2017 (NSW EPA, 2017).
- NSW Environment Protection Authority (EPA) 1995. Sampling Design Guidelines, September 1995 (NSW EPA, 1995).
- NSW Environment Protection Authority (EPA) 2020. Consultants reporting on contaminated land, April 2020 (NSW EPA, 2020).

- NSW EPA Waste Classification Guidelines 2014 – Part 1: Classification of Waste (NSW EPA 2014) as amended October 2016.
- NSW EPA (2014a) Technical Note: Investigation of Service Station Sites, dated April 2014.
- NSW Department of Environment, Climate Change and Water (DECCW) (June 2008), Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008 (the 'UPSS Regulation') (as revised in September 2014).
- NSW EPA (December 2020), Guidelines for Implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019.
- NSW DECCW (January 2010) – UPSS Technical Note: Decommissioning, Abandonment and Removal of UPSS.
- NSW DECCW (January 2010) – UPSS Technical Note: Site Validation Reporting.
- *Environmental Planning and Assessment Act 1979*, State Environmental Planning Policy (SEPP) No. 55 Remediation of Land.
- AS 1940–2004: Storage and handling of flammable and combustible liquids (AS 2004b).
- AS 4976–2008: The removal and disposal of underground petroleum storage tanks (AS 2008b).
- AS 2601-2001: The demolition of structures- summary.
- NSW WorkCover Authority 2005, Code of Practice: Storage and handling of dangerous goods.

2 Site setting

2.1 Site Identification

The Site is a rectangular shaped land parcel located between Raymond Avenue and Botany Road. The Site identification details are provided below in Table 2.1 and the Site layout is presented in Figure 2.1.

Table 2.1 Site identification

Item	Description
Site address	42-52 Raymond Avenue, Matraville NSW
Legal description[1]	Lot 1 in Deposited Plan (DP) 369668, Lot 1 in DP 511092 and Lot 32 in DP8313
Site area[1]	Approximately 2 hectares
Site owner	Epsom Enterprises Pty Ltd
Local government authority	Randwick City Council
Current zoning[2]	IN1: General industrial
Current land use	Vacant (formerly industrial)
Proposed land use	Industrial/commercial
Site location	Refer Figure 1.1
Site layout	Refer Figure 2.1 and Figure 2.2

Notes:

1. Spatial Information Exchange Viewer (www.maps.six.nsw.gov.au)
2. State Environmental Planning Policy (Three Ports) 2013

The Site is predominantly covered with hardstand consisting of concrete slab and bitumen driveways at the northern and eastern boundaries. The western boundary of the Site comprises unsealed ground/garden beds with a small vegetated area at the southern portion of the Site (Figure 2.2). The Site was formerly occupied by a large industrial building which was demolished between May to June 2020.

A small electrical substation is located at the south-western corner of the Site, enclosed by a chain-wire fence.

A stormwater drainage channel is present immediately adjacent to the Site's western boundary and a retention pond is located to the south. The drainage channel has been identified as a SWC asset called the Bunnerong Stormwater Channel No. 11 and is listed on the Sydney Water State Agency Section 170 Heritage and Conservation Register.

2.1.1 UPSS Infrastructure – September 2020

During the September 2020 DSI investigations, EMM located UPSS infrastructure along the western site boundary adjacent to the edge of the concrete slab and stormwater channel wall across an area of approximately 150 m^2. The infrastructure was visually observed between the concrete slab and drainage channel along the western boundary of the Site. The approximate layout of the observed UPSS infrastructure is summarised in Table 2.2 below and presented in Figure 2.2

Table 2.2 UPSS infrastructure

Tank ID	Volume	Contents	Dimensions (m)	Photograph (Direction)
T1	UST containing 3,000 gallons (11,356 L)	Black oil, medium-high viscosity	Unknown, but dipstick max measurement is 4,000 gallons	 (S)
T2	Unknown	UST containing solid waste, top cut open, no liquid visible.	2 m ⌀ depth unknown	 (S)
T3	Unknown	UST <50 % full of liquid with oily sheen, mostly filled with solid waste	1.45 m ⌀ depth unknown but assumed approximately 2 m	 (S)
T4	~887 L based on dimensions	Full of liquid with sheen,	1.75 length (l) x 0.65 width (w) x 0.78 depth (d)	 (NW)
Holding Tank	Unknown	<50 % full of high viscosity black oily sludge	~2 l x 0.9 w depth unknown	 (SE)
Interceptor Pit	Unknown	Filled with glass fragments, no liquid visible	2.5 l x 0.55 w depth unknown	 (SE)

Source: EMM (2021); Nearmap (2020); DFSI (2017)

0 25 50 m

GDA 1994 MGA Zone 56

N

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KEY

- Site boundary
- Area with identified former UPSS infrastructure (July 2020)
- Major road
- Minor road
- Watercourse/drainage line
- Waterbody

Sampling location

- Borehole
- Monitoring well

Site layout and sampling locations

42-52 Raymond Avenue, Matraville NSW
Remediation action plan
Figure 2.1

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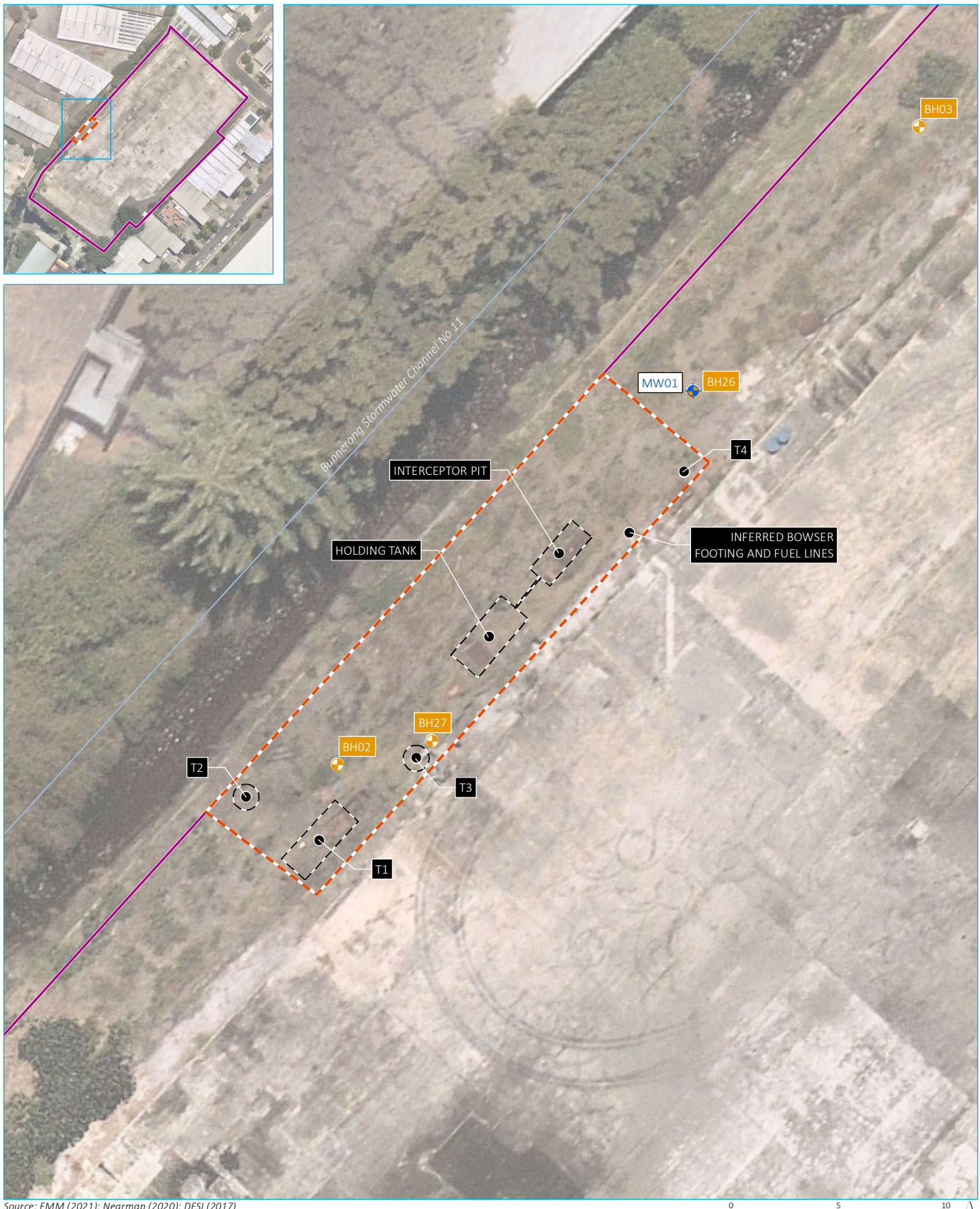

Source: EMM (2021); Nearmap (2020); DFSI (2017)

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KEY

- Site boundary
- Area with identified former UPSS infrastructure (July 2020)
- Approximate tank outline
- UPSS feature
- Watercourse/drainage line

Sampling location

- Borehole
- Monitoring well

Detailed layout

42-52 Raymond Avenue, Matraville NSW
Remediation action plan
Figure 2.2

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2.2 Environmental setting

The environmental setting and landscape at the Site is summarised in Table 2.3 below.

Table 2.3 Environmental setting

Topography	The Site is relatively flat and level, with an elevation of approximately 6 m Australian Height Datum (mAHD). The Site features a stormwater drainage channel running along the western border of the Site, which flows into a stormwater retention basin adjacent to the southern Site boundary (Figure 2.1). The surrounding area slopes gently to the southwest, towards Port Botany approximately 500 m to the south.
Geology and Soils	The Site and surrounds are mostly underlain by highly disturbed Quaternary deposits comprising medium to fine grained marine sands with podsols (Herbert, 1983). The soil type is described as coastal sand plains and dunes, lagoons, and swampy areas, with generally leached, siliceous, and/or calcareous sands. Based on the completion of 30 soil bores across the Site in the September 2020 DSI (EMM, 2020), fill is typically encountered from surface (or the base of the concrete slab) to 0.9 m below ground level (m bgl). This fill was predominantly gravelly sand comprised of ceramic, brick, asphalt, concrete, glass and potential ACM fragments (EMM, 2020). Underlying the fill was medium grained sand and minor peat.
Hydrogeology	The Site is within the Botany Groundwater Management Zone 1, which is an extraction exclusion zone. The Botany Sands Aquifer is described as a porous and highly productive aquifer. A large number of registered bores were located within a 1.5 km radius of the Site. The Botany Sands Aquifer has been banned for domestic purposes since 2006, therefore no beneficial use of groundwater is expected on the Site or in the surrounding area. Three monitoring wells installed in September 2020 indicated groundwater levels at the Site ranged from 3.286 to 3.130 m bgl (2.439 to 2.5 mAHD) and the indicative groundwater flow direction is towards the west (EMM, 2020).
Surface water and drainage	The nearest surface water bodies are the SWC owned Bunnerong Stormwater Channel No 11 adjacent to the western boundary of the Site, and the SWC stormwater retention basin adjacent to the southern boundary of the Site (Figure 2.1). Port Botany is approximately 515 m downgradient to the south of the Site. Most of the Site is sealed by concrete slab. As such, precipitation falling onto the Site is expected to pool on the slab and evaporate or enter preferential pathways (eg drainage lines, cracks or holes). Runoff along the western and southern boundaries would be expected to follow the topographic gradient and infiltrate surface soils where exposed at a rate reflective of the permeability of the underlying soils. Excess water, especially during periods of heavy or prolonged rainfall, is expected to be collected by the Site's stormwater drainage network, or into the stormwater channel west and south of the Site.
Acid sulfate soils	The Site has a low probability of occurrence of ASS (JBS&G 2019a). This is consistent with the topographic and geologic setting of the Site. Therefore, land management activities are not likely to be affected by acid sulfate soil materials.

2.3 Site history

A review of the Site history was included in the PSI and limited DSI (JBS&G 2019a). In summary, the Site has been occupied by an industrial building/warehouse since the 1950s. Previous landowners included Sydney Paper Mills Limited, The Australian Paper and Pulp Company, Australian Paper Manufacturers and Fibre Containers Pty Ltd. Since 2005 Epsom has had sole ownership of the Site.

3 Previous site investigations

3.1 JBS&G Preliminary Site Investigation (PSI) and limited Detailed Site Investigation (DSI) (JBS&G 2019a)

JBS&G (2019a) included a historical review, soil sampling from five locations, installation and screening of sub-slab soil vapour probes at 20 locations and soil vapour sampling at four locations. Groundwater was not assessed during these investigations.

Fill materials were identified in each of the five boreholes, and concentrations of zinc (Zn) and benzo(a)pyrene (B(a)P) were reported to be greater than the ecological assessment criteria in one sample each. No contaminants of potential concern (CoPC) were reported in soil at concentrations greater than the human health assessment criteria. Readings using a photoionisation detector (PID) reported volatile organic compounds (VOCs) up to 18.9 parts per million (ppm) at soil vapour probe locations. Volatile total recoverable hydrocarbons (TRH) were reported in the four soil vapour samples, but at concentrations less than the assessment criteria.

JBS&G (2019a) concluded that contamination was not identified which could prevent continued commercial use of the Site, although it was noted that some areas of concern were not assessed and further investigations were recommended to comply with NSW EPA 1995.

A former 3,000-gallon UST and a 1,000-gallon UST were identified in a Safe Work NSW Dangerous Goods records search; however, the search results were not available at the time the fieldwork was undertaken at the Site. Furthermore, the records did not indicate the location of the 3,000-gallon UST. Potential impacts associated with the USTs were unknown as these features were not specifically targeted by the JBS&G (2019a) soil or soil vapour investigations.

3.2 Hazardous Building Materials Survey (HBMS) (JBS&G 2019b)

The HBMS was completed on the large warehouse located on the Site at the time of reporting. The HBMS identified fragments of asbestos containing materials (ACM) in a garden bed at the western Site boundary. Sources of asbestos were also identified in the warehouse building that has since been demolished at the Site. This included roofing that was found to be significantly weathered and a source of friable asbestos within dust identified in the building.

Removal of visible asbestos from the Site surface was advised and the remediation of friable asbestos containing dust and sealing of the roof materials to prevent recontamination.

3.3 Clearance Certificate Friable Asbestos Removal (Pickford and Rhyder, 2020)

A final asbestos clearance certificate was completed by Pickford and Rhyder (2020) for the Site following removal of asbestos containing material from the former building and structures and from the exposed ground along the western boundary of the Site. Both friable and non-friable asbestos was removed. An excavation approximately 1.5m wide was made along the western boundary of the concrete pad footprint and cleared to a depth where no further friable asbestos was present. The clearance certificate concludes the Site safe for re-occupation.

3.4 EMM Detailed Site Investigation (EMM, 2020)

EMM was engaged by Epsom Enterprises in September 2020 to undertake a DSI for due diligence to address the identified data gaps of the previous investigations undertaken by JBS&G in 2019. The objective of the DSI was to gather sufficient information to provide Epsom with an understanding of contamination impacts and potential remedial requirements at the Site and to support divestment of the Site.

The DSI works completed in September 2020 included:

- completion of a ground penetrating radar (GPR) survey to identify subsurface anomalies that may represent the locations of the USTs;
- drilling of 25 boreholes up to 5.5 m bgl and collection of soil samples. The boreholes were targeted to the potential USTs as well as providing general coverage across the Site;
- conversion of 3 boreholes to groundwater monitoring wells targeting the area of the USTs; and
- collection of five soil samples using hand tools form a garden bed at the western boundary of the Site.

3.4.1 UPSS infrastructure

A GPR survey completed in September 2020 did not identify the 3,000-gallon UST or the 1,000-gallon UST in the areas indicated on the plan in the SafeWork NSW Dangerous Goods record (originally obtained by JBS&G (2019a)). The USTs are estimated to be up to 40 years old (based on Dangerous Goods records from 1970).

Visual observations by EMM located UPSS infrastructure along the western Site boundary adjacent to the edge of the concrete slab and the stormwater canal wall (Bunnerong Stormwater Channel No 11), covering an area of approximately 150 m^2 (Table 2.2 and Figure 2.2). EMM observed liquid seeping through the brick wall of the stormwater canal downgradient (west) of the 3000-gallon UST (T1). A hydrocarbon sheen was also visible on the surface of the water in the canal from the area of seepage and may indicate that the UST or related UPSS infrastructure is leaking.

Grab samples were collected where practicable of product within the former UPSS tanks on 30 September 2020 by EMM. A summary of these analytical results are provided in Table 3.1 below with detailed results provided in Appendix A1. As indicated in Table 3.1, product sampled within the former UPSS tanks is predominantly composed of the heavier TRH fractions C_{16}-C_{34} and C_{34}-C_{40}. UST T1 is noted to contain elevated BTEX compounds. Based on the industrial land use at the Site and the heavier hydrocarbon fractions identified, the original product in these USTs may have been diesel or fuel oils.

Table 3.1 Summary of Former UPSS Analytical Results

Tank ID	Description	BTEX	PAH's (Sum of Total)	TRH
T1	Black, medium to high viscosity oil, product volume of ~ 11,356 L.	Xylene Total – 176 mg/kg Benzene – 142 mg/kg Ethylbenzene – 1.4 mg/kg Toluene – 11.4 mg/kg	1,230 mg/kg	C_{10}-C_{40} (Sum of total): 186,000 mg/kg C_{34}-C_{40}: 9,900 mg/kg C_{16}-C_{34}: 97,200 mg/kg C_6-C_{10}: 1,280 mg/kg
T3	Low viscosity, unknown product volume.	Below LOR	Below LOR	C_{10}-C_{40} (Sum of total): 5,740 µg/L C_{34}-C_{40}: 820 µg/L C_{16}-C_{34}: 4,760 µg/L C_6-C_{10}: below LOR

Table 3.1 Summary of Former UPSS Analytical Results

Tank ID	Description	BTEX	PAH's (Sum of Total)	TRH
T4	Low viscosity, product volume of ~ 887 L.	Below LOR except for Benzene – 1 ug/L	Below LOR	C_{10}-C_{40} (Sum of total): 2,620 µg/L C_{34}-C_{40}: 370 µg/L C_{16}-C_{34}: 1,460 µg/L C_{6}-C_{10}: 80 µg/L
Holding Tank	Low viscosity, unknown product volume.	Below LOR	Below LOR	C_{10}-C_{40} (Sum of total): 62,800 µg/L C_{34}-C_{40}: 34,100 µg/L C_{16}-C_{34}: 28,700 µg/L C_{6}-C_{10}: below LOR

3.4.2 Soil assessment results

A total of 54 primary samples from 30 soil bore locations across the Site (Figure 3.1) were submitted for laboratory analysis for contaminants of potential concern (CoPC). The following soil analytical results were reported:

- one soil sample at BH21/0.2 m representing fill reported benzo(a) pyrene with a concentration of 3.3 mg/kg exceeded the ASC NEPM Table 1B(6) Ecological Screening Level (ESL) for industrial coarse soil of 1.4 mg/kg;
- one soil sample at BH17/1.6 m representing fill reported lead with a concentration of 2,000 mg/kg exceeded the ASC NEPM Table 1A(1) Health Investigation Level (HIL) for industrial D soil of 1.4 mg/kg;
- the 95% upper confidence limit (UCL) for both benzo(a)pyrene and lead was less than the relevant screening criteria;
- soil samples at BH02/0.5 m and BH03/0.9 m, located adjacent to the observed UPSS infrastructure, had the highest detections of TPH and TRH during the DSI investigations but did not exceed the adopted criteria[1]. These results indicate potentially elevated petroleum hydrocarbons in soil within proximity to the UPSS:
  - at BH02/0.5 m, TPH concentrations for the C_{15}-C_{28} and C_{29}-C_{36} fractions were 420 mg/kg and 660 mg/kg respectively while TRH concentration for C_{10}-C_{40} (sum total) was 1,500 mg/kg; and
  - at BH03/0.9 m, TPH concentrations for the C_{15}-C_{28} and C_{29}-C_{36} fractions were 270 mg/kg and 300 mg/kg respectively while TRH concentration for C_{10}-C_{40} (sum total) was 630 mg/kg;
- asbestos was detected in fill material at one location (BH22_1.2), identified as chrysolite, commonly known as white asbestos; and
- all remaining soil samples reported concentrations of CoPC below the adopted investigation and screening levels.

