JBS&G

UrbanGrowth NSW Development Corporation

Environmental Site Assessment

The new Sydney Fish Market
1A to 1C Bridge Rd, Glebe NSW and
part 56-60 Pyrmont Bridge Road, Pyrmont NSW

4 April 2019
54162 – 112239 (Rev 3)
JBS&G

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List of Abbreviations

AETV	Aquatic Ecosystem Trigger Value
APECs	Areas of Potential Environmental Concern
ACM	Asbestos Containing Material
AHD	Australian Height Datum
ASS	Acid Sulfate Soil
AST	Aboveground Storage Tank
bgs	Below Ground Surface
BTEX	Benzene, toluene, ethylbenzene and xylenes
B(a)P	Benzo(a)pyrene
CBD	Central Business District
CLM Act	Contaminated Land Management Act 1997
COPCs	Constituents of Potential Concern
CoS	City of Sydney
CSM	Conceptual Site Model
DDT	Dichlorodiphenyltrichloroethane
DP	Deposited Plan
DPI	Department of Planning and Infrastructure
DQI	Data Quality Indicators
DQO	Data Quality Objectives
DSI	Detailed Site Investigation
DWTV	Drinking Water Trigger Value
EHC	Environmentally Hazardous Chemicals Act 1985
EMP	Environmental Management Plan
EPA	NSW Environment Protection Authority
ESA	Environmental Site Assessment
GIL	Groundwater Investigation Level
GSW	General Solid Waste
GWAC	Groundwater Acceptance Criteria
Ha	Hectare
HIL	Health Investigation Level
ISQG	Interim Sediment Quality Guidelines
JBS&G	JBS&G Australia Pty Ltd
MSIL	Management Strategy for Impacted Land
LEMP	Long Term Environmental Management Plan

LNAPL	Light Non-Aqueous Phase Liquid
LOR	Limit of Reporting
OCPs	Organochlorine Pesticides
OPPs	Organophosphate Pesticides
PAHs	Polycyclic Aromatic Hydrocarbons
PARCC	Precision, Accuracy, Representativeness, Completeness, Comparability
PCBs	Polychlorinated Biphenyls
PSI	Preliminary Site Investigation
POEO	Protection of the Environment Operations Act 1997
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance / Quality Control
RAP	Remedial Action Plan
RPD	Relative Percentage Difference
RTV	Recreational Trigger Value
SAQP	Sampling Analysis and Quality Plan
SAS/SAR	Site Audit Statement/Report
SHFA	Sydney Harbour Foreshore Authority
sVOCs	Semi-volatile Organic Compounds
SWRCP	Site Wide Remedial Concept Plan
TBT	Tributyltin
TPH	Total Petroleum Hydrocarbons (C_6-C_9 and C_{10}-C_{36})
TRH	Total Recoverable Hydrocarbons (C_6-C_{10}, >C_{10}-C_{16}, >C_{16}-C_{34}, >C_{34}-C_{40})
UST	Underground Storage Tank
VCH	Volatile Chlorinated Hydrocarbons
VOCs	Volatile Organic Compounds
WH&S	Work Health and Safety

Executive Summary

JBS&G Australia Pty Ltd (JBS&G) was engaged by UrbanGrowth NSW Development Corporation (UrbanGrowth NSW, the client) to prepare an environmental site assessment (ESA) of the proposed new Sydney Fish Market located at the head of Blackwattle Bay between the Pyrmont Peninsula and the foreshore of Glebe (the site). The site is legally identified as Lots 3-5 in DP 1064339, part Lot 107 in DP 1076596 and part Lot 1 in DP835794 as shown on **Figures 1** and **2**. The individual lots fall within City of Sydney (CoS) local government area. The site area is approximately 3.7 Ha, of which 0.7 Ha consists of soil based materials present above the high water mark.

The ESA has been requested in anticipation of a development application for the construction of a new Sydney Fish Market development situated at the southern portion of Blackwattle Bay, to the south-west of the existing Fish Market site to address requirements under State Environmental Planning Policy No. 55 (SEPP55).

The objective of the ESA is to identify potential site contamination issues that will require to be addressed during the construction works prior to the use of the site for a fish market. The findings of the ESA are proposed to inform the development of a Remedial Action Plan (RAP) to be implemented prior to the construction works such that the site can be demonstrated as suitable for the proposed land use as required under SEPP55.

The scope of works completed for the ESA comprised a review of previous contamination and other assessment/investigation reports available for the site, or portions thereof, a review of the proposed development information; development of a conceptual site model (CSM) specific to the environmental characteristics of the site and the proposed development; and development of conclusions with regard to the suitability of the site, or the provision of recommendations on issues requiring management/remediation that will require to be addressed within a RAP for the site.

Based on the scope of work completed for this assessment and subject to the Limitations in **Section 8**, the following is concluded:

- Review of currently available previous site assessment documents has identified that there is sufficient existing data to characterise soil, sediment and groundwater conditions within the area of the proposed development in order to establish a CSM. Notwithstanding, a number of data gaps were identified as follows that will require additional data to refine specific management/remedial actions during application of a future RAP:
    - Shallow soils at PBHA01 and PBHA02 with TPH impacts that may pose a risk to groundwater quality discharging from the site;
    - Groundwater assessment hydraulically downgradient from identified PAH and heavy metal impacts and potential risks to off-site ecological receptors;
    - Additional ground gas and soil vapour investigation to assess the inhalation risks to future site users of the commercial building;
    - Additional characterisation of sediment conditions, particularly in areas where proposed construction activities will result in movement or otherwise, disturbance of sediments to facilitate the implementation of appropriate management measures in relation to contaminant concentrations and acid sulfate soil conditions; and
    - Characterisation of site soils with respect to sampling density as provided in EPA (1995) guidance for the land portion of the site and consideration as to the uncertainty associated with the status of historical remediation of former fuel storage facilities. Whilst any potential soil impacts may not affect site suitability (under the proposed development), the impacts (if any) may require appropriate management during

development and construction works. Such potential impacts requiring further assessment include asbestos in soils, characterisation of fill material and natural soils for such that material requiring management in future development works can be refined and leachate data of soils to inform potential waste classification of surplus soils to the development.