[1] ASC NEPM (2013) Health Screening Levels (HSL) D (Commercial / Industrial), Ecological Screening Levels (ESL) Commercial / Industrial, and Table 1 B(7) Management Limits (Commercial/Industrial)

3.4.3 Groundwater assessment results

Three groundwater wells were installed (MW01, MW02, MW03) with samples collected and analysed for CoPC associated with the identified source of potential contamination (Figure 3.2). The following observations and analytical results are noted:

- groundwater levels at the site ranged from 3.286 to 3.130 m bgl (2.439 to 2.5 m AHD) and the inferred groundwater flow direction was towards the west;
- the three groundwater monitoring wells were installed in accessible locations close to the UPSS, noting steep and uneven terrain along the western Site boundary (between the UPSS and the stormwater channel). The wells were located either up or across hydraulic gradient of the observed UPSS infrastructure;
- there were no odours detected or notable PID results to indicate hydrocarbon impact in groundwater (<2 ppm); and
- there were no exceedances of the adopted criteria for the groundwater assessment. Benzene was reported at a concentration of 3 µg/L and TRH C_6-C_{10} was reported at 40 µg/L in a groundwater sample collected at MW02.

Source: EMM (2021); Nearmap (2020); DFSI (2017)

0 25 50 m

GDA 1994 MGA Zone 56

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KEY

- Site boundary
- Area with identified former UPSS infrastructure (July 2020)
- Major road
- Minor road
- Watercourse/drainage line
- Waterbody

Soil results

- Below adopted guidelines
- Exceeds adopted NEPM guidelines
- ▲ Asbestos present

Soil analytical results

42-52 Raymond Avenue, Matraville NSW
Remediation action plan
Figure 3.1

EMM
creating opportunities

Source: EMM (2021); Nearmap (2020); DFSI (2017)

0 25 50 m

GDA 1994 MGA Zone 56

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KEY

- Site boundary
- Area with identified former UPSS infrastructure (July 2020)
- Major road
- Minor road
- Watercourse/drainage line
- Waterbody
- XXX Groundwater level (metres Australian Height Datum)
- Inferred groundwater elevation contour
- Inferred groundwater flow direction

Groundwater

- Below adopted guidelines

Groundwater analytical results

42-52 Raymond Avenue, Matraville NSW
Remediation action plan
Figure 3.2

EMM
creating opportunities

4 Environmental site status

4.1 Nature and extent of contamination

4.1.1 Soil

Historical soil data indicates there are petroleum hydrocarbons present in soil in proximity to the former USTs identified along the western boundary the site (ie BH02 and BH03 in Figure 3.1). The hydrocarbon impact is characterised by elevated TRH concentrations of C_{16}-C_{34} and C_{34}-C_{40} but concentrations do not exceed the adopted soil assessment criteria. Concentrations of TRH beyond the proximity of the former USTs is reported to be below or only slightly above the limit of reporting (EMM, 2020).

Due to access limitations for soil boring during the September 2020 DSI (ie the embankment considered unsafe), soil sampling was not completed between the UPSS and the stormwater canal. It is possible that some localised soil and/or groundwater impact associated with the UPSS may be encountered during any potential removal/excavation works adjacent to the stormwater canal.

Based on historical building inspections (JBS&G 2019b) and intrusive investigations (JBS&G 2019a and EMM, 2020), there is potential for ACM fragments within shallow fill material, particularly along the garden bed adjacent to the western Site boundary.

4.1.2 Groundwater

There have been limited groundwater investigations completed at the Site. Based on data obtained from three wells installed in the south west of the Site in September 2020 (EMM, 2020), there are indications of limited hydrocarbon impacts in the vicinity of the UPSS infrastructure (MW02 and MW03 – Figure 3.2 and Appendix A1), with contaminant concentrations not reported to be greater than the adopted assessment criteria.

It is noted that the three monitoring wells are located up or across hydraulic gradient of the identified UPSS infrastructure and it is possible that groundwater impact could exist in close proximity to, or down hydraulic gradient from, the UPSS infrastructure.

4.2 Geotechnical conditions

EMM commissioned Douglas Partners to complete a geotechnical analysis report to understand the potential risks to the Bunnerong Stormwater Channel No 11 from excavation activities. Numerical modelling using PLAXIS 2D was used to estimate the induced displacements on the stormwater channel wall as a result of excavation works. The modelled excavation scenario, based on the proposed work method provided by the remediation contractor, included a plant exclusion area of 7 m from the channel wall. The reports findings are:

- total deflections of up to 7 mm at the top of the wall and 6 mm at the base of the wall during excavation; and
- final deflections reducing to approximately 2 mm of the initial positions at the completion of the remediation works.

5 Conceptual site model

Based on historical investigations and the intrusive investigation works completed by EMM (2020), a conceptual site model (CSM) has been developed to evaluate the nature and extent of contamination and to inform remediation options at the Site.

The CSM is summarised below.

5.1 Sources of contamination and contaminants of potential concern

A summary of the potential sources of contamination and associated contaminants of potential concern (CoPC) identified as an outcome of the historical investigations is presented in Table 5.1.

Table 5.1 Summary of potential sources of contamination and CoPC

Potential sources of contamination	CoPCs	Likelihood of contamination/release mechanisms
UPSS infrastructure: • 1 x 3,000-gallon (11,356 L) UST full of black oil, medium viscosity, referred to as **T1**; • 2 x approximate 1,000-gallon (3,785 L) USTs, referred to as **T2** and **T3** respectively; • 1 x 887 L UST full of water/oil mixture, referred to as **T4**; and • remnant ancillary infrastructure including supply lines, vent pipes and potential dispensing bowser footing. Refer to **Table 2.2** and **Table 3.1** for further details.	BTEX/TRH/PAHs/VOCs/ phenols/lead	**Likely.** As shown in Table 2.2, USTs were observed to contain black oily product and their integrity is unknown. Leaking of oil through the stormwater canal brickwork (off-site to the west) was observed in the vicinity of the UPSS (EMM, 2020). Leaking of the other USTs and ancillary infrastructure is considered possible particularly given the age of the infrastructure (1970s).
Electrical substation containing transformers (south-western corner of the Site)	PCBs	**Unlikely.** It is unknown if the transformers contained PCB, however, based on the age of the facility it is possible. Leaking from the former transformer and substation infrastructure was considered possible but significant contamination is unlikely due to the size of the facilities and no observations of leakage. No concentrations of PCBs in soils were recorded above the laboratory LOR (EMM, 2020).
ACM used in former buildings, utilities and pipework and impacted soils Site wide	Asbestos	**Likely**. Confirmed ACM present throughout many of the buildings based on the HBMS (JBS&G, 2019). Clearance certificates were issued for recently demolished buildings; however, some asbestos pipes were noted to remain in-situ. EMM (2020) observed relatively widespread potential ACM fragments in shallow fill material, mostly along the garden bed adjacent to the western Site boundary. Asbestos fibres were positively identified by the laboratory at one sample location (BH22).

Table 5.1 Summary of potential sources of contamination and CoPC

Potential sources of contamination	CoPCs	Likelihood of contamination/release mechanisms
Former use of lead paint on buildings, based on the age of the former buildings (pre-1980s) and historical application of lead-based paints during that time.	Lead	**Unlikely.** Flaking and/or lead dust cannot be precluded. As most of the Site is occupied by a concrete slab and driveways, impacts would likely be limited to small areas of exposed soil. Only one soil sample exceeded the adopted assessment criteria (EMM, 2020). Lead was not recorded above the laboratory LOR in groundwater.
Potential application of pesticides for pest control	OCP/OPP	**Possible.** Pesticides may have been applied to building footings and void spaces with the potential to impact surrounding soils, including beneath the concrete slab. Trace concentrations of OCP were recorded in soil at two locations within the surface soil (0.2-0.3 m depth) at the southern portion of the site (EMM, 2020). Pesticides were not recorded above the laboratory LOR in groundwater.
Use of aqueous film-forming foam (AFFF) containing per and poly fluoroalkyl substances (PFAS) in fire suppression (the Site is understood to formerly be used to store significant quantities of Dangerous Goods), possible use of PFAS containing products in paper/packaging manufacturing	PFAS	**Possible.** PFAS and AFFF were generally introduced in Australia for civilian use in the late 1970s until gradual phasing out commenced in the 2000s. It is unknown if AFFF was historically stored or applied at the Site. Trace concentrations of PFAS compounds in soil, primarily perfluorooctanesulfonic acid (PFOS), were reported at 11 locations across the site at varying depths during the September 2020 DSI (EMM, 2020). However, none of these exceeded the adopted assessment criteria.
Chemical storage – bulk storage of chemicals at the Site	BTEX/TRH/PAHs/VOCs/metals/phenols/OCP/OPP	**Possible.** Spills and leaks may have resulted in seepage into underlying soils, discharge into surface water and infiltration to groundwater.
Use/importation of fill material Site wide Fill materials may have been imported to the Site for levelling and grading. JBS&G (2019a) identified fill materials across the Site. The presence of contaminants within fill cannot be precluded.	BTEX/TRH/PAHs/VOCs/ phenols/heavy metals/PCBs/ Asbestos/PFAS	**Likely** Based on the potential leachability of CoPC within fill material and the historical use of the Site, vertical migration of contamination from the fill materials/surface soils into the underlying natural soils is possible. Fill material imported from unknown origins may also contain contaminants such as asbestos.

5.2 Migration and exposure pathways

The following transport mechanisms may apply at the Site:

- surface run-off of CoPC into surface water channels adjacent to the Site;
- excavation and re-location of soil during future construction activities;
- vertical seepage of CoPC into the underlying soils and into the local groundwater system;
- migration of CoPC via groundwater transport, inferred to flow in a south-westerly direction;
- migration and infiltration of vapours from contaminants in soil and/or groundwater beneath the Site; and
- atmospheric dispersion (aeolian transport) of dust, derived from contaminated soil or hazardous building materials (HBM), eg asbestos or lead.

Identified potential exposure pathways for the nominated CoPC include:

- dermal contact and incidental ingestion of soil;
- inhalation of dust (including soil derived) or fibres;
- dermal contact and incidental ingestion of groundwater/surface water;
- inhalation of soil/groundwater vapours in indoor air;
- inhalation of soil/groundwater/surface water vapours in outdoor air;
- inhalation of soil/groundwater vapours within a trench;
- plant uptake and/or ingestion by animals; and
- uptake of CoPC from groundwater (stygofauna and microorganisms).

5.3 Sensitive receptors

The nearest sensitive human receptors identified at the Site include:

- current and future Site users (industrial);
- future construction workers involved in the development of the Site;
- users of surrounding properties; and
- down-gradient users of surface water (such as recreational users of Penrhyn Estuary and Botany Bay).

Based on the Orica Botany Groundwater Extraction Exclusion Area (GEEA), there are not considered to be sensitive human health receptors associated with groundwater beneath the Site and/or downgradient.

The Site is mostly covered by hardstand pavement and building footprints. On this basis, there are limited on-site ecological receptors that could be exposed to environmental impacts at the Site. Possible off-site ecological receptors are limited to potential impacts to flora and fauna associated with groundwater or surface water runoff migrating from the Site into the following adjacent water bodies:

- Bunnerong Stormwater Channel No 11, along the western Site boundary; and
- the stormwater retention basin immediately south of the Site.

5.4 Conceptual site model

Table 5.2 Conceptual site model

Source	Pathway	Receptor	Potentially complete S-P-R?
UPSS – USTs and ancillary underground infrastructure (eg pits and supply lines). Observations of potential leakage through stormwater channel wall in the vicinity of the UPSS. CoPC include: BTEX/TRH/PAHs/VOCs/phenols	Seepage into underlying soils and inhalation of soil vapour/dust	• Future Site users • Future construction workers involved in the development of the Site • Users of surrounding properties	**Yes**
	Direct contact/ingestion of soils	• Future Site users • Future construction workers involved in the development of the Site	
	Migration through surface water runoff	• Future construction workers involved in the development of the Site • Current and future users of surface water • Off-site downgradient surface water ecology (Penrhyn Estuary and Botany Bay)	**Yes**
	Seepage through soil profile into groundwater and migration through groundwater flow – direct contact or incidental ingestion of groundwater or inhalation of vapours	• Future construction workers involved in the development of the Site • Off-Site adjoining land users/occupants • Groundwater ecosystem	**Possible** CoPC were detected in groundwater (EMM, 2020), but were below the adopted groundwater assessment criteria (GAC). Groundwater would be managed during future construction (if required) and is unlikely to be abstracted due to the GEEA.
Substation – transformers CoPC include PCBs and TRH	Seepage into underlying soils and inhalation of soil vapour/dust	• Future Site users • Future construction workers involved in the development of the Site • Users of surrounding properties	**Possible** It is noted that concentrations of PCBs in soils were below the laboratory LOR (EMM, 2020).

Table 5.2 Conceptual site model

Source	Pathway	Receptor	Potentially complete S-P-R?
	Direct contact/ingestion of soils	• Future Site users • Future construction workers involved in the development of the Site	**Possible**
	Migration through surface water runoff	• Future construction workers involved in the development of the Site • Current and future users of surface water • Off-site downgradient surface water ecology (Penrhyn Estuary and Botany Bay)	**Possible**
	Seepage through soil profile into groundwater and migration through groundwater flow – direct contact or incidental ingestion of groundwater or inhalation of vapours	• Future construction workers involved in the development of the Site • Adjoining land users/occupants • Groundwater ecosystem • Off-site downgradient surface water ecology (Penrhyn Estuary and Botany Bay)	**Possible**
Potential ACM in former buildings, fragments on surface and potential asbestos impacted soil	Inhalation of dust and/or fibres through atmospheric dispersion and incidental ingestion	• Future construction workers involved in the development of the site • Future site users • Users of surrounding properties	**Yes**
Potential residual lead-based paint on former buildings	Paint flaking – dermal contact/incidental ingestion and inhalation of lead entrained dust	• Future Site users • Future construction workers involved in the development of the Site • Users of surrounding properties	**Yes**
	Direct contact/ingestion of soils	• Future Site users • Future construction workers involved in the development of the Site	**Yes**
	Migration through surface runoff	• Future construction workers involved in the development of the Site • Off-Site current and future users near surface water flow • Off-site downgradient surface water ecology (Penrhyn Estuary and Botany Bay)	**Unlikely**

Table 5.2 Conceptual site model

Source	Pathway	Receptor	Potentially complete S-P-R?
	Seepage through soil profile into groundwater and migration through groundwater flow – direct contact or incidental ingestion of groundwater or inhalation of vapours	• Future construction workers involved in the development of the Site • Adjoining land users/occupants • Groundwater ecosystem	**Unlikely**
Potential application of pesticides for pest control	Seepage into underlying soils and inhalation of soil vapour/dust	• On Site future Site users • Future construction workers involved in the development of the Site	**Possible**
	Direct contact/ingestion of soils	• On Site future Site users • Future construction workers involved in the development of the Site	**Possible**
	Migration through surface runoff	• Future construction workers involved in the development of the Site • Off-Site current and future site users near surface water flow • Off-site downgradient surface water ecology (Penrhyn Estuary and Botany Bay)	**Possible**
	Seepage through soil profile into groundwater and migration through groundwater flow – direct contact or incidental ingestion of groundwater or inhalation of vapours	• Future construction workers involved in the development of the Site • Adjoining land users/occupants • Groundwater ecosystem • Off-site downgradient surface water ecology (Penrhyn Estuary and Botany Bay)	**Unlikely**
Use of aqueous film-forming foam (AFFF) containing per and poly fluoroalkyl substances (PFAS) in fire suppression infrastructure or PFAS in paper/packaging manufacturing process	Seepage into underlying soils and inhalation of soil vapour/dust	• On Site future Site users • Future construction workers involved in the development of the Site	**Possible**
	Direct contact/ingestion of soils		**Possible**
	Migration through surface runoff	• Future construction workers involved in the development of the Site • Current and future users of surface water • Off-site downgradient surface water ecology (Penrhyn Estuary and Botany Bay)	**Possible**

Table 5.2 Conceptual site model

Source	Pathway	Receptor	Potentially complete S-P-R?
	Seepage through soil profile into groundwater and migration through groundwater flow – direct contact or incidental ingestion of groundwater or inhalation of vapours	• Future construction workers involved in the development of the Site • Adjoining land users/occupants • Groundwater ecosystem • Off-site downgradient surface water ecology (Penrhyn Estuary and Botany Bay)	**Unlikely**
Chemical storage – former bulk storage of chemicals at the Site	Seepage into underlying soils and inhalation of soil vapour/dust	• Future Site users • Future construction workers involved in the development of the Site • Users of surrounding properties	**Yes**
	Direct contact/ingestion of soils	• Future Site users • Future construction workers involved in the development of the Site	**Yes**
	Migration through surface runoff	• Future construction workers involved in the development of the Site • Current and future users of surface water • Off-site downgradient surface water ecology (Penrhyn Estuary and Botany Bay)	**Possible**
	Seepage through soil profile into groundwater and migration through groundwater flow – direct contact or incidental ingestion of groundwater or inhalation of vapours	• Future construction workers involved in the development of the Site • Adjoining land users/occupants • Groundwater ecosystem • Off-site downgradient surface water ecology (Penrhyn Estuary and Botany Bay)	**Unlikely**
Use/importation of fill material Site wide	Seepage into underlying soils and inhalation of soil vapour/dust	• On Site future Site users • Future construction workers involved in the development of the Site • Users of surrounding properties	**Yes**
	Direct contact/ingestion of soils	• Future Site users • Future construction workers involved in the development of the Site	**Yes**

Table 5.2 Conceptual site model

Source	Pathway	Receptor	Potentially complete S-P-R?
	Migration through surface runoff	• Future construction workers involved in the development of the Site • Current and future users near surface water flow • Off-site downgradient surface water ecology (Penrhyn Estuary and Botany Bay)	**Possible**
	Seepage through soil profile into groundwater and migration through groundwater flow – direct contact or incidental ingestion of groundwater or inhalation of vapours	• Future construction workers involved in the development of the Site • Adjoining land users/occupants • Groundwater ecosystem • Off-site downgradient surface water ecology (Penrhyn Estuary and Botany Bay)	**Unlikely**

6 Remediation strategy

The following section details the proposed remedial strategy to meet the objectives of preparing the Site to a condition suitable for redevelopment in accordance with the current land zoning.

6.1 Data quality objectives

Data Quality Objectives (DQO) have been developed to define the type, quantity and quality of data required to achieve the project objectives. The DQOs have been prepared in accordance with the seven-step DQO process outlined in the ASC NEMP (2013). The adopted DQOs for the proposed remediation at the site are provided below in Table 6.1.

Table 6.1 Data quality objectives

DQO steps	Details of DQO process
State the Problem	The Site has been identified for future divestment by Epsom. UPSS and associated contamination needs to be removed from the Site and soil (and potentially groundwater) conditions further assessed to understand if any further remediation is required, or if the investigation area is suitable for the current land zoning (IN1: General industrial).
Identify the Goals (decisions)	Decisions to be made to meet anticipated future uses are: • Have the identified primary sources of contamination (i.e. UPSS) been adequately mitigated in accordance with the objectives of this RAP? • Does residual contamination in soils, groundwater or surface water associated with UPSS pose an unacceptable risk to human health or the environment under the future end use?
Identify the information inputs	The inputs required to make the above decisions listed in Step 2 are as follows: • existing Site data (from previous investigations); • proposed land uses and Site boundaries; • appropriate NSW EPA endorsed guideline documents; • appropriately experienced environmental consultants; • geological data and information relevant to subsurface structures; • hydrogeological data; • geotechnical data; • concentrations of CoPC in different fill/soil types and groundwater; • distribution of identified contamination both laterally and vertically; • plans showing the location of underground services and known, present subsurface infrastructure; and • Quality Assurance and Quality Control (QA/QC) data.
Define the Study Boundaries	The boundaries of the investigation have been identified as follows: • *Spatial boundaries* – The lateral boundary of the remediation area is limited to the area of UPSS infrastructure shown on Figure 2.2. The western extent of this area is constrained by the Bunnerong Stormwater Channel No 11. The vertical boundary for soil will be the base of tank excavations and validation soil samples collected; and • *Temporal boundaries* – data collected from previous soil and groundwater investigations undertaken in 2019 and 2020 and data collected during remediation works.

Table 6.1 Data quality objectives

DQO steps	Details of DQO process
Develop a Decision Rule	The remedial activities described by the RAP will be considered a success if: • it is established that there are no on-going primary sources of petroleum hydrocarbon contamination remaining at the Site; • soil materials excavated from the UST excavations have been adequately characterised and that no heavily impacted materials are returned to the tank excavations during reinstatement; and • groundwater concentrations of CoPCs do not indicate a potential risk to identified human health and environmental receptors.
Specify performance or acceptance criteria that the data need to achieve	Acceptable limits on decision errors and the approach to addressing possible decision errors developed are based on the Data Quality Indicators (DQIs) of sensitivity, precision, accuracy, representativeness, comparability and completeness (SPARCC). The tolerable limits on decision errors for data are that EMM considers acceptable are: • probability that 95% of data satisfied the DQIs, therefore the limit on the decision error was 5% that a conclusive statement may be incorrect. In applying statistical analysis of a data set (where appropriate): • no individual sample will report a concentration that exceeds 250% of Site assessment criteria; • a normal distribution will only be used if the coefficient of variance is not greater than 1.2; • the standard deviation of a sample population will not exceed 50% of the Site assessment criteria; and • a robust QA/QC program for soil and groundwater will be designed and implemented. The possible outcomes of making an error in the decision are: • basing decisions on unreliable data and consequently making incorrect decisions; and • basing decisions on unreliable data and inappropriately recommending the need for further remediation. Relevant performance and/or acceptance criteria will be determined for QA/QC purposes and comparison of soil and groundwater analytical results to appropriate assessment criteria.
Optimise the Design	Based on Steps 1 to 6 of the DQO process, the design (ie scope of works or sample and analysis quality plan) for obtaining the required data (ie proposed field and laboratory programs) is presented in Section 7.3.

6.1.1 Data quality indicators

The project DQIs have been established to set acceptance limits on field and laboratory data collected as part of this investigation. For both field and laboratory procedures acceptance limits are set at different levels for different projects and by the laboratories. Non-compliances with acceptance limits are to be documented and discussed in the report. The DQIs are presented in Table 6.2 below.

Table 6.2 Data quality indicators

DQI	Field	Laboratory	Acceptability Limits
Completeness	• All critical locations sampled • All samples collected • SOPs appropriate and complied with • Experienced sampler • Documentation correct	• All critical samples analysed and for all CoPC • Appropriate methods implemented • Appropriate laboratory limits of reporting (LORs) • Sample documentation complete Compliance with sample holding times	• As per ASC NEPM (2013) <nominated criteria
Comparability	• Sample SOPs used on each occasion • Experienced sampler • Climatic conditions • Same types of samples collected	• Same analytical methods used (including clean-up) • Sample laboratory LORs (justify/quantify if different) • Same laboratories (NATA accredited) • Consistent reported units of measurement	• As per ASC NEPM (2013) <nominated criteria
Representativeness	• Appropriate media sampled	• All critical samples analysed and for all CoPC as required for the project objectives	• Appropriate samples analysed
Precision	• SOPs appropriate and complied • Collection of blind and split duplicate samples	• Analysis of: – Blind duplicate samples (1 in 20 samples) – Split duplicate samples (1 in 20 samples) • Laboratory duplicate sample	 • RPD of < 30%(organics) and <50% (inorganics) • RPD of < 30% (organics) and <50% (inorganics) • RPD of < 50%
Accuracy	• SOPs appropriate and complied • Collection of rinsate blanks	• Analysis of: – Field/trip blanks (1/day) – Method blanks – Matrix spikes – Matrix spike duplicates – Surrogate spikes – Laboratory control samples – Laboratory prepared spikes – Reagent blank	• Non-detect for CoPC • Non-detect for CoPC • 70 to 130% • RPD of <30% • 70 to 130% • 70 to 130 % • 70 to 130% • Non-detect for CoPC

6.2 Remedial options assessment

Hierarchical management of contaminated land is preferred by the NSW EPA and is detailed in Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme, 3rd Edition (NSW EPA, 2017). This order of preference for soil remediation and management is as follows:

1. On-site treatment of soil so the CoPC is either destroyed or the hazard is reduced to an acceptable level;

2. Off-site treatment of excavated soil so the CoPC is either destroyed or the hazard is reduced to an acceptable level and then returned to the Site;

3. Removal of contaminated soil to an approved site or facility and where applicable replacement with clean fill; and

4. Consolidation and isolation of the on-site soil by containment.

The suitability of available soil remediation methods is presented below in Table 6.3.

Table 6.3 Soil remediation options assessment

Option	Details	Suitability
On-site treatment	The Site is large and has sufficient space for this option. There is not expected to be a significant volume of contaminated soils requiring treatment (based on the findings of the September 2020 DSI (EMM, 2020). Both in-situ and ex-situ remediation methods may take an extended period to complete and may not be compatible with development at the Site. Off-site disposal of contaminated soil is not required. However, importation of clean fill will be required at this Site to backfill excavations resulting from the tank removal.	Partly suitable
Off-site treatment	In-situ and ex-situ remediation methods as per on Site treatment but more suitable for sites with limited space. Requires excavation and transport of contaminated soils and reinstatement of excavations. Timeframes may be an issue with redevelopment plans at the Site. Requires transportation of contaminated soils within an urban area to a suitable treatment facility.	Partly suitable
Excavation and off-site disposal	Landfill disposal which will be the simplest remediation method. Will involve excavation, tank removal and disposal at a licenced facility. Excavation is then back filled with clean, validated fill. Removes secondary source of contamination (impacted soils) to the extent practicable.	**Suitable**
On-site capping/containment	Involves installation of a physical barrier around the contaminated area to contain potential migration. Does not remove source of contamination. Requires ongoing management to maintain cap or barrier. Not preferred given more suitable options available.	Contingency action

6.3 Preferred remedial strategy

In assessing the remedial options to meet the key objectives for the Site, the preferred approach to remediating the Site is a mixed approach including excavation, tank removal, off-site disposal and in-situ UPSS abandonment, as detailed in Table 6.4

Table 6.4 Tank remediation strategy

Tank	Approach
Tank 1	Tank removal and off-site disposal
Tank 2	In-situ remediation (UPSS abandonment)
Tank 3	Tank removal and off-site disposal
Tank 4	Tank removal and off-site disposal
Holding tank	Tank removal and off-site disposal
Interceptor pit	Tank removal and off-site disposal

This option would allow removal of the primary contamination source (ie UPSS contents) at five tanks and impacted soil immediately surrounding the excavated tanks, while removing any in-situ contamination from within Tank 2. This option provides the most structural protection to the Bunnerong Stormwater Channel No 11, which may be damaged if wider soil excavation works were completed.

6.3.1 Primary source control

Primary source control involves the removal of primary sources of petroleum hydrocarbon related CoPCs at the Site to the extent practicable. As discussed in Section 2.1.1, former UPSS infrastructure identified near the western Site boundary could result in release of petroleum hydrocarbons to the ground contributing to soil, surface water and groundwater impacts at the Site. Primary source control will focus on excavation, tank removal and in-situ remediation as detailed in Table 6.4, of the former UPSS infrastructure along the western Site boundary. It is noted that T2, which is closest to the stormwater channel and proposed for in situ abandonment, was observed to be filled with inert waste (see Table 3.1). As a result, it is considered unlikely that T2 would present an ongoing primary source of contamination following abandonment. Additionally, the presence of grossly impacted soil around T2 (which will not be excavated) is also considered unlikely based on the observed contents and condition of the tank.

6.3.2 Soil data gap analysis

The presence of the UPSS infrastructure and safety concerns from the unstable/sloping grounds surface has hindered investigations of soil beneath the areas with former UPSS infrastructure. Once the infrastructure has been removed, soil samples will be collected, analysed for CoPCs and assessed against validation criteria as outlined in Section 10. This sampling will provide supplementary data to evaluate if the investigation Site is suitable for the current land zoning or if further remediation works (ie excavation of impacted soils) are required.

6.3.3 Groundwater data gaps

Three groundwater monitoring wells are located at the Site (Figure 2.1). Based on the September 2020 DSI (EMM, 2020), these monitoring wells are located up hydraulic gradient (MW01 and MW03) or across hydraulic gradient (MW02) of the area with the former UPSS infrastructure. Without monitoring locations down hydraulic gradient of the UPSS infrastructure is unclear if there are hydrocarbon impacts in groundwater.

Following removal of the tanks an assessment will be made to consider the likelihood of groundwater contamination resulting from the UPSS (ie the presence of significantly impacted soil, visual presence of contamination, etc). Should groundwater contamination be considered likely, all efforts will be made to install a fourth groundwater monitoring well to the west (downgradient) of the UPSS to assess conditions.

7 Remediation strategy implementation

The proposed remediation scope of works includes the following stages:

1. Stakeholder engagement;
2. Site establishment;
3. Soil remediation works including former UPSS tank removal and abandonment; and
4. Validation.

7.1 Step 1: stakeholder consultation

Before the implementation of this RAP, it will be necessary to secure all relevant approvals and licences and submit a notification of the works to Randwick City Council. Sydney Water, the asset owner of Bunnerong Stormwater Channel No 11, will be engaged to ensure any proposed works do not interfere with Sydney Water infrastructure adjacent to the Site. EMM has commenced the process of engagement with Randwick Council (notification made on 13 August 2020) and Sydney Water, which can take up to 60 days (refer to Appendix B for current documentation).

7.2 Step 2: site establishment

Initial activities at the Site will include preparation of all health and safety documentation and the engagement of all plant and equipment required for the proposed remediation works. Before commencing any earthmoving activities, environmental protection safeguards and Site security measures should be in place. These measures are detailed in the Site Environmental Management Plan (SEMP) in Section 11 of this RAP.

The general Site establishment activities will include:

- mobilise to the Site with a suitably sized excavator, equipment and personnel to undertake the works;
- any above or below ground services located in the works area will be identified and disconnected (if required) prior to works starting;
- installation of temporary fencing around the works area;
- installation of Site safety requirements and warning signage (Section 11); and
- installation of Site environmental controls as per Section 11 (ie silt fencing, bunding and odour controls).

7.3 Step 3: remediation works

7.3.1 HAZMAT removal (if required)

Hazardous materials in the form of asbestos containing material (ACM) has been found in garden beds along the western Site boundary in the vicinity of the former UPSS infrastructure (JBS&G, 2029b and EMM, 2020). In addition, lead concentrations in soil have been found to exceed ASC NEMP (2013) criteria in at least one location, BH17 in Figure 3.1 (EMM, 2020). Based on the Site history and previous investigations, it is possible that ACM and elevated lead concentrations in soils may be encountered during excavation works and therefore mitigation measures have been included in this RAP under Section 11.1.1.

7.3.2 UST removal and remediation

The removal of the USTs and associated infrastructure will be undertaken by a suitably licenced contractor in accordance with NSW environmental and safety requirements and industry best practice, including:

- Australian Standard AS 4976 (2008): The removal and disposal of underground petroleum storage tanks;
- AS 1940–2004: Storage and handling of flammable and combustible liquids (AS, 2004);
- AS 4976–2008: The removal and disposal of underground petroleum storage tanks (AS, 2008); and
- Code of Practice: Storage and handling of dangerous goods (NSW WorkCover Authority, 2005).

The remediation of former USTs will include the infrastructure identified in the September 2020 DSI (EMM, 2020) (Table 2.2) and Table 6.4. It is possible that additional infrastructure may be identified during the excavation works. The general process for remediation will be:

- any pavements across the former UPSS area will be removed and disposed of at a licensed disposal facility or sent to landfill;
- if applicable, geophysical methods will be used to delineate the size and orientation of the former UPSS infrastructure;
- all USTs which contain liquids (ie T1, T3 and T4 in Figure 2.2) will be decommissioned in accordance with *UPSS Technical Note: Decommissioning, Abandonment and Removal of UPSS* (DECCW, 2010). The currently proposed method for removal of liquid will be via vacuum extraction, and will be completed before any disturbance to the in-situ position of each UST;
- tanks to be remediated in-situ (ie T2) which contains soil will have soil removed by air or water blading with vacuum extraction, waste material will be disposed of at a licensed landfill;
- tanks will be confirmed to be gas free. If tanks are not gas free, degassing will be undertaken using applicable methodologies (ie compressed CO_2);
- T2 will be filled with an inert material, such as concrete slurry, sand or foam;
- at each remaining UST, the subsurface will be excavated to expose the top of the UTS and related fuel lines;
- the use of pneumatic tools (drill and/or reciprocating saw) will be used to cold cut the top of tanks and create an opening large enough to inspect the tanks' interior;
- all concrete anchors (if any) associated with tanks will be removed;
- the UST will be lifted from the subsurface under supervision of an EMM Site supervisor. Fuel lines, remote fill points and vent pipes will be removed. The Site supervisor will inspect and document the UST condition;
- the walls and base of the excavations will be validated by a suitably qualified EMM Site supervisor in accordance with the validation plan presented in Section 10.1;
- overburden material will be stockpiled on waterproof lining in an agreed location with environmental controls installed. This material will be sampled and put back in situ if it meets validation criteria (Section 10.2). If it does not meet validation criteria it will be kept stockpiled and recommendations made on remediation options; and

- tanks will again be confirmed to be gas free and mechanically cut-up on site by an excavator using shears and/or rippers and disposed offsite at an appropriately licensed recycling facility.

7.3.3 Pipework decommissioning

The following methodology will be applied for fuel related infrastructure:

- bulk product will be removed from the lines if present using a vacuum extraction truck (existing pumps not operational);
- residual product if present in the lines will be flushed with the use of a vacuum truck which connects to the pipe work and flushes the lines with water. This recovered water/product will be classified in line with NSW EPA Waste Classification and disposed of to a suitably licensed facility;
- piping is drained and disconnected, and all fittings and internal tubes that are not specifically required for the selected purging method are removed and plugged;
- gaskets will be assumed to have asbestos containing materials and will be disposed at an appropriate off-site facility;
- cut and remove fuel line infrastructure and dispose off-site at an appropriate recycling or disposal facility; and
- remove all other associated fuel related infrastructure, including lines.

7.3.4 Notification to SafeWork NSW

SafeWork NSW will be notified within 7 days of the UPSS removal and abandonment. Information provided to SafeWork will include:

- tank size and location;
- abandonment method;
- Site plan identifying abandoned tank location and site boundaries; and
- copy of the letter from the suitably qualified contractor confirming the abandonment.

7.3.5 Source removal validation/characterisation

Following removal of each of the USTs and related subsurface infrastructure, material beneath will be sampled and analysed for CoPCs. If samples meet validation criteria the material will be considered validated, if they do not meet validation criteria samples will characterise the material and inform further remediation options.

Validation and characterisation sampling, including sampling frequencies is presented in Section 10.1.

7.3.6 Soil investigation – test pitting

On completion of all demolition works, EMM will conduct an investigation by test pitting to close out identified data gaps in soil to the extent practicable which include, but are not limited to:

- locations down gradient of the UPSS infrastructure. EMM notes that the Site slopes to the west and south west and that a brick lined storm water wall lies immediately west of the former UPSS infrastructure. It is possible that impact may have migrated along the stormwater wall to the south and south west; and

- any other area where the potential for contamination is identified after demolition which may include locations of staining, distressed plants or locations where filling is likely.

Based on the above criteria test pitting is proposed at up to 8 locations. EMM notes that this may change dependent on the findings after the demolition works.

EMM notes that the extent of excavation works to the west may be limited by the requirements of Sydney Water to maintain the integrity of the stormwater channel. Any specific requirements will be incorporated into the RAP prior to works commencing.

7.3.7 Characterisation of excavated soils

Excavated soils will be stockpiled and segregated according to the area they have been removed and based on visual observations, odour and PID readings during the remedial works. Stockpiles will be sampled and characterised. If samples meet validation criteria, material will be reinstated into the excavation voids. If samples do not meet validation criteria, analytical results will be used to further inform remediation options. The sampling and analysis requirements for excavated material is provided in Table 7.1 below.

Table 7.1 Excavated material characterisation

Item	Description
Sample collection	Samples will be collected by the use of an excavator bucket. Disturbed samples will be retrieved from the bulk sample within the bucket by the use of a trowel. Larger "blocks" of soil will be broken apart in order to obtain a sample from the centre which has not been in contact with the bucket.
Field screening	Use of a calibrated PID and visual assessment.
Rate/ frequency	Stockpiles will typically be sampled at a ratio of one sample per 25 m^3 of material, in line with Table 4 within ASC NEPM (2013) Schedule B2; Guideline on Site Characterisation stockpile based on stockpile volume and homogeneity.
Analytical suite	All samples for TRH, BTEXN and lead. Select samples will also be analysed for asbestos and heavy metals.

7.3.8 Reinstatement of excavations

Overburden soils removed from around the tanks will be replaced in the area the tank was removed from after it has been suitably validated and/or used on-site to fill excavations if required. Clean fill validated as virgin excavated natural materials (VENM) or excavated natural materials (ENM) may also be used to reinstate the excavations. Compaction will be completed by track rolling.

7.3.9 Monitoring well installation

The following methodology will be applied if additional monitoring well installations are required to monitor contamination related to the former UPSS:

- service location will be completed at each monitoring well location;

- non-intrusive digging will be undertaken for the first 1.5 m bgl or to refusal at bedrock;

- wells will be progressed to their target depths using an appropriate method for the Site conditions by a licenced driller; and
- when the target depth is achieved, groundwater wells will be constructed in accordance with the "Minimum Construction Requirements for Water Bores in Australia, 4th ed, 2020."[2].

[2] Minimum Construction Requirements for Water Bores in Australia 2020, Fourth edition, National Uniform Drillers Licensing Committee 2020

8 Contingencies

8.1 Excavation contingencies

8.1.1 Dewatering

Based on the September 2020 DSI (EMM, 2020), groundwater lies at approximately 3.1−3.3 m bgl in the vicinity of the former UPSS infrastructure. It is possible that groundwater could be intersected during the tank removals. As such, the following management measures will be implemented in the event that groundwater is intersected:

- where practicable, sumps will be created at the base of the excavations to collect groundwater;
- groundwater will be sampled and classified to facilitate appropriate off-site disposal prior to the collection of the validation samples from the floor and walls of the excavation pits;
- sediment control measures will be implemented to mitigate potential runoff off-site;
- a discharge to stormwater licence will be sought from the local council, provided the sample analysis indicates compliance with council criteria;
- if the sampled groundwater does not comply with council criteria, a licence to discharge to the sewer as trade waste will be sought from Sydney Water; and
- if the sampled groundwater does not comply with Sydney Water criteria then the groundwater will be pumped and disposed off-site at an appropriate licenced treatment facility.

8.1.2 Management of soil impacts

The excavation works will be supervised by EMM to facilitate on-site recommendations regarding the fate of the excavated soil materials. Recommendations will be made based on PID field screening measurements and by field observations (visual and olfactory).

The following approach will be followed to address soil impacts:

- removed overburden soils will be stockpiled separately and visual/olfactory impacted material segregated to an agreed location on-site;
- excavation of any vents and product line trenches to a nominal 600 mm depth to allow validation sampling, these materials also be transported to a relevant stockpile area; and
- representative samples from the stockpiles will be collected for laboratory analysis, with an analysis rate of:
  - a minimum of three for stockpiles <75 m^3;
  - one per 25 m^3 of stockpiled soils >75 m^3; and
  - as per the ASC NEPM (2013), lower sampling rates may be derived for soil quantities >200 m^3 by applying statistical analysis.

8.2 Remediation contingencies

It is anticipated that the proposed remedial methodology will be effective in characterising the hydrocarbon impact present. However, additional contingencies may be required should the scenarios detailed in Table 8.1 arise:

Table 8.1 Summary of remediation contingencies

Scenario	Contingencies/actions required
Significantly contaminated water (ie free product) is identified during remediation works.	Work will be suspended until EMM can further assess the impacted perched/groundwater and the associated risks. Once the assessment is completed, a decision on any changes to the remediation approach will be made.
Additional underground tanks or fuel infrastructure are encountered at the Site.	All information relating to additional tanks and/or infrastructure will be recorded and discussed with Epsom regarding the course of action to be taken. The objective of the remediation is to remove all redundant UPSS to the extent practicable.
Additional hazardous material is encountered which was not previously identified.	All information relating to additional ACM identified during the remediation will be recorded for provision to regulatory bodies and EMM will consult with Epsom on the course of action to be taken.
Excessive vapours emanating from excavated and stockpiled soil or excavation pits.	Works will be suspended and EMM will advise on how best to proceed regarding safe management of contaminant vapours to remove risks posed to onsite workers. Once the assessment is completed, a decision on any changes to the remediation approach will be issued to Epsom for review and implementation.
Contamination found in areas previously not identified.	Work will be suspended and EMM will consult with Epsom on how best to proceed regarding the newly identified contamination. Once the contaminant is evaluated, a decision on any changes to the remediation approach will be issued for review and implantation.

9 Waste management

Waste disposal activities will be conducted in accordance with the Waste Classification Guidelines (NSW EPA, 2014) and other relevant legislation.

9.1 Waste classification

Representative soil samples will be collected and analysed from excavated or stockpiled material at an approximate rate of:

- a minimum of three for stockpiles <75 m^3;
- one per 25 m^3 of stockpiled soils >75 m^3; and
- as per the ASC NEPM (2013) lower sampling rates may be derived for soil quantities >200 m^3 by applying statistical analysis.

Soil samples collected for waste classification purposes will be analysed for metals, TRH, BTEX, OC/OP, PCB and asbestos. Selected samples will also be analysed using the Toxicity characteristics Leaching Procedure (TCLP) for metals and PAH. Laboratory results will be compared against Tables 1 and 2 of the waste classification guidelines (NSW EPA, 2014).

Soils that require off-site disposal during the remediation works will be disposed of at a suitably licenced facility. Disposal documents will be provided by the remediation contractor to confirm the source, type and quantity of material and will be included in the validation report.

Validation sampling of surface soils within stockpile footprints will be completed at a rate of one sample per 50 m^2 with the samples analysed for the relevant CoPCs.

9.2 Imported soils

Imported fill materials to reinstate excavations must be Virgin Extracted Natural Material (VENM) or excavated natural materials (ENM). These materials must have a validation certificate from the supplier which confirms the material is VENM or ENM, otherwise the material must be subject to validation sampling prior to importation to site. Imported materials will be observed by a suitably qualified environmental consultant when it is delivered to site to confirm:

- the material is consistent with the VENM source; and
- there are no visual of olfactory indications of contamination (ie staining or odours).

Soil importation dockets will be provided by the remediation contractor to confirm the source, type and quality of material to be included in the validation report.

9.3 Materials handling

In accordance with the POEO Act 1997, removal of waste material from the Site will only be conducted by contractors holding appropriate licences or approvals to handle and dispose of the materials. Contractors will track the movement of all materials excavated and handled as part of the remediation works. This will include stockpile locations, off-site disposal records for soils and volume estimates for exported or imported soils.

10 Validation

Validation sampling will be required for the following areas:

- UST pit excavations, fuel line trenches and bowser footprints; and
- petroleum hydrocarbon impacted soil excavations areas (if applicable).

Validation works will be completed in accordance with the DQOs in Section 6.1.

10.1 Validation sampling and analysis plan

Validation sampling and visual inspections will be required for the excavations created by removal of UPSS infrastructure, including the USTs, fuel lines and fill points. Where applicable, visual indications of contamination (staining, odours or asbestos) may be used to guide more intensive validation sampling.

Validation sampling methodology, frequency and analysis is summarised below in Table 10.1.

Table 10.1 Validation and characterisation sampling

Item	Description
Sample Collection	Samples will be collected by the use of the excavator bucket. Samples will be retrieved from the bulk sample within the bucket by the use of a trowel. Larger "blocks" of soil will be broken apart in order to obtain a sample from the centre which has not been in contact with the bucket
Field Screening	Use a calibrated PID, field screening will be used to inform soil material segregation and stockpiling, with the following nominal categories: • 0–100 ppm • >100 ppm–450 ppm • >450 ppm (based on an indirect indicator of LNAPL being 500 ppm after Davis et al. (2009))
Rate / Frequency	Soil validation/characterisation samples will be collected in accordance with the Technical Note: Investigation of Service Station Sites (NSW EPA, 2014) as follows: • UST excavations/excavations - created during removal of tank sands will require samples per excavation as follows: – UST <4 m long: at least one sample from each wall and one from the floor in the centre of the tank; – UST is 4–10 m long: at least two samples from each long wall, at least one from each short wall, and one under each end of the tank; and – fuel lines - one sample every 5 m of line. • Other soil excavations (outside UPSS excavations - if required): – Base: minimum of one sample per 10 m x 10 m grid; and – Walls: minimum of one sample from each wall per 10 linear metres. Samples will also be collected from depths in line with the soil validation criteria discussed in Section 10.2 to allow comparison of the analytical data to the depth appropriate criteria.
Analytical Suite	All samples for TRH and BTEXN, PAHs and lead. Samples collected of fill materials (not natural material) should be analysed for asbestos and heavy metals.

Table 10.1 Validation and characterisation sampling

Item	Description
Soil Sample Labelling, Storage and Transport	All samples will be clearly labelled with unique sample identification numbers consisting of the date, sample location, depth of sample and samplers initials. In the case of field duplicates and triplicates sample containers will be labelled so as to not reveal their purpose or sample location to the laboratory. All samples will be kept chilled in an ice-filled cooler or dedicated site refrigerator prior to dispatch to a National Association of Testing Authorities (NATA) registered laboratory under standard chain of custody procedures. All samples collected during remediation works will be stored at the laboratory (3 months for metals [28 days for mercury] or 14 days for organics) and could potentially be selected for analysis if further delineation of identified contamination is required.
Field logging	The soil profile will be logged in the field and will be conducted in accordance with AS1726-1993. Any soils sampled will be classified in accordance with the Unified Soil Classification System (USCS) *Procedure for Determining Unified Soil Classification (Visual Method)*, United States Department of the Interior, Bureau of Reclamation (USBR) 5005-86, including observation of any anthropogenic material (ie asbestos cement (AC) sheeting etc.) or olfactory evidence of contamination if it is observed. Descriptions will be recorded on field log sheets for uniformity in descriptions, presentation and to aid in any future interpretations.
Decontamination	Decontamination procedures will be performed before initial use of re-useable equipment and after each subsequent use (eg the use of a trowel). All re-usable sampling equipment (eg metal trowel or spatula etc.) will be decontaminated between each sample by scrubbing with a solution of Decon-90 followed by a rinse in potable water. For each day of sampling, following decontamination procedures, a rinsate blank will be completed by running laboratory prepared deionised water over the re-usable sampling equipment for collection directly into laboratory prepared sampling containers for analysis. At each sample location a new set of disposable nitrile gloves will be used to directly collect soil samples from the re-useable sampling equipment for placement into the laboratory prepared glass sampling containers.

If results from the validation sampling indicate that there is residual contamination, the tank pit (s) will be further excavated and re-validated at the following sampling rates:

- one sample per wall and base, or one sample per 5 linear meters (whichever is greater); and
- one sample per 2 m depth interval (ie 0−2m, 2−4 m, etc)

10.2 Validation criteria

The primary reference for environmental site assessment in Australia is the ASC NEPM (2013). This document includes criteria for use in evaluating potential risk to human health and ecosystems from chemical impacts, which are presented as generic investigation levels and screening levels appropriate to a Tier 1 risk-based assessment applicable to the first stage of site assessment. The application of these investigation levels and screening levels is subject to limitations, and their selection and use should be in the context of a CSM relating to the nature and distribution of impacts and potential exposure pathways (as summarised in Section 5).

10.2.1 Soil validation criteria

Soil validation criteria adopted for the proposed remediation works are summarised below in Table 10.2. The criteria are primarily Tier 1 screening criteria and are not designed to be remediation criteria. An exceedance of a criterion would trigger additional evaluation of the site-specific circumstances, and not necessarily indicate that large scale remediation is required.

Table 10.2 Soil validation criteria

Adopted Validation Criteria	Rationale and Selection
Health Investigation Levels (HILs), ASC NEPM (2013)	ASC NEPM (2013) HILs provide a framework for the use of investigation and screening levels. The framework is applicable for assessing human health risk via all relevant pathways of exposure and covers a broad range of metals and organic substances.
Health Screening Levels (HSLs), ASC NEPM (2013)	ASC NEPM (2013) presents HSLs for petroleum compounds which have been derived through consideration of risks to human health, with the main focus being on the vapour exposure pathway. The HSLs have been calculated using parameters that generally correspond to data available and as such aim to provide levels that are realistic rather than overly conservative. The Site is zoned as IN1: General industrial (Table 2.1) and it is understood the Site will be divested and it is assumed the land will be used for commercial or industrial purposes in future. **HSL D Commercial/Industrial are deemed to be suitable validation criteria.** Subsoil conditions (beneath the paved areas) is characterised by gravelly sand fill to 0.9 m bgl followed by naturals sands with minor peat inclusions to a depth of at least 3.0 m bgl. Where the value is non-limiting (NL) for depth range 0 to <2 m, direct contact values will be adopted (CRC CARE #10, part 2, Friebel, E. and Nadebaum, P., 2011): **HSL D Direct Contact.**
Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs), ASC NEPM (2013)	ASC NEPM (2013): Ecological Investigation Levels (EILs) and ecological screening levels (ESLs) apply to the top 2m of soil. EILs and ESLs protective of Areas of Ecological Significance have been selected for soil samples collected in the site. EILs and ESLs protective of **Commercial/Industrial** have been selected.
Intrusive Maintenance Worker (Shallow Trench) Health Screening Levels, CRC CARE Technical Report No. 10, Part 2	Health screening levels for intrusive maintenance workers are adopted for potential future intrusive work into shallow soil onsite. Adopted Validation Criteria: **Soil HSLs – Intrusive Maintenance Worker (Sand) 0–<2 m bgs.** Where the value is non-limiting (NL) for depth range 0 to <2 m, direct contact values will be adopted (the Friebel, E. and Nadebaum, P., 2011): HSL Intrusive Maintenance Worker Direct Contact.

Table 10.2 Soil validation criteria

Adopted Validation Criteria	Rationale and Selection
Management Limits, Amended ASC NEPM (2013)	The ASC NEPM (2013) Management Limits for TRH are applied after the consideration of the relevant HSLs as there are a number of policy considerations which reflect the nature and properties of petroleum hydrocarbons. There are Management Limits for specific soil types (coarse and fine) and land uses in the Amended ASC NEPM (NEPC, 2013). The Management Limits avoid or minimise the potential effects of the following and require consideration of site-specific factors to determine the maximum depth to which the limits should apply: • Formation of observable LNAPL. • Fire and explosive hazards. • Effects on buried infrastructure, eg penetration of, or damage to, in-ground services by hydrocarbons. This guideline is considered relevant for the upper 2 m of soil for the majority of the Site. As the Site geology is dominated by sandy fill and natural sands, the soil texture 'coarse' will be adopted.
Soil Aesthetic Issues	In accordance with the Amended ASC NEPM (NEPC, 2013), the aesthetic state of sites is required to be taken into account. Aesthetic issues generally relate to the presence of materials with a negligible risk or non-hazardous inert foreign material in soil or fill resulting from human activity. Sites that have been assessed as being acceptable from a human health and environmental perspective may still contain such foreign material. An assessment of the site aesthetics requires consideration of the natural state of soil on any given site, and a comparison between it and the soil encountered during investigation works. In particular, soils onsite should not exhibit discolouration (staining), a malodorous nature (odours) or abnormal consistency (rubble and asbestos). Both odours and staining should be considered for commercial end use.

10.2.2 Groundwater validation criteria

Table 10.3 below summarises the groundwater validation criteria adopted for the remediation validation works.

Table 10.3 Groundwater validation criteria

Adopted Validation Criteria	Rationale and Selection
Health Screening Levels (HSLs), ASC NEPM (2013)	The Amended NEPM 2013 (NEPC, 2013) presents health screening levels (HSLs) for petroleum compounds which have been derived through consideration of risks to human health, with the main focus being on the vapour exposure pathway. Adopted HSL to be protective of future onsite and offsite receptors is: **HSL D Commercial Industrial,** strata type **Sand,** with depth profile of **2-4m** for groundwater encountered at the site at a maximum depth of 3.3 m bgl.
Protection of Aquatic Ecosystems – Moderate to Highly Disturbed Level of Protection (ANZG, 2018)	Guidelines for the protection of Aquatic Ecosystems provide trigger values for organic and inorganic chemicals for the protection of freshwater and marine aquatic ecosystems (ANZG, 2018). The Amended ASC NEPM (NEPC, 2013) Schedule B2 suggests a search radius of 500 m from a site boundary for ecological receptors. This guidance gives a maximum screening distance for viable receptors. Adopted as a conservative measure to screen shallow groundwater which may enter nearby moderate to highly disturbed surface water ecosystems.

10.3 Quality assurance and quality control

10.3.1 Field methods and quality control measures

The following QA/QC procedures will be incorporated into the validation sampling and analysis program:

- intra-laboratory duplicates (at a rate one per 20 samples analysed) will be submitted to the primary National Association of Testing Authorities (NATA) accredited external analytical laboratory (ALS) for analysis of CoPC;
- inter-laboratory duplicates (at a rate one per 20 samples analysed) will be submitted to the secondary NATA accredited external analytical laboratory (Envirolab) for analysis of CoPC;
- collection and analysis of rinsate samples (collected following decontamination of field sampling equipment) at a rate of one per media, per day; and
- trip blank and trip spike samples will be analysed at a rate of one per day.

10.3.2 Laboratory QA/QC

Details of the specific analytical techniques utilised by EnviroLab and ALS are provided in the laboratory reports with each sampling event. Chain of Custody documentation accompanies all analytical data provided by EnviroLab and ALS.

As part of the QA/QC programme, relative percent differences (RPD) between the duplicate and its primary sample will be calculated. To be acceptable, the RPD must be within the limits detailed in Table 6.2, which is recommended in Australian Standard 4482.1-2005. The RPD results and an EMM data QA/QC report will be presented with the DSI report.

10.3.3 Analytical data validation

Analytical data validation is the process of assessing if data are in compliance with method requirements and Project specifications. The primary objectives of this process are to ensure that data of known quality are reported, and to identify if the data can be used to fulfil the overall Project objectives.

Specific elements of data validation that will be checked and assessed for this Project are:

- preservation and storage of samples upon collection and during transport to the laboratory;
- sample holding times;
- required limits of reporting;
- frequency of conducting quality control measurements;
- laboratory blanks;
- rinsate blanks;
- trip blanks;
- field duplicates;
- laboratory duplicates;

- inter-laboratory duplicates;
- laboratory control samples;
- surrogates; and
- the occurrence of apparently unusual or anomalous results, eg laboratory results that appear to be inconsistent with field observations or measurements.

The overall reliability of the analytical data will be assessed against the DQIs as required by NSW EPA.

10.3.4 Corrective actions

Analytical data that fail to meet the predetermined data quality objectives and acceptable limits of accuracy and precision will be managed using the following corrective actions on a case-by-case basis:

- reanalyse suspect samples, provided sample or extract is within holding time;
- evaluate and amend sampling and/or analytical procedures;
- resampling and reanalysis;
- accept the data as an estimate with an acknowledged level of bias and imprecision; and
- discard the data.

In the event that data of questionable reliability are used, restrictions and limitations associated with the use of such data will be clearly identified. Failure to meet the DQOs will be reported and the significance to the outcome of the program will be addressed.

10.4 Validation report

Upon completion of the remediation works, a validation report will be prepared by EMM to validate the remedial works in accordance with the Consultants reporting on contaminated land – Contaminated land guidelines (NSW EPA, 2020).

11 Site environmental management plan

The remediation contractor will be responsible for preparing Remediation Work Method Statements (RWMS) to manage environmental, health and safety hazards. The RWMS will address the issues and controls presented in the following items of the Site Environmental Management Plan (SEMP).

11.1 Health and safety

A project specific health and safety plan for the remediation works will be prepared and available on-Site. The plan will identify all potential risks associated with the works and detail safety measures to be adopted to protect both on-Site workers and the general public.

11.1.1 Asbestos management

During the remediation works, ACM may be encountered and will require management and disposal to an off-site landfill licenced to receive 'Special Waste – Asbestos' under the Waste Classification Guidelines (NSW EPA, 2014). Detailed health and safety measures will be provided in the health and safety plan developed of the remediation works.

11.1.2 Hours of operation

Operational hours for any remediation work will be in consultation with Randwick City Council and is likely to be as follows:

Monday to Friday: 7:00 am to 5:00 pm

Saturday: 7:00 am to 4:00 pm

Sunday or Public Holidays: Not permitted

11.1.3 Site access

Site access will be restricted to authorised staff and contractors who have completed the Site induction and are suitably trained for the remediation works. Perimeter fencing must be installed and maintained around the remediation area and secured from outside entry outside of operational hours. Signage will include key contact details and be erected at the Site entry gate.

11.1.4 Personal protective equipment

Appropriate personal protective equipment (PPE) must be worn by all workers. The minimum PPE when working or visiting remediation areas will be disposable overalls, steel cap boots, gloves, eye protection. Hard hats and high visibility clothing must be worn on-site at all times.

First aid and safety equipment including fire extinguishers will be provided at the Site for emergency use.

11.1.5 Training

All Site workers and visitors will be inducted so as to be aware of potential hazards at the Site. As part of the Site induction, all employees, sub-contractors and visitors will be made aware of the emergency protocols for the project.

11.2 Erosion and sediment control

Erosion and sediment control measures will be in place during the remediation works in accordance with Managing Urban Stormwater, Soils and Construction, 4th edition (Landcom, 2004). EMM notes the close proximity of the former UPSS infrastructure to a stormwater drain (Bunnerong Stormwater Channel No 11) and therefore strict adherence to appropriate sediment control measures will be critical during the remediation works.

Erosion and sediment control measures may include:

- installation of silt fencing and bunding as appropriate for the Site;
- silt fences must be installed upright and securely fixed. Accumulated sediments behind silt fences must be periodically removed to maintain the retention capacity of the fencing;
- inspections of the control measures in place must be completed daily during the remediation works or immediately following heavy rainfall events to confirm the measures are in good condition; and
- the surface area of exposed soils at a given time should be minimised by adopting a controlled sequence of works and progressive approach to excavations.

11.3 Stockpile management

Stockpiles are to be appropriately located and tracked to avoid mixing of difference classes of waste material. Bunding and sediment controls will be installed as appropriate to minimise runoff from stockpiles to surrounding areas. Stockpiles should be formed in a manner that reduces the potential from stockpile erosion.

11.4 Soil haulage

Soil tracked off the Site due to vehicles and plant should be avoided. The following measures are to be adopted to minimise the risk of tracking soils off-Site:

- the number of vehicles and plant on-site should be minimised where practicable;
- the frequency of vehicles and plant entering and exiting the site should be minimised where practicable;
- equipment and plant should be washed down before leaving the Site; and
- covers should be used on vehicles transporting soils for off-site disposal.

11.5 Noise

Vehicles and equipment which produce substantial noise will only be used during the approved operational hours for the remediation works. Equipment and plant used must be fitted with noise attenuating devises and adopt measures to minimise noise being produced at the Site as much as practicable. Vehicles and equipment should be maintained and operated in an efficient manner and should be switched off or throttled to a minimum when not in use.

11.6 Odour and dust

Measures to reduce dust and odour from the Site may include:

- covering contaminated excavation faces or stockpiles with barriers or applying water during high winds; and
- apply odour suppressant sprays. Where strong odours are present on or off the Site, work may need to stop and the odour source covered or treated.

11.7 Communication

If complaints are made to the on-site workers or sub-contractors, the complaint will be documented in a complaints register. Incident reporting will be completed for complaints regarding environmental issues such as pollution related to the works. Corrective actions will be taken as soon as practicable. Complaints and incidents should be reported to local Council as soon as practicable.

12 Approvals and licences

State Environmental Planning Policy (SEPP) No. 55 – Remediation of Land, relates to the decision-making process for conducting remediation activities and making planning decisions regarding contaminated land. Category 1 remediation works require development consent while Category 2 remediation works do not. The proposed works at the Site are considered to be Category 2 works under SEPP 55, which require:

- notification to Council at least 30 days prior to works commencing; and
- at least 14 days prior to works commencing, provide copies of investigations reports and a remediation action plan, including contact details, to Council.

Randwick City Council was provided with notification of the proposed Category 2 remediation works by EMM on 13 August 2020. The rational for Category 2 remediation works is based on a review of Clauses 9, 14 and 15(1) of the SEPP, and is provided in detail in Appendix B.

The proposed remediation area is adjacent to a Sydney Water stormwater drainage canal (Bunnerong Stormwater Channel No. 11), which is listed on the Sydney Water State Agency Section 170 Heritage and Conservation Register. EMM has commenced engagement with Sydney Water and will incorporate requirements for the protection of the stormwater channel as required in this RAP.

13 Conclusions

The Site will be considered suitable for land use purposes under the current land zoning (IN1: General industrial) subject to appropriate remediation implemented according to this RAP and SEPP 55.

This RAP:

- has been developed in accordance with current industry practice;
- has selected a preferred remediation strategy (excavation and offsite disposal) based on the site-specific nature of the Site and currently available remediation technologies; and
- details a plan which will validate that the completed works were successful.

EMM notes that Sydney Water requirements may affect the remediation methodology proposed, for example, limitations to the extent of excavation that can be conducted adjacent to the stormwater channel. Any necessary amendments will be made following receipt of Sydney Water advice.

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Appendix A

Historical data

			Asbestos	Inorganics		Metals								PFAS										
			Asbestos fibres	Moisture Content	Moisture Content	Cadmium	Arsenic	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	N-Methyl perfluorooctane sulfonamide (NMeFOSA)	N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	N-(Methylperfluorooctanesulfonamidoethanol (N-MeFOSE)	Perfluorobutane sulfonic acid (PFBS)
			Detect	%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	µg/kg	mg/kg	mg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	mg/kg	mg/kg
EQL				1	0.1	0.4	4	1	1	1	0.1	1	1	0.2	0.1	0.0001	0.0002	1	0.2	5	1	0.2	0.001	0.0001
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil						900	3,000	3,600	240,000	1,500	730	6,000	400,000											
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand																								
0-1m																								
1-2m																								
2-4m																								
>=4m																								
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind							160																	
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil																								
0-2m																								
NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil																								
PFAS NEMP 2020 Industrial/ commercial (HIL D)																								
Location ID	Field ID	Date																						
BH01	BH01_0.4_200715	15/07/2020	0		7.8	<0.4	<4	2	2	3	<0.1	8	13											
BH02	BH02_0.5_200715	15/07/2020	0		5.2	<0.4	<4	3	20	18	<0.1	17	39											
BH03	BH03_0.9_200715	15/07/2020	0		3.4	<0.4	<4	1	3	3	<0.1	1	8											
	QC100_200715	15/07/2020			4.5	<0.4	<4	2	5	10	<0.1	2	14											
BH04	BH04_0.9_200715	15/07/2020	0		19	<0.4	<4	4	25	47	0.7	22	38	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
	BH04_0.9_200715 - [TRIPLICATE]	15/07/2020				<0.4	<4	5	29	49	0.8	24	36											
BH05	BH05_0.5_200715	15/07/2020	0		8.9	<0.4	<4	1	2	8	<0.1	2	17											
BH06	BH06_0.3_200722	22/07/2020	0		10	<0.4	12	26	15	23	<0.1	15	41	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
	BH06_1.3_200722	22/07/2020			6.7	<0.4	<4	3	<1	3	<0.1	<1	2											
BH07	BH07_0.3_200722	22/07/2020	0		3.4	<0.4	<4	<1	<1	<1	<0.1	<1	<1											
	BH07_3.5_200722	22/07/2020			13	<0.4	<4	1	<1	<1	<0.1	<1	1	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
BH08	BH08_0.3_200722	22/07/2020	0		4.3	<0.4	<4	2	<1	<1	<0.1	<1	8											
	BH08_2.7_200722	22/07/2020			4.3	<0.4	<4	1	<1	<1	<0.1	<1	2											
BH09	BH09_0.3_200722	22/07/2020			11	<0.4	<4	1	5	7	<0.1	6	18											
	BH09_1.5_200722	22/07/2020	0		5.3	<0.4	<4	1	<1	<1	<0.1	<1	<1	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
BH10	BH10_0.3_200722	22/07/2020	0		4.1	<0.4	<4	4	<1	2	<0.1	2	3											
	BH10_0.8_200722	22/07/2020			12	<0.4	<4	1	<1	<1	<0.1	<1	<1											
BH11	BH11_0.5_200722	22/07/2020	0		<0.1	<0.4	<4	<1	2	4	<0.1	1	13											
	BH11_5.5_200724	24/07/2020			12	<0.4	<4	1	<1	<1	<0.1	<1	3	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
BH12	BH12_0.5_200722	22/07/2020	0		6.5	<0.4	<4	2	3	12	<0.1	2	120											
	BH12_1.6_200722	22/07/2020			5.2	<0.4	<4	2	<1	1	<0.1	<1	10											
BH13	BH13_0.3_200724	24/07/2020			8.5	<0.4	<4	1	<1	3	<0.1	<1	5											
	BH13_1.5_200724	24/07/2020	0		5	<0.4	<4	<1	<1	1	<0.1	<1	9	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
BH14	BH14_0.3_200722	22/07/2020	0		5.9	<0.4	<4	1	2	7	<0.1	1	11											
	BH14_3.9_200722	22/07/2020			15	<0.4	<4	1	<1	<1	<0.1	<1	6	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
BH15	BH15_0.3_200723	23/07/2020	0		5.3	<0.4	<4	7	30	35	0.2	20	55											
	BH15_3.9_200723	23/07/2020			20	<0.4	<4	1	<1	<1	<0.1	<1	1											
BH16	BH16_0.9_200723	23/07/2020	0		2.2	<0.4	<4	<1	<1	<1	<0.1	<1	1	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
	BH16_1.7_200723	23/07/2020			4.4	<0.4	<4	2	<1	1	<0.1	<1	2											
BH17	BH17_0.3_200723	23/07/2020			5	<0.4	<4	1	4	6	<0.1	2	13											
	BH17_1.6_200723	23/07/2020	0		16	<0.4	10	5	790	2,000	0.2	8	190											
	QC200_200723	23/07/2020		18.8		<1	7	3	267	221	0.4	5	591											
	BH17_1.6_200723 - [TRIPLICATE]	23/07/2020				0.5	11	7	480	630	0.3	10	340											
BH18	BH18_0.3_200723	23/07/2020	0		2.9	<0.4	<4	<1	4	5	<0.1	1	13											
	BH18_5.5_200724	24/07/2020			13	<0.4	<4	<1	<1	<1	<0.1	<1	5	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
BH19	BH19_1.8_200723	23/07/2020			6.2	<0.4	<4	2	<1	3	<0.1	<1	3	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
	QC201_200723	23/07/2020		7.5		<1	<5	2	<5	<5	<0.1	<2	<5	<0.5	<0.5	<0.0005	<0.0005							<0.0002
	BH19_1_200723	23/07/2020	0		5.4	<0.4	<4	<1	3	2	<0.1	<1	6											
BH20	BH20_0.3_200723	23/07/2020	0		1.2	<0.4	<4	<1	<1	2	<0.1	<1	2											
	BH20_1.6_200723	23/07/2020			3.1	<0.4	<4	<1	<1	<1	<0.1	<1	<1											
BH21	BH21_0.2_200723	23/07/2020	0		12	<0.4	<4	10	12	430	<0.1	47	29	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
	BH21_0.2_200723 - [TRIPLICATE]	23/07/2020				<0.4	<4	7	16	82	<0.1	36	33											
	BH21_1.3_200723	23/07/2020			2.8	<0.4	<4	<1	<1	1	<0.1	<1	<1											
BH22	BH22_1.2_200723	23/07/2020	1		2.2	<0.4	<4	<1	<1	<1	<0.1	<1	3	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
	BH22_3.9_200723	23/07/2020			17	<0.4	<4	2	<1	<1	<0.1	<1	3											
BH23	BH23_0.9_200723	23/07/2020	0		28	<0.4	<4	<1	<1	<1	<0.1	1	3											
	BH23_1.5_200723	23/07/2020			9.9	<0.4	<4	1	<1	<1	<0.1	<1	1											
BH24	BH24_0.3_200723	23/07/2020	0		37	<0.4	<4	6	25	41	<0.1	36	53											
	BH24_2.7_200723	23/07/2020			13	<0.4	<4	<1	<1	1	<0.1	<1	3											
BH25	BH25_0.3_200723	23/07/2020	0		4.7	<0.4	<4	<1	1	2	<0.1	<1	4	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
	BH25_0.9_200723	23/07/2020			2.2	<0.4	<4	<1	1	1	<0.1	1	2											
BH26	BH26_1_200724	24/07/2020	0		5.2	<0.4	<4	<1	1	2	<0.1	1	13	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
	QC101_200724	24/07/2020			4.9	<0.4	<4	<1	3	4	<0.1	2	22			<0.0001	<0.0002							
	BH26_4.4_200724	24/07/2020			19	<0.4	<4	1	<1	<1	<0.1	<1	2											
BH27	BH27_0.5_200724	24/07/2020	0		6.3	<0.4	<4	3	26	10	<0.1	10	25											
	BH27_2_200724	24/07/2020			7.6	<0.4	<4	1	4	2	<0.1	6	43	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
	QC102_200724	24/07/2020			11	<0.4	<4	1	3	1	<0.1	5	31			<0.0001	<0.0002							
BH28	BH28_0.3_200724	24/07/2020	0		5.7	<0.4	<4	2	1	4	<0.1	5	14	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
	BH28_1_200724	24/07/2020	0		7.8	<0.4	<4	1	<1	<1	<0.1	<1	4											
BH29	BH29_0.3_200724	24/07/2020	0		43	<0.4	<4	4	6	26	<0.1	4	30											
	QC202_200724	23/07/2020		4.2		<1	<5	2	<5	13	<0.1	2	17											
BH30	BH30_0.3_200724	24/07/2020	0		8.2	<0.4	<4	5	4	4	<0.1	6	10											
	BH30_2.7_200724	24/07/2020			23	<0.4	<4	1	<1	1	<0.1	<1	1	<0.2	<0.1	<0.0001	<0.0002	<1	<0.2	<5	<1	<0.2	<0.001	<0.0001
	TB01_200715	15/07/2020																						
	TB02_200724	24/07/2020																						
	TB03_200724	24/07/2020																						

Environmental Standards
NEPM, NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil
HEPA, January 2020, PFAS NEMP 2020 Industrial/ commercial (HIL D)

			PFOS/PFOA																							
			Perfluorobutanoic acid (PFBA)	Perfluorodecanesulfonic acid (PFDS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexane sulfonic acid (PFHxS)		Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorooctane sulfonamide (PFOSA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid (PFPeS)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Sum of PFAS	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)**	Naphthalene	Acenaphthene
			µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/L	µg/kg	µg/kg	µg/kg	mg/kg	mg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	mg/kg	mg/kg
EQL			0.2	0.2	0.5	0.5	0.1	0.1	0.1	0.01	0.1	0.1	1	0.0001	0.0001	0.1	0.2	5	0.5	0.5	0.1	0.2	0.1	0.1	0.1	0.1
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil																										
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand																										
0-1m																										
1-2m																										
2-4m																										
>=4m																										
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind																									370	
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil																										
0-2m																										
NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil																										
PFAS NEMP 2020 Industrial/ commercial (HIL D)															50									20,000		
Location ID	Field ID	Date																								
BH01	BH01_0.4_200715	15/07/2020																							<0.1	<0.1
BH02	BH02_0.5_200715	15/07/2020																							<0.1	<0.1
BH03	BH03_0.9_200715	15/07/2020																							<0.1	<0.1
	QC100_200715	15/07/2020																							<1	
BH04	BH04_0.9_200715	15/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	0.0027	0.0002	<0.1	<0.2	<5	<0.5	<0.5	2.9		2.7	2.9	<0.1	<0.1
	BH04_0.9_200715 - [TRIPLICATE]	15/07/2020																								
BH05	BH05_0.5_200715	15/07/2020																							<0.1	<0.1
BH06	BH06_0.3_200722	22/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	<0.0001	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	<0.1		<0.1	<0.1	<0.1	<0.1
	BH06_1.3_200722	22/07/2020																							<0.1	<0.1
BH07	BH07_0.3_200722	22/07/2020																							<0.1	<0.1
	BH07_3.5_200722	22/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	0.0004	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	0.4		0.4	0.4	<0.1	<0.1
BH08	BH08_0.3_200722	22/07/2020																							<0.1	<0.1
	BH08_2.7_200722	22/07/2020																							<0.1	<0.1
BH09	BH09_0.3_200722	22/07/2020																							<0.1	<0.1
	BH09_1.5_200722	22/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	<0.0001	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	<0.1		<0.1	<0.1	<0.1	<0.1
BH10	BH10_0.3_200722	22/07/2020																							<0.1	<0.1
	BH10_0.8_200722	22/07/2020																							<0.1	<0.1
BH11	BH11_0.5_200722	22/07/2020																							<0.1	<0.1
	BH11_5.5_200724	24/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	<0.0001	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	<0.1		<0.1	<0.1	<0.1	<0.1
BH12	BH12_0.5_200722	22/07/2020																							<0.1	<0.1
	BH12_1.6_200722	22/07/2020																							<0.1	<0.1
BH13	BH13_0.3_200724	24/07/2020																							<0.1	<0.1
	BH13_1.5_200724	24/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	<0.0001	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	<0.1		<0.1	<0.1	<0.1	<0.1
BH14	BH14_0.3_200722	22/07/2020																							<0.1	<0.1
	BH14_3.9_200722	22/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	0.0009	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	0.9		0.9	0.9	<0.1	<0.1
BH15	BH15_0.3_200723	23/07/2020																							<0.1	<0.1
	BH15_3.9_200723	23/07/2020																							<0.1	<0.1
BH16	BH16_0.9_200723	23/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	0.0005	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	0.5		0.5	0.5	<0.1	<0.1
	BH16_1.7_200723	23/07/2020																							<0.1	<0.1
BH17	BH17_0.3_200723	23/07/2020																							<0.1	<0.1
	BH17_1.6_200723	23/07/2020																							<0.1	<0.1
	QC200_200723	23/07/2020																							<1	
	BH17_1.6_200723 - [TRIPLICATE]	23/07/2020																								
BH18	BH18_0.3_200723	23/07/2020																							<0.1	<0.1
	BH18_5.5_200724	24/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	<0.0001	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	<0.1		<0.1	<0.1	<0.1	<0.1
BH19	BH19_1.8_200723	23/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	<0.0001	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	<0.1		<0.1	<0.1	<0.1	<0.1
	QC201_200723	23/07/2020	<1					<0.2	<0.2		<0.2			<0.0002	<0.0002		<0.2					<0.2	<0.2		<1	
	BH19_1_200723	23/07/2020																							<0.1	<0.1
BH20	BH20_0.3_200723	23/07/2020																							<0.1	<0.1
	BH20_1.6_200723	23/07/2020																							<0.1	<0.1
BH21	BH21_0.2_200723	23/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	<0.0001	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	<0.1		<0.1	<0.1	<0.1	0.7
	BH21_0.2_200723 - [TRIPLICATE]	23/07/2020																								
	BH21_1.3_200723	23/07/2020																							<0.1	<0.1
BH22	BH22_1.2_200723	23/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	0.0002	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	0.2		0.2	0.2	<0.1	<0.1
	BH22_3.9_200723	23/07/2020																							<0.1	<0.1
BH23	BH23_0.9_200723	23/07/2020																							<0.1	<0.1
	BH23_1.5_200723	23/07/2020																							<0.1	<0.1
BH24	BH24_0.3_200723	23/07/2020																							<0.1	<0.1
	BH24_2.7_200723	23/07/2020																							<0.1	<0.1
BH25	BH25_0.3_200723	23/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	0.0011	0.0001	<0.1	<0.2	<5	<0.5	<0.5	1.2		1.1	1.2	<0.1	<0.1
	BH25_0.9_200723	23/07/2020																							<0.1	<0.1
BH26	BH26_1_200724	24/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	0.0031	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	3.1		3.1	3.1	<0.1	<0.1
	QC101_200724	24/07/2020							<0.1					0.0032	<0.0001						3.2		3.2	3.2	<1	
	BH26_4.4_200724	24/07/2020																							<0.1	<0.1
BH27	BH27_0.5_200724	24/07/2020																							<0.1	<0.1
	BH27_2_200724	24/07/2020	<0.2	<0.2	<0.5	<0.5	0.3	<0.1	<0.1		<0.1	<0.1	<1	0.016	0.0027	<0.1	<0.2	<5	<0.5	<0.5	19		16	19	<0.1	<0.1
	QC102_200724	24/07/2020							0.1					0.016	0.0031						19		16	19	<1	
BH28	BH28_0.3_200724	24/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	<0.0001	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	<0.1		<0.1	<0.1	<0.1	<0.1
	BH28_1_200724	24/07/2020																							<0.1	<0.1
BH29	BH29_0.3_200724	24/07/2020																							<0.1	<0.1
	QC202_200724	23/07/2020																							<1	
BH30	BH30_0.3_200724	24/07/2020																							<0.1	<0.1
	BH30_2.7_200724	24/07/2020	<0.2	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1		<0.1	<0.1	<1	0.0004	<0.0001	<0.1	<0.2	<5	<0.5	<0.5	0.4		0.4	0.4	<0.1	<0.1
	TB01_200715	15/07/2020																							<1	
	TB02_200724	24/07/2020																							<1	
	TB03_200724	24/07/2020																							<1	

Environmental Standards
NEPM, NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil
HEPA, January 2020, PFAS NEMP 2020 Industrial/ commercial (HIL D)

Table 1 - Soil Results

			PAH																TPH							
			Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(a)pyrene TEQ (LOR)	Benzo(a)pyrene TEQ calc (half)	Benzo(a)pyrene TEQ calc (zero)	Benzo(b+j+k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	PAHs (Sum of positives)	Phenanthrene	Pyrene	>C10-C36 (Sum of total)	C10-C14	C15-C28	C29-C36	C6-C9	C10-C16	C10-C16 (F2 minus Naphthalene)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.1	0.1	0.1	0.05	0.5	0.5	0.5	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.05	0.1	0.1	50	50	100	100	10	50	50
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil							40	40	40																	
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand																										
0-1m																										
1-2m																										
2-4m																										
>=4m																										
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind																										
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil						1.4																				170
0-2m						1.4																				170
NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil																									1,000	
PFAS NEMP 2020 Industrial/ commercial (HIL D)																										
Location ID	Field ID	Date																								
BH01	BH01_0.4_200715	15/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH02	BH02_0.5_200715	15/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	420	660	<25	<50	<50
BH03	BH03_0.9_200715	15/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	270	300	<25	<50	<50
	QC100_200715	15/07/2020																			<50	210	290	<25	<50	<50
BH04	BH04_0.9_200715	15/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH04_0.9_200715 - [TRIPLICATE]	15/07/2020																								
BH05	BH05_0.5_200715	15/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH06	BH06_0.3_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH06_1.3_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH07	BH07_0.3_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH07_3.5_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH08	BH08_0.3_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH08_2.7_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH09	BH09_0.3_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.3	<0.1	0.1		<50	<100	<100	<25	<50	<50
	BH09_1.5_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH10	BH10_0.3_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH10_0.8_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH11	BH11_0.5_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH11_5.5_200724	24/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH12	BH12_0.5_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH12_1.6_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH13	BH13_0.3_200724	24/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH13_1.5_200724	24/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH14	BH14_0.3_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH14_3.9_200722	22/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH15	BH15_0.3_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.2	<0.1	0.1		<50	<100	<100	<25	<50	<50
	BH15_3.9_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH16	BH16_0.9_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH16_1.7_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH17	BH17_0.3_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH17_1.6_200723	23/07/2020	<0.1	<0.1	0.7	0.5	0.8	0.7	0.7	1	0.2	0.7	<0.1	1.1	<0.1	0.2	5.7	0.6	0.8		<50	<100	<100	<25	<50	<50
	QC200_200723	23/07/2020																		280	<50	140	140	<10	<50	<50
	BH17_1.6_200723 - [TRIPLICATE]	23/07/2020																								
BH18	BH18_0.3_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH18_5.5_200724	24/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH19	BH19_1.8_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	QC201_200723	23/07/2020																		<50	<50	<100	<100	<10	<50	<50
	BH19_1_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH20	BH20_0.3_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH20_1.6_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH21	BH21_0.2_200723	23/07/2020	<0.1	1.4	3.6	3.3	4.4	4.4	4.4	3.9	1.5	3.9	0.3	6	0.3	0.9	39	4.1	9.4		<50	180	<100	<25	<50	<50
	BH21_0.2_200723 - [TRIPLICATE]	23/07/2020																								
	BH21_1.3_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH22	BH22_1.2_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH22_3.9_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH23	BH23_0.9_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH23_1.5_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH24	BH24_0.3_200723	23/07/2020	<0.1	<0.1	0.1	0.06	<0.5	<0.5	<0.5	<0.2	<0.1	0.2	<0.1	0.2	<0.1	<0.1	1.1	0.3	0.2		<50	120	<100	<25	<50	<50
	BH24_2.7_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH25	BH25_0.3_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH25_0.9_200723	23/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH26	BH26_1_200724	24/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	QC101_200724	24/07/2020																			<50	<100	<100	<25	<50	<50
	BH26_4.4_200724	24/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH27	BH27_0.5_200724	24/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH27_2_200724	24/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	QC102_200724	24/07/2020																			<50	<100	<100	<25	<50	<50
BH28	BH28_0.3_200724	24/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH28_1_200724	24/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
BH29	BH29_0.3_200724	24/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	QC202_200724	23/07/2020																		<50	<50	<100	<100	<10	<50	<50
BH30	BH30_0.3_200724	24/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	BH30_2.7_200724	24/07/2020	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1		<50	<100	<100	<25	<50	<50
	TB01_200715	15/07/2020																						<25		
	TB02_200724	24/07/2020																						<25		
	TB03_200724	24/07/2020																						<25		

Environmental Standards
NEPM, NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil
HEPA, January 2020, PFAS NEMP 2020 Industrial/ commercial (HIL D)

			TRH					BTEX							PCBs											
			C10-C40 (Sum of total)	C16-C34	C34-C40	C6-C10	C6-C10 (F1 minus BTEX)	Total BTEX	Xylene Total	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	PCBs (Sum of total)	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			50	100	100	10	10	0.2	0.5	0.2	0.5	0.5	0.5	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	1	1
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil																						7			
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand							260 | 370 | 630 |																		
0-1m							260		230	3															
1-2m							370			3															
2-4m							630			3															
>=4m										3															
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind																									
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil				1,700	3,300		215		180	75	165	135													
0-2m				1,700	3,300		215		180	75	165	135													
NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil				3,500	10,000	700																			
PFAS NEMP 2020 Industrial/ commercial (HIL D)																									
Location ID	Field ID	Date																							
BH01	BH01_0.4_200715	15/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
BH02	BH02_0.5_200715	15/07/2020	1,500	930	610	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH03	BH03_0.9_200715	15/07/2020	630	510	120	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	QC100_200715	15/07/2020	620	450	180	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH04	BH04_0.9_200715	15/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	BH04_0.9_200715 - [TRIPLICATE]	15/07/2020																							
BH05	BH05_0.5_200715	15/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH06	BH06_0.3_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	BH06_1.3_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH07	BH07_0.3_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	BH07_3.5_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
BH08	BH08_0.3_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	BH08_2.7_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH09	BH09_0.3_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	BH09_1.5_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
BH10	BH10_0.3_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	BH10_0.8_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
BH11	BH11_0.5_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	BH11_5.5_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
BH12	BH12_0.5_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	BH12_1.6_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH13	BH13_0.3_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	BH13_1.5_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
BH14	BH14_0.3_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
	BH14_3.9_200722	22/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1									<1	<1	<1
BH15	BH15_0.3_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	BH15_3.9_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH16	BH16_0.9_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	BH16_1.7_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
BH17	BH17_0.3_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	BH17_1.6_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	QC200_200723	23/07/2020	240	240	<100	<10	<10	<0.2	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5											
	BH17_1.6_200723 - [TRIPLICATE]	23/07/2020																							
BH18	BH18_0.3_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	BH18_5.5_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
BH19	BH19_1.8_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	QC201_200723	23/07/2020	<50	<100	<100	<10	<10	<0.2	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5											
	BH19_1_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH20	BH20_0.3_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	BH20_1.6_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH21	BH21_0.2_200723	23/07/2020	230	230	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	BH21_0.2_200723 - [TRIPLICATE]	23/07/2020																							
	BH21_1.3_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH22	BH22_1.2_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	BH22_3.9_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH23	BH23_0.9_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	BH23_1.5_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH24	BH24_0.3_200723	23/07/2020	200	200	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	BH24_2.7_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH25	BH25_0.3_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	BH25_0.9_200723	23/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
BH26	BH26_1_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	QC101_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	BH26_4.4_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
BH27	BH27_0.5_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	BH27_2_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	QC102_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH28	BH28_0.3_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	BH28_1_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
BH29	BH29_0.3_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1
	QC202_200724	23/07/2020	<50	<100	<100	<10	<10	<0.2	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5											
BH30	BH30_0.3_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	BH30_2.7_200724	24/07/2020	<50	<100	<100	<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	TB01_200715	15/07/2020				<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	TB02_200724	24/07/2020				<25	<25		<3	<0.2	<1	<0.5	<2	<1											
	TB03_200724	24/07/2020				<25	<25		<3	<0.2	<1	<0.5	<2	<1											

Environmental Standards
NEPM, NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil
HEPA, January 2020, PFAS NEMP 2020 Industrial/ commercial (HIL D)

			Chlorinated Hydrocarbons																								
			1,1,1-dichloroethane	1,1-dichloroethene	1,2-dichloroethane	1,2-dichloropropane	Bromodichloromethane	Bromoform	Carbon tetrachloride	Chlorodibromomethane	Chloroethane	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Chloroform	Hexachlorobutadiene	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Trichloroethene	Vinyl chloride	1,1,1,2-tetrachloroethane	1,1-dichloropropene	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,3-dichloropropane
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil																											
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand																											
0-1m																											
1-2m																											
2-4m																											
>=4m																											
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind																											
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil																											
0-2m																											
NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil																											
PFAS NEMP 2020 Industrial/ commercial (HIL D)																											
Location ID	Field ID	Date																									
BH01	BH01_0.4_200715	15/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH02	BH02_0.5_200715	15/07/2020																									
BH03	BH03_0.9_200715	15/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	QC100_200715	15/07/2020																									
BH04	BH04_0.9_200715	15/07/2020																									
	BH04_0.9_200715 - [TRIPLICATE]	15/07/2020																									
BH05	BH05_0.5_200715	15/07/2020																									
BH06	BH06_0.3_200722	22/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	BH06_1.3_200722	22/07/2020																									
BH07	BH07_0.3_200722	22/07/2020																									
	BH07_3.5_200722	22/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH08	BH08_0.3_200722	22/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	BH08_2.7_200722	22/07/2020																									
BH09	BH09_0.3_200722	22/07/2020																									
	BH09_1.5_200722	22/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH10	BH10_0.3_200722	22/07/2020																									
	BH10_0.8_200722	22/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH11	BH11_0.5_200722	22/07/2020																									
	BH11_5.5_200724	24/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH12	BH12_0.5_200722	22/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	BH12_1.6_200722	22/07/2020																									
BH13	BH13_0.3_200724	24/07/2020																									
	BH13_1.5_200724	24/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH14	BH14_0.3_200722	22/07/2020																									
	BH14_3.9_200722	22/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH15	BH15_0.3_200723	23/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	BH15_3.9_200723	23/07/2020																									
BH16	BH16_0.9_200723	23/07/2020																									
	BH16_1.7_200723	23/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH17	BH17_0.3_200723	23/07/2020																									
	BH17_1.6_200723	23/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	QC200_200723	23/07/2020																									
	BH17_1.6_200723 - [TRIPLICATE]	23/07/2020																									
BH18	BH18_0.3_200723	23/07/2020																									
	BH18_5.5_200724	24/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH19	BH19_1.8_200723	23/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	QC201_200723	23/07/2020																									
	BH19_1_200723	23/07/2020																									
BH20	BH20_0.3_200723	23/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	BH20_1.6_200723	23/07/2020																									
BH21	BH21_0.2_200723	23/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	BH21_0.2_200723 - [TRIPLICATE]	23/07/2020																									
	BH21_1.3_200723	23/07/2020																									
BH22	BH22_1.2_200723	23/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	BH22_3.9_200723	23/07/2020																									
BH23	BH23_0.9_200723	23/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	BH23_1.5_200723	23/07/2020																									
BH24	BH24_0.3_200723	23/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	BH24_2.7_200723	23/07/2020																									
BH25	BH25_0.3_200723	23/07/2020																									
	BH25_0.9_200723	23/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH26	BH26_1_200724	24/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	QC101_200724	24/07/2020																									
	BH26_4.4_200724	24/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH27	BH27_0.5_200724	24/07/2020																									
	BH27_2_200724	24/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	QC102_200724	24/07/2020																									
BH28	BH28_0.3_200724	24/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	BH28_1_200724	24/07/2020																									
BH29	BH29_0.3_200724	24/07/2020	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	QC202_200724	23/07/2020																									
BH30	BH30_0.3_200724	24/07/2020																									
	BH30_2.7_200724	24/07/2020																									
	TB01_200715	15/07/2020																									
	TB02_200724	24/07/2020																									
	TB03_200724	24/07/2020																									

Environmental Standards
NEPM, NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil
HEPA, January 2020, PFAS NEMP 2020 Industrial/ commercial (HIL D)

			Halogenated Benzenes										Halogenated Hydrocarbons										
			2,2-dichloropropane	Bromochloromethane	Dibromomethane	Hexachlorobenzene	1,2,4-trichlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	Chlorobenzene	1,2,3-trichlorobenzene	2-chlorotoluene	4-chlorotoluene	Bromobenzene	1,2-dibromoethane	Bromomethane	Dichlorodifluoromethane	Trichlorofluoromethane	4,4-DDE	Heptachlor epoxide	Chlordane (cis)	a-BHC	Aldrin	b-BHC	Chlordane (trans)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			1	1	1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil						80																				
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand																										
0-1m																										
1-2m																										
2-4m																										
>=4m																										
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind																										
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil																										
0-2m																										
NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil																										
PFAS NEMP 2020 Industrial/ commercial (HIL D)																										
Location ID	Field ID	Date																								
BH01	BH01_0.4_200715	15/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH02	BH02_0.5_200715	15/07/2020																								
BH03	BH03_0.9_200715	15/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	QC100_200715	15/07/2020																								
BH04	BH04_0.9_200715	15/07/2020																								
	BH04_0.9_200715 - [TRIPLICATE]	15/07/2020																								
BH05	BH05_0.5_200715	15/07/2020																								
BH06	BH06_0.3_200722	22/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	BH06_1.3_200722	22/07/2020																								
BH07	BH07_0.3_200722	22/07/2020																								
	BH07_3.5_200722	22/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH08	BH08_0.3_200722	22/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	BH08_2.7_200722	22/07/2020																								
BH09	BH09_0.3_200722	22/07/2020																								
	BH09_1.5_200722	22/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH10	BH10_0.3_200722	22/07/2020																								
	BH10_0.8_200722	22/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH11	BH11_0.5_200722	22/07/2020																								
	BH11_5.5_200724	24/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH12	BH12_0.5_200722	22/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	BH12_1.6_200722	22/07/2020																								
BH13	BH13_0.3_200724	24/07/2020																								
	BH13_1.5_200724	24/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH14	BH14_0.3_200722	22/07/2020				<0.1														<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	BH14_3.9_200722	22/07/2020	<1	<1	<1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1							
BH15	BH15_0.3_200723	23/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	BH15_3.9_200723	23/07/2020																								
BH16	BH16_0.9_200723	23/07/2020																								
	BH16_1.7_200723	23/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH17	BH17_0.3_200723	23/07/2020																								
	BH17_1.6_200723	23/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	QC200_200723	23/07/2020																								
	BH17_1.6_200723 - [TRIPLICATE]	23/07/2020																								
BH18	BH18_0.3_200723	23/07/2020																								
	BH18_5.5_200724	24/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH19	BH19_1.8_200723	23/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	QC201_200723	23/07/2020																								
	BH19_1_200723	23/07/2020																								
BH20	BH20_0.3_200723	23/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	0.6	<0.1	<0.1
	BH20_1.6_200723	23/07/2020																								
BH21	BH21_0.2_200723	23/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.2
	BH21_0.2_200723 - [TRIPLICATE]	23/07/2020																								
	BH21_1.3_200723	23/07/2020																								
BH22	BH22_1.2_200723	23/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	BH22_3.9_200723	23/07/2020																								
BH23	BH23_0.9_200723	23/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	BH23_1.5_200723	23/07/2020																								
BH24	BH24_0.3_200723	23/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	BH24_2.7_200723	23/07/2020																								
BH25	BH25_0.3_200723	23/07/2020																								
	BH25_0.9_200723	23/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH26	BH26_1_200724	24/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	QC101_200724	24/07/2020																								
	BH26_4.4_200724	24/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH27	BH27_0.5_200724	24/07/2020																								
	BH27_2_200724	24/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	QC102_200724	24/07/2020																								
BH28	BH28_0.3_200724	24/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	BH28_1_200724	24/07/2020																								
BH29	BH29_0.3_200724	24/07/2020	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	QC202_200724	23/07/2020																								
BH30	BH30_0.3_200724	24/07/2020																								
	BH30_2.7_200724	24/07/2020																								
	TB01_200715	15/07/2020																								
	TB02_200724	24/07/2020																								
	TB03_200724	24/07/2020																								

Environmental Standards
NEPM, NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil
HEPA, January 2020, PFAS NEMP 2020 Industrial/ commercial (HIL D)

Table 1 - Soil Results

			Organochlorine Pesticides													Organophosphorous Pesticides										
			a-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endrin aldehyde	Endosulfan II	Endosulfan sulphate	Methoxychlor	Endrin	g-BHC (Lindane)	Heptachlor	Chlorpyrifos-methyl	Dichlorvos	Ethion	Fenitrothion	Malathion	Ronnel	Azinophos methyl	Chlorpyrifos	Bromophos-ethyl	Diazinon	Dimethoate
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			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	0.1	0.1	0.1
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil						3,600						2,500	100		50								2,000			
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand																										
0-1m																										
1-2m																										
2-4m																										
>=4m																										
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind					640																					
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil																										
0-2m																										
NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil																										
PFAS NEMP 2020 Industrial/ commercial (HIL D)																										
Location ID	Field ID	Date																								
BH01	BH01_0.4_200715	15/07/2020	<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	<0.1	<0.1	<0.1
BH02	BH02_0.5_200715	15/07/2020																								
BH03	BH03_0.9_200715	15/07/2020	<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	<0.1	<0.1	<0.1
	QC100_200715	15/07/2020																								
BH04	BH04_0.9_200715	15/07/2020																								
	BH04_0.9_200715 - [TRIPLICATE]	15/07/2020																								
BH05	BH05_0.5_200715	15/07/2020																								
BH06	BH06_0.3_200722	22/07/2020	<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	<0.1	<0.1	<0.1
	BH06_1.3_200722	22/07/2020																								
BH07	BH07_0.3_200722	22/07/2020																								
	BH07_3.5_200722	22/07/2020	<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	<0.1	<0.1	<0.1
BH08	BH08_0.3_200722	22/07/2020	<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	<0.1	<0.1	<0.1
	BH08_2.7_200722	22/07/2020																								
BH09	BH09_0.3_200722	22/07/2020																								
	BH09_1.5_200722	22/07/2020	<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	<0.1	<0.1	<0.1
BH10	BH10_0.3_200722	22/07/2020																								
	BH10_0.8_200722	22/07/2020	<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	<0.1	<0.1	<0.1
BH11	BH11_0.5_200722	22/07/2020																								
	BH11_5.5_200724	24/07/2020	<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	<0.1	<0.1	<0.1
BH12	BH12_0.5_200722	22/07/2020	<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	<0.1	<0.1	<0.1
	BH12_1.6_200722	22/07/2020																								
BH13	BH13_0.3_200724	24/07/2020																								
	BH13_1.5_200724	24/07/2020	<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	<0.1	<0.1	<0.1
BH14	BH14_0.3_200722	22/07/2020	<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	<0.1	<0.1	<0.1
	BH14_3.9_200722	22/07/2020																								
BH15	BH15_0.3_200723	23/07/2020	<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	<0.1	<0.1	<0.1
	BH15_3.9_200723	23/07/2020																								
BH16	BH16_0.9_200723	23/07/2020																								
	BH16_1.7_200723	23/07/2020	<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	<0.1	<0.1	<0.1
BH17	BH17_0.3_200723	23/07/2020																								
	BH17_1.6_200723	23/07/2020	<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	<0.1	<0.1	<0.1
	QC200_200723	23/07/2020																								
	BH17_1.6_200723 - [TRIPLICATE]	23/07/2020																								
BH18	BH18_0.3_200723	23/07/2020																								
	BH18_5.5_200724	24/07/2020	<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	<0.1	<0.1	<0.1
BH19	BH19_1.8_200723	23/07/2020	<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	<0.1	<0.1	<0.1
	QC201_200723	23/07/2020																								
	BH19_1_200723	23/07/2020																								
BH20	BH20_0.3_200723	23/07/2020	<0.1	<0.1	<0.1	<0.1	0.4	<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
	BH20_1.6_200723	23/07/2020																								
BH21	BH21_0.2_200723	23/07/2020	<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	<0.1	<0.1	<0.1
	BH21_0.2_200723 - [TRIPLICATE]	23/07/2020																								
	BH21_1.3_200723	23/07/2020																								
BH22	BH22_1.2_200723	23/07/2020	<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	<0.1	<0.1	<0.1
	BH22_3.9_200723	23/07/2020																								
BH23	BH23_0.9_200723	23/07/2020	<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	<0.1	<0.1	<0.1
	BH23_1.5_200723	23/07/2020																								
BH24	BH24_0.3_200723	23/07/2020	<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	<0.1	<0.1	<0.1
	BH24_2.7_200723	23/07/2020																								
BH25	BH25_0.3_200723	23/07/2020																								
	BH25_0.9_200723	23/07/2020	<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	<0.1	<0.1	<0.1
BH26	BH26_1_200724	24/07/2020	<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	<0.1	<0.1	<0.1
	QC101_200724	24/07/2020																								
	BH26_4.4_200724	24/07/2020	<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	<0.1	<0.1	<0.1
BH27	BH27_0.5_200724	24/07/2020																								
	BH27_2_200724	24/07/2020	<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	<0.1	<0.1	<0.1
	QC102_200724	24/07/2020																								
BH28	BH28_0.3_200724	24/07/2020	<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	<0.1	<0.1	<0.1
	BH28_1_200724	24/07/2020																								
BH29	BH29_0.3_200724	24/07/2020	<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	<0.1	<0.1	<0.1
	QC202_200724	23/07/2020																								
BH30	BH30_0.3_200724	24/07/2020																								
	BH30_2.7_200724	24/07/2020																								
	TB01_200715	15/07/2020																								
	TB02_200724	24/07/2020																								
	TB03_200724	24/07/2020																								

Environmental Standards
NEPM, NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil
HEPA, January 2020, PFAS NEMP 2020 Industrial/ commercial (HIL D)

			Pesticides
			Parathion
			mg/kg
EQL			0.1
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil			
NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand			
0-1m			
1-2m			
2-4m			
>=4m			
NEPM 2013 Table 1B(5) Generic EIL - Comm/Ind			
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Coarse Soil			
0-2m			
NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil			
PFAS NEMP 2020 Industrial/ commercial (HIL D)			
Location ID	Field ID	Date	
BH01	BH01_0.4_200715	15/07/2020	<0.1
BH02	BH02_0.5_200715	15/07/2020	
BH03	BH03_0.9_200715	15/07/2020	<0.1
	QC100_200715	15/07/2020	
BH04	BH04_0.9_200715	15/07/2020	
	BH04_0.9_200715 - [TRIPLICATE]	15/07/2020	
BH05	BH05_0.5_200715	15/07/2020	
BH06	BH06_0.3_200722	22/07/2020	<0.1
	BH06_1.3_200722	22/07/2020	
BH07	BH07_0.3_200722	22/07/2020	
	BH07_3.5_200722	22/07/2020	<0.1
BH08	BH08_0.3_200722	22/07/2020	<0.1
	BH08_2.7_200722	22/07/2020	
BH09	BH09_0.3_200722	22/07/2020	
	BH09_1.5_200722	22/07/2020	<0.1
BH10	BH10_0.3_200722	22/07/2020	
	BH10_0.8_200722	22/07/2020	<0.1
BH11	BH11_0.5_200722	22/07/2020	
	BH11_5.5_200724	24/07/2020	<0.1
BH12	BH12_0.5_200722	22/07/2020	<0.1
	BH12_1.6_200722	22/07/2020	
BH13	BH13_0.3_200724	24/07/2020	
	BH13_1.5_200724	24/07/2020	<0.1
BH14	BH14_0.3_200722	22/07/2020	<0.1
	BH14_3.9_200722	22/07/2020	
BH15	BH15_0.3_200723	23/07/2020	<0.1
	BH15_3.9_200723	23/07/2020	
BH16	BH16_0.9_200723	23/07/2020	
	BH16_1.7_200723	23/07/2020	<0.1
BH17	BH17_0.3_200723	23/07/2020	
	BH17_1.6_200723	23/07/2020	<0.1
	QC200_200723	23/07/2020	
	BH17_1.6_200723 - [TRIPLICATE]	23/07/2020	
BH18	BH18_0.3_200723	23/07/2020	
	BH18_5.5_200724	24/07/2020	<0.1
BH19	BH19_1.8_200723	23/07/2020	<0.1
	QC201_200723	23/07/2020	
	BH19_1_200723	23/07/2020	
BH20	BH20_0.3_200723	23/07/2020	<0.1
	BH20_1.6_200723	23/07/2020	
BH21	BH21_0.2_200723	23/07/2020	<0.1
	BH21_0.2_200723 - [TRIPLICATE]	23/07/2020	
	BH21_1.3_200723	23/07/2020	
BH22	BH22_1.2_200723	23/07/2020	<0.1
	BH22_3.9_200723	23/07/2020	
BH23	BH23_0.9_200723	23/07/2020	<0.1
	BH23_1.5_200723	23/07/2020	
BH24	BH24_0.3_200723	23/07/2020	<0.1
	BH24_2.7_200723	23/07/2020	
BH25	BH25_0.3_200723	23/07/2020	
	BH25_0.9_200723	23/07/2020	<0.1
BH26	BH26_1_200724	24/07/2020	<0.1
	QC101_200724	24/07/2020	
	BH26_4.4_200724	24/07/2020	<0.1
BH27	BH27_0.5_200724	24/07/2020	
	BH27_2_200724	24/07/2020	<0.1
	QC102_200724	24/07/2020	
BH28	BH28_0.3_200724	24/07/2020	<0.1
	BH28_1_200724	24/07/2020	
BH29	BH29_0.3_200724	24/07/2020	<0.1
	QC202_200724	23/07/2020	
BH30	BH30_0.3_200724	24/07/2020	
	BH30_2.7_200724	24/07/2020	
	TB01_200715	15/07/2020	
	TB02_200724	24/07/2020	
	TB03_200724	24/07/2020	

Environmental Standards
NEPM, NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil
HEPA, January 2020, PFAS NEMP 2020 Industrial/ commercial (HIL D)

			BTEX						Metals							
			Total BTEX	Xylene Total	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Cadmium (filtered)	Arsenic (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Lead (filtered)	Mercury (filtered)	Nickel (filtered)	Zinc (filtered)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL			1	2	1	1	1	2	1	0.0001	0.001	0.001	0.001	0.001	0.00005	0.001	0.001
ANZG (2018) Marine water 95% toxicant DGVs					700					0.0055			0.0013	0.0044	0.0004	0.07	0.015
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand 2-4m					5,000 5,000												
NEPM 2013 Table 1C GILs, Marine Waters					500					0.0007			0.0013	0.0044	0.0001	0.007	0.015
Location ID	**Field ID**	**Date**															
MW01	**MW01_200730**	**30/07/2020**	<1	<2	<1	<2	<2	<2	<2	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	**0.011**
MW02	**MW02_200730**	**30/07/2020**	**3**	<2	**3**	<2	<2	<2	<2	<0.0001	**0.006**	**0.002**	<0.001	<0.001	<0.0001	<0.001	<0.005
MW02	**QC103_200730**	**30/07/2020**	**3**	<2	**3**	<2	<2	<2	<2	<0.0001	**0.005**	**0.002**	<0.001	<0.001	<0.0001	<0.001	**0.005**
	QC203_200730	**30/07/2020**			**3**	<1	<1	<2	<1	<0.0001	**0.006**	**0.002**	<0.001	<0.001	**0.0001**	**0.001**	**0.008**
MW03	**MW03_200730**	**30/07/2020**	<1	<2	<1	<2	<2	<2	<2	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.005
	QC300_200715	**15/07/2020**			<1	<1	<1	<2	<1	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001
	QC301_200722	**22/07/2020**			<1	<1	<1	<2	<1	<0.01	<0.05	<0.01	<0.01	<0.03	<0.0005	<0.02	<0.02
	QC302_200723	**23/07/2020**			<1	<1	<1	<2	<1	<0.01	<0.05	<0.01	<0.01	<0.03	<0.0005	<0.02	<0.02
	QC303_200724	**24/07/2020**			<1	<1	<1	<2	<1	<0.01	<0.05	<0.01	<0.01	<0.03	<0.0005	<0.02	<0.02
	QC304_200730	**30/07/2020**	<1	<2	<1	<2	<2	<2	<2	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.005
	TB04_200730	**30/07/2020**	<1	<2	<1	<2	<2	<2	<2								

Environmental Standards

ANZG, 2018, ANZG (2018) Marine water 95% toxicant DGVs

			PFOS/PFOA								MAH								
			6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Sum of PFAS	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene	Styrene	Isopropylbenzene	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene	tert-butylbenzene
			mg/L	mg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.00001	0.00002	0.01	0.00001	0.00001	0.01	0.01	0.01	5	5	5	5	5	5	5	5	5
ANZG (2018) Marine water 95% toxicant DGVs																			
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand 2-4m																			
NEPM 2013 Table 1C GILs, Marine Waters																			
Location ID	**Field ID**	**Date**																	
MW01	MW01_200730	30/07/2020									<5	<5	<5	<5	<5	<5	<5	<5	<5
MW02	MW02_200730	30/07/2020									<5	<5	<5	<5	<5	<5	<5	<5	<5
MW02	QC103_200730	30/07/2020																	
	QC203_200730	30/07/2020																	
MW03	MW03_200730	30/07/2020									<5	<5	<5	<5	<5	<5	<5	<5	<5
	QC300_200715	15/07/2020																	
	QC301_200722	22/07/2020	<0.00001	<0.00002	<0.01	<0.00001	<0.00001	<0.01	<0.01	<0.01									
	QC302_200723	23/07/2020	<0.00001	<0.00002	<0.01	<0.00001	<0.00001	<0.01	<0.01	<0.01									
	QC303_200724	24/07/2020	<0.00001	<0.00002	<0.01	<0.00001	<0.00001	<0.01	<0.01	<0.01									
	QC304_200730	30/07/2020																	
	TB04_200730	30/07/2020																	

Environmental Standards

ANZG, 2018, ANZG (2018) Marine water 95% toxicant DGVs

			PAH																				
			Naphthalene	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	7,12-dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(a)pyrene TEQ calc (Zero)	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	PAHs (Sum of total)	Phenanthrene	Pyrene
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			1	2	2	2	2	1	1	1	1	0.5	0.0005	0.001	1	1	1	1	1	1	1	0.5	1	1
ANZG (2018) Marine water 95% toxicant DGVs			70																					
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand 2-4m																								
NEPM 2013 Table 1C GILs, Marine Waters			50																					
Location ID	**Field ID**	**Date**																						
MW01	**MW01_200730**	**30/07/2020**	<1.0	<2	<2	<2	<2	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0005	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0
MW02	**MW02_200730**	**30/07/2020**	<1.0	<2	<2	<2	<2	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0005	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0
MW02	**QC103_200730**	**30/07/2020**	<5																					
	QC203_200730	**30/07/2020**	<1																					
MW03	**MW03_200730**	**30/07/2020**	<1.0	<2	<2	<2	<2	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0005	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0
	QC300_200715	**15/07/2020**	<1																					
	QC301_200722	**22/07/2020**	<1																					
	QC302_200723	**23/07/2020**	<1																					
	QC303_200724	**24/07/2020**	<1																					
	QC304_200730	**30/07/2020**	<5																					
	TB04_200730	**30/07/2020**	<5																					

Environmental Standards

ANZG, 2018, ANZG (2018) Marine water 95% toxicant DGVs

			TPH					TRH							Phenols													Amino A	
			>C10-C36 (Sum of total)	C10-C14	C15-C28	C29-C36	C6-C9	C10-C16	C10-C16 (F2 minus Naphthalene)	C10-C40 (Sum of total)	C16-C34	C34-C40	C6-C10	C6-C10 (F1 minus BTEX)	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,6-Dichlorophenol	2-Chlorophenol	2-Methylphenol	2-Nitrophenol	3&4-Methylphenol (m&p-cresol)	4-chloro-3-methylphenol	Pentachlorophenol	Phenol	N-nitrosodiethylamine	N-nitrosodi-n-butylamine
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			50	50	100	50	10	50	50	100	100	100	10	10	2	2	2	2	2	2	2	2	4	2	4	2	2	2
ANZG (2018) Marine water 95% toxicant DGVs																									22	400		
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand 2-4m														6,000														
NEPM 2013 Table 1C GILs, Marine Waters																									11	400		
Location ID	**Field ID**	**Date**																										
MW01	**MW01_200730**	**30/07/2020**	<50	<50	<100	<50	<20	<100	<100	<100	<100	<100	<20	<20	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2	<2	<2
MW02	**MW02_200730**	**30/07/2020**	<50	<50	<100	<50	**20**	<100	<100	<100	<100	<100	**20**	<20	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2	<2	<2
MW02	**QC103_200730**	**30/07/2020**	<50	<50	<100	<50	**40**	<100	<100	<100	<100	<100	**40**	**40**														
	QC203_200730	**30/07/2020**		<50	<100	<100	**11**	<50	<50		<100	<100	**12**	<10														
MW03	**MW03_200730**	**30/07/2020**	<50	<50	<100	<50	<20	<100	<100	<100	<100	<100	<20	<20	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2	<2	<2
	QC300_200715	**15/07/2020**		<50	<100	<100	<10	<50	<50		<100	<100	<10	<10														
	QC301_200722	**22/07/2020**		<50	<100	<100	<10	<50	<50		<100	<100	<10	<10														
	QC302_200723	**23/07/2020**		<50	<100	<100	<10	<50	<50		<100	<100	<10	<10														
	QC303_200724	**24/07/2020**		<50	<100	<100	<10	<50	<50		<100	<100	<10	<10														
	QC304_200730	**30/07/2020**	<50	<50	<100	<50	<20	<100	<100	<100	<100	<100	<20	<20														
	TB04_200730	**30/07/2020**					**20**						<20	<20														

Environmental Standards

ANZG, 2018, ANZG (2018) Marine water 95% toxicant DGVs

			Aliphatics		Amino Aromatics		Anilines						Chlorinated Hydroc																	
			N-nitrosodi-n-propylamine	N-Nitrosomethylethylamine	1-naphthylamine	N-Nitrosodiphenyl & Diphenylamine	2-methyl-5-nitroaniline	2-nitroaniline	3-nitroaniline	4-chloroaniline	4-nitroaniline	Aniline	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,2-dichloroethane	1,2-dichloropropane	Bromodichloromethane	Bromoform	Carbon tetrachloride	Chlorodibromomethane	Chloroethane	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Chloroform
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			2	2	2	4	2	4	4	2	2	2	5	5	5	5	5	5	5	5	5	5	5	50	50	5	5	5
ANZG (2018) Marine water 95% toxicant DGVs															1,900													
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand 2-4m																												
NEPM 2013 Table 1C GILs, Marine Waters															1,900													
Location ID	**Field ID**	**Date**																										
MW01	MW01_200730	30/07/2020	<2	<2	<2	<4	<2	<4	<4	<2	<2	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<50	<5	<5	<5
MW02	MW02_200730	30/07/2020	<2	<2	<2	13	<2	<4	<4	<2	<2	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<50	7	<5	<5
MW02	QC103_200730	30/07/2020																										
	QC203_200730	30/07/2020																										
MW03	MW03_200730	30/07/2020	<2	<2	<2	<4	<2	<4	<4	<2	<2	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<50	<5	<5	<5
	QC300_200715	15/07/2020																										
	QC301_200722	22/07/2020																										
	QC302_200723	23/07/2020																										
	QC303_200724	24/07/2020																										
	QC304_200730	30/07/2020																										
	TB04_200730	30/07/2020																										

Environmental Standards

ANZG, 2018, ANZG (2018) Marine water 95% toxicant DGVs

			arbons														Halogenated Benzenes										
			Hexachlorobutadiene	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Trichloroethene	Vinyl chloride	1,1,1,2-tetrachloroethane	1,1-dichloropropene	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,3-dichloropropane	2,2-dichloropropane	Dibromomethane	Hexachlorocyclopentadiene	Hexachloroethane	Hexachlorobenzene	1,2,4-trichlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	Chlorobenzene	1,2,3-trichlorobenzene	2-chlorotoluene	4-chlorotoluene	Bromobenzene	Pentachlorobenzene
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			2	5	5	5	5	50	5	5	5	5	5	5	5	10	2	4	2	2	2	2	5	5	5	5	5	2
ANZG (2018) Marine water 95% toxicant DGVs																			80									
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand 2-4m																												
NEPM 2013 Table 1C GILs, Marine Waters																			20									
Location ID	**Field ID**	**Date**																										
MW01	MW01_200730	30/07/2020	<2	<5	<5	<5	<5	<50	<5	<5	<5	<5	<5	<5	<5	<10	<2	<4	<2	<2	<2	<2	<5	<5	<5	<5	<5	<2
MW02	MW02_200730	30/07/2020	<2	<5	<5	<5	<5	<50	<5	<5	<5	<5	<5	<5	<5	<10	<2	<4	<2	<2	<2	<2	<5	<5	<5	<5	<5	<2
MW02	QC103_200730	30/07/2020																										
	QC203_200730	30/07/2020																										
MW03	MW03_200730	30/07/2020	<2	<5	<5	<5	<5	<50	<5	<5	<5	<5	<5	<5	<5	<10	<2	<4	<2	<2	<2	<2	<5	<5	<5	<5	<5	<2
	QC300_200715	15/07/2020																										
	QC301_200722	22/07/2020																										
	QC302_200723	23/07/2020																										
	QC303_200724	24/07/2020																										
	QC304_200730	30/07/2020																										
	TB04_200730	30/07/2020																										

Environmental Standards

ANZG, 2018, ANZG (2018) Marine water 95% toxicant DGVs

			Halogenated Hydrocarbons					Herbicides	Nitroaromatics			Pesticides		
			1,2-dibromoethane	Bromomethane	Dichlorodifluoromethane	Trichlorofluoromethane	Iodomethane	Pronamide	2-Picoline	4-aminobiphenyl	Pentachloronitrobenzene	Carbazole	Chlorobenzilate	Pirimphos-ethyl
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			5	50	50	50	5	2	2	2	2	2	2	2
ANZG (2018) Marine water 95% toxicant DGVs														
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand 2-4m														
NEPM 2013 Table 1C GILs, Marine Waters														
Location ID	**Field ID**	**Date**												
MW01	**MW01_200730**	**30/07/2020**	<5	<50	<50	<50	<5	<2	<2	<2	<2	<2	<2	<2
MW02	**MW02_200730**	**30/07/2020**	<5	<50	<50	<50	<5	<2	<2	<2	<2	<2	<2	<2
MW02	**QC103_200730**	**30/07/2020**												
	QC203_200730	**30/07/2020**												
MW03	**MW03_200730**	**30/07/2020**	<5	<50	<50	<50	<5	<2	<2	<2	<2	<2	<2	<2
	QC300_200715	**15/07/2020**												
	QC301_200722	**22/07/2020**												
	QC302_200723	**23/07/2020**												
	QC303_200724	**24/07/2020**												
	QC304_200730	**30/07/2020**												
	TB04_200730	**30/07/2020**												

Environmental Standards

ANZG, 2018, ANZG (2018) Marine water 95% toxicant DGVs

			Organochlorine Pesticides															
			4,4-DDE	Heptachlor epoxide	a-BHC	Aldrin	d-BHC	b-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	g-BHC (Lindane)	Heptachlor	Aldrin + Dieldrin
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			2	2	2	2	2	2	2	4	4	2	2	2	2	2	2	2	4
ANZG (2018) Marine water 95% toxicant DGVs																0.008			
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand 2-4m																			
NEPM 2013 Table 1C GILs, Marine Waters																0.004			
Location ID	**Field ID**	**Date**																	
MW01	MW01_200730	30/07/2020	<2	<2	<2	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<4
MW02	MW02_200730	30/07/2020	<2	<2	<2	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<4
MW02	QC103_200730	30/07/2020																	
	QC203_200730	30/07/2020																	
MW03	MW03_200730	30/07/2020	<2	<2	<2	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<4
	QC300_200715	15/07/2020																	
	QC301_200722	22/07/2020																	
	QC302_200723	23/07/2020																	
	QC303_200724	24/07/2020																	
	QC304_200730	30/07/2020																	
	TB04_200730	30/07/2020																	

Environmental Standards

ANZG, 2018, ANZG (2018) Marine water 95% toxicant DGVs

			Organophosphorous Pesticides										Explosives				Phthalates					
			Chlorpyrifos-methyl	Dichlorvos	Ethion	Malathion	Chlorpyrifos	Diazinon	Dimethoate	Chlorfenviphos	Fenthion	Prothiofos	1,3,5-Trinitrobenzene	2,4-Dinitrotoluene	2,6-dinitrotoluene	Nitrobenzene	Bis(2-ethylhexyl) phthalate	Butyl benxyl phthalate	Diethylphthalate	Dimethyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate
			mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.002	2	2	2	2	2	2	2	2	2	0.002	4	4	2	10	2	2	2	2	2
ANZG (2018) Marine water 95% toxicant DGVs							0.009															
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand 2-4m																						
NEPM 2013 Table 1C GILs, Marine Waters							0.009															
Location ID	**Field ID**	**Date**																				
MW01	**MW01_200730**	**30/07/2020**	<0.002	<2	<2	<2	<2	<2	<2	<2	<2	<2	<0.002	<4	<4	<2	<10	<2	<2	<2	<2	<2
MW02	**MW02_200730**	**30/07/2020**	<0.002	<2	<2	<2	<2	<2	<2	<2	<2	<2	<0.002	<4	<4	<2	<10	<2	<2	<2	<2	<2
MW02	**QC103_200730**	**30/07/2020**																				
	QC203_200730	**30/07/2020**																				
MW03	**MW03_200730**	**30/07/2020**	<0.002	<2	<2	<2	<2	<2	<2	<2	<2	<2	<0.002	<4	<4	<2	<10	<2	<2	<2	<2	<2
	QC300_200715	**15/07/2020**																				
	QC301_200722	**22/07/2020**																				
	QC302_200723	**23/07/2020**																				
	QC303_200724	**24/07/2020**																				
	QC304_200730	**30/07/2020**																				
	TB04_200730	**30/07/2020**																				

Environmental Standards

ANZG, 2018, ANZG (2018) Marine water 95% toxicant DGVs

			Solvents						Other	VOCs			SVOCs																	
			Methyl Ethyl Ketone	Vinyl acetate	2-hexanone (MBK)	4-Methyl-2-pentanone	Carbon disulfide	Isophorone	Acetophenone	cis-1,4-Dichloro-2-butene	Pentachloroethane	trans-1,4-Dichloro-2-butene	2-(acetylamino) fluorene	3,3-Dichlorobenzidine	4-(dimethylamino) azobenzene	4-bromophenyl phenyl ether	4-chlorophenyl phenyl ether	4-Nitroquinoline-N-oxide	Azobenzene	Bis(2-chloroethoxy) methane	Bis(2-chloroethyl)ether	Dibenzofuran	Hexachloropropene	Methapyrilene	N-nitrosomorpholine	N-nitrosopiperidine	N-nitrosopyrrolidine	Phenacetin
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			50	50	50	50	5	2	2	5	5	5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	2
ANZG (2018) Marine water 95% toxicant DGVs																												
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand 2-4m																												
NEPM 2013 Table 1C GILs, Marine Waters																												
Location ID	**Field ID**	**Date**																										
MW01	MW01_200730	30/07/2020	<50	<50	<50	<50	<5	<2	<2	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2
MW02	MW02_200730	30/07/2020	<50	<50	<50	<50	<5	<2	<2	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2
MW02	QC103_200730	30/07/2020																										
	QC203_200730	30/07/2020																										
MW03	MW03_200730	30/07/2020	<50	<50	<50	<50	<5	<2	<2	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2
	QC300_200715	15/07/2020																										
	QC301_200722	22/07/2020																										
	QC302_200723	23/07/2020																										
	QC303_200724	24/07/2020																										
	QC304_200730	30/07/2020																										
	TB04_200730	30/07/2020																										

Environmental Standards

ANZG, 2018, ANZG (2018) Marine water 95% toxicant DGVs

Table 3 - UST Analytical Results

		Field ID	HT_200730	T1_200730	T1_200730	T3_200730	T4_200730
		Date	30/07/2020	30/07/2020	30/07/2020	30/07/2020	30/07/2020
	Unit	EQL					
BTEX							
Total BTEX	µg/L	1	<1			<1	**1**
	mg/kg	0.2		**176**			
Xylene Total	µg/L	2	<2			<2	<2
	mg/kg	0.5		**142**			
Benzene	µg/L	1	<1			<1	**1**
	mg/kg	0.2		**1.4**			
Ethylbenzene	µg/L	1	<2			<2	<2
	mg/kg	0.5		**20.9**			
Toluene	µg/L	1	<2			<2	<2
	mg/kg	0.5		**11.4**			
Xylene (m & p)	µg/L	2	<2			<2	<2
	mg/kg	0.5		**108**			
Xylene (o)	µg/L	1	<2			<2	<2
Xylene (o)	mg/kg	0.5		**33.9**			
TRH							
C10-C16	µg/L	50	<570			**160**	**790**
	mg/kg	50		**78,600**			
C10-C16 (F2 minus Naphthalene)	µg/L	50	<570			**160**	**790**
	mg/kg	50		**78,400**			
C10-C40 (Sum of total)	µg/L	100	**62,800**			**5,740**	**2,620**
	mg/kg	50		**186,000**			
C16-C34	µg/L	100	**28,700**			**4,760**	**1,460**
	mg/kg	100		**97,200**			
C34-C40	µg/L	100	**34,100**			**820**	**370**
	mg/kg	100		**9,900**			
C6-C10	µg/L	10	<20			<20	**80**
	mg/kg	10		**1,280**			
C6-C10 (F1 minus BTEX)	µg/L	10	<20			<20	**80**
C6-C10 (F1 minus BTEX)	mg/kg	10		**1,100**			
Metals							
Cadmium	mg/kg	1		<1			
Cadmium (filtered)	mg/L	0.0001					
Arsenic	mg/kg	5		<5			
Arsenic (filtered)	mg/L	0.001					
Chromium (III+VI)	mg/kg	2		<2			
Chromium (III+VI) (filtered)	mg/L	0.001					
Copper	mg/kg	5		**10**			
Copper (filtered)	mg/L	0.001					
Lead	mg/kg	5		<5			
Lead (filtered)	mg/L	0.001					
Mercury	mg/kg	0.1		<0.1			
Mercury (filtered)	mg/L	0.00005					
Nickel	mg/kg	2		<2			
Nickel (filtered)	mg/L	0.001					
Zinc	mg/kg	5		**6**			
Zinc (filtered)	mg/L	0.001					
PAH							
Naphthalene	µg/L	1	<1.0			<1.0	<1.0
	mg/kg	0.5		**177**	**412**		
2-chloronaphthalene	µg/L	2					
2-methylnaphthalene	µg/L	2					
3-methylcholanthrene	µg/L	2					
7,12-dimethylbenz(a)anthracene	µg/L	2					
Acenaphthene	µg/L	1	<1.0			<1.0	<1.0
	mg/kg	0.5		**103**			
Acenaphthylene	µg/L	1	<1.0			<1.0	<1.0
	mg/kg	0.5		<40.0			
Anthracene	µg/L	1	<1.0			<1.0	<1.0
	mg/kg	0.5		<40.0			
Benz(a)anthracene	µg/L	1	<1.0			<1.0	<1.0
	mg/kg	0.5		<40.0			
Benzo(a) pyrene	µg/L	0.5	<0.5			<0.5	<0.5
	mg/kg	0.5		<40.0			
Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5		**96.8**			
Benzo(a)pyrene TEQ calc (Half)	mg/kg	0.5		**48.4**			
Benzo(a)pyrene TEQ calc (Zero)	mg/L	0.0005	<0.0005			<0.0005	<0.0005
	mg/kg	0.5		<10.0			
Benzo(b+j)fluoranthene	mg/L	0.001	<0.0010			<0.0010	<0.0010
	mg/kg	0.5		<40.0			
Benzo(g,h,i)perylene	µg/L	1	<1.0			<1.0	<1.0
	mg/kg	0.5		<40.0			
Benzo(k)fluoranthene	µg/L	1	<1.0			<1.0	<1.0
	mg/kg	0.5		<40.0			
Chrysene	µg/L	1	<1.0			<1.0	<1.0
	mg/kg	0.5		<40.0			
Dibenz(a,h)anthracene	µg/L	1	<1.0			<1.0	<1.0
	mg/kg	0.5		<40.0			
Fluoranthene	µg/L	1	<1.0			<1.0	<1.0
	mg/kg	0.5		<40.0			
Fluorene	µg/L	1	<1.0			<1.0	<1.0
	mg/kg	0.5		**154**			
Indeno(1,2,3-c,d)pyrene	µg/L	1	<1.0			<1.0	<1.0
	mg/kg	0.5		<40.0			
PAHs (Sum of total)	µg/L	0.5	<0.5			<0.5	<0.5
	mg/kg	0.5		**1,230**			
Phenanthrene	µg/L	1	<1.0			<1.0	<1.0
	mg/kg	0.5		**514**			
Pyrene	µg/L	1	<1.0			<1.0	<1.0
Pyrene	mg/kg	0.5		**49.6**			
PCBs							
PCBs (Sum of total)	µg/L	1	<2			<1	<1
PCBs (Sum of total)	mg/kg	0.1		<4.5			
TPH							
+C10-C36 (Sum of total)	µg/L	50	**36,900**			**5,300**	**2,400**
	mg/kg	50		**179,000**			
C10-C14	µg/L	50	<570			**70**	**500**
	mg/kg	50		**44,900**			
C15-C28	µg/L	100	**11,100**			**2,660**	**1,420**
	mg/kg	100		**119,000**			
C29-C36	µg/L	50	**25,800**			**2,570**	**480**
	mg/kg	100		**15,300**			
C6-C9	µg/L	10	<20			<20	**80**
C6-C9	mg/kg	10		**718**			

Appendix B

Supporting information

Assessment of remediation category under SEPP No. 55

The proposed works at 42-52 Raymond Avenue, Matraville have been assessed as Category 2 remediation works based on a review of Clauses 9, 14 and 15(1) of the SEPP, as follows:

Clause 9 Category 1 remediation work: work needing consent For the purposes of this policy, a category 1 remediation work is a remediation work (not being work to which clause 14(b) applies) that is -	**Proposed works**
(a) Designated development	No
(b) Carried out or to be carried out on land declared to be a critical habitat	No
(c) Likely to have a significant effect on a critical habitat or a threatened species, population or ecological community	No
(d) Development for which another State environmental planning policy or a regional environmental plan required development consent	No
(e) Carried out or to be carried out in an area or zone to which any classifications to the following effect apply under an environmental planning instrument – (i) coastal protection (ii) conservation or heritage conservation (iii) habitat area, habitat protection area, habitat or wildlife corridor (iv) environment protection (v) escarpment, escarpment protection or escarpment preservation (vi) floodway (vii) littoral rainforest (viii) nature reserve (ix) scenic area or scenic protection (x) wetland	No
(f) carried out or to be carried out on any land in a manner that does not comply with a policy made under the contaminated land planning guidelines by the council for any local government area in which the land is situated (or if the land is within the unincorporated area, the Minister)	No
Clause 14 Category 2 remediation work: work not needing consent For the purposes of this Policy, a category 2 remediation work is -	
(a) a remediation work that is not a work of a kind described in clause 9(a)-(f)	**Yes**
(b) a remediation work (whether or not it is a work of a kind described in clause 9(a)-(f)) that – (i) by the terms of a remediation order, is required to be commenced before the expiry of the usual period under the *Contaminated Land Management Act 1997* for lodgement of an appeal against the order (ii) may be carried out without consent under another State environmental planning policy or a regional environmental plan (as referred to in clause 19(4)) (iii) is carried out or to be carried out by or on behalf of the Director-General of the Department of Agriculture on land contaminated by the use of a cattle dip under a program implemented in accordance with the recommendation or advice of the Board of Tick Control under Part 2 of the *Stock Diseases Act 1923* (iv) is carried out or to be carried out under the Public Land Remediation Programme administered by the Broken Hill Environmental Lead Centre	No
Clause 15 Remediation work that is ancillary to other development A remediation work that would itself be a category 2 remediation work but which is ancillary to designated development that requires development consent may, as an applicant chooses-	
(a) be made part of the subject of the development application for the designated development instead of being made the subject of a separate development application	No
(b) be treated as a category 2 remediation work	No