- Each of the environmental data sets (as sourced from PB (2009), JBS&G (2015a) and EIS (2017) were found to be reliable for the purposes of making decisions as part of this assessment. It is noted that data collected as part of PB (2009) is approximately eight years old. However, from a review of the site history since 2009, the site use and immediate surrounds have remained relatively unchanged and therefore the data is considered to be sufficiently representative of current conditions for the purposes of developing the CSM. Groundwater analytical results as reported in PB (2009) were also found to have elevated laboratory LORs that did not allow for a direct comparison to the adopted criteria, whilst some sediment analysis data in EIS (2017) had elevated LORs once consideration was given to normalisation to organic carbon levels as per CSIRO (2013);
- Based on the CSM presented in **Section 6**, the potential exposure pathways for commercial users of the site will include inhalation (gas or vapours) pathways. On-site ecological receptors will be limited as the whole site will be covered in hardstand. Exposure pathways for off-site receptors will include contaminated groundwater (if any) migrating off-site and contaminant up-take from sediments;
- Based on the results and CSM presented herein, there were no potential unacceptable health risks identified with respect to the proposed development. Notwithstanding, this is required to be confirmed with the results of a data gaps assessment;
- Heavy metal, PAH and TRH contaminated sediments have been identified within the extent of the development site that were reported to exceed both low and high trigger value sediment quality guidelines protective of ecological communities. UNSW (2017) reported sediments within Blackwattle Bay had significant metal and nutrient contamination that were indicative of highly disturbed conditions. This is supported by the results reported in EIS (2017) in which sediment data collected from sampling points outside the proposed development area (but in Blackwattle Bay) had similar levels of impact to those reported within sediments of the site.

  As reported in ANZECC/ARMCANZ (2000) sediment remediation is not straightforward and should only be undertaken where absolutely warranted. To this extent, UNSW (2017) recommended the following with respect to increasing biodiversity and restore ecosystem services within the Bays Precinct:

  - Reduction of contaminant loads through the treatment of storm water and land runoff; and
  - Prevention of the resuspension of sediments during development by minimising sediment disturbance and using sediment curtains during construction activities.
- Consistent with EPA (2017) guidance, in which remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site in its current condition with regard to contamination, it is considered that sediments should not be actively remediated as it will likely result in adverse impacts through requirements for excavation, dewatering, ASS treatment and off-site disposal of the resulting stabilised material to landfill. Moreover, it will likely not result in any meaningful environmental outcomes within the context of the highly disturbed conditions of Blackwattle Bay in

which sediments with elevated levels of contaminants have been reported throughout the entire Bay.

- It is noted that a small area of sediments adjacent to the existing sea wall, beneath the proposed new Sydney Fish Market building envelope will require adjustment in location within the current site extent to facilitate continued discharge from existing stormwater culverts. It is understood that the adjustment sediments will extend to a maximum depth of approximately 1.4 m in minor areas of the site. Given the limited spatial movement area, no specific characterisation data is currently available for this material. Review of the broader sediment characteristics at the site, it is expected that material to be moved will have concentrations of heavy metals, PAHs and possibly TRH consistent with surrounding sediments. Whilst this will require specific confirmatory sampling/analysis prior to the commencement of works, based on the available data it is considered that these sediments will be suitable from a contamination perspective to placed elsewhere within the proposed basement footprint. In addition, the removal of the surface sediments from within these locations is not expected to expose any underlying sediments (at depth) with greater contaminant concentrations that would result in a net-increase in contaminant exposure risks to ecological receptors on or in the vicinity of the site.

  Consistent with the previous point, the potential for resuspension of sediments during development works is required to be minimised such that mobilisation of contaminants and associated short-term ecological risks are appropriately managed. To enable an appropriate understanding of sediment characteristics within areas of disturbance, it is recommended that further site investigation activities across the development works footprint be undertaken prior to the commencement of any works that will result in disturbance of the sediments. These additional works will be designed to provide a suitable data set to guide management and if required, rehabilitation of these sediments during/following the required disturbance activities.

  A temporary a coffer dam will be constructed at the limits of the development works area prior to construction activities that will isolate the construction works footprint from the balance of the Bay. This will minimise the risk of any environmental impacts beyond the site boundary. Within the site, potential environmental impacts associated with localised movement of the sediment to achieve the construction requirements will be managed via selection of a methodology to minimise the suspension of sediments in the water column. It is expected that this will include use of either a long arm excavator, clam shell apparatus or similar to collect and locally transport small quantities of saturated sediment across the bed floor, within a silt curtain surround, followed by gentle placement at the final location. Resuspension of sediment will be minimised and with consideration to the continued saturated condition of the sediment, the low concentration of oxygen in water when compared to the atmosphere, the high buffering capacity of the marine Bay waters and the isolated nature of the works area from the balance of the surrounding environment, it is considered that the environmental (contamination and acid sulfate soil) risks associated with disturbance of the sediments may be suitably managed.

- The site is situated within an area of high probability of ASS. Indicators of potential ASS comprising sulfide odours and the presence of sea shells were observed within media inspected from boreholes conducted on both the land and water portion of the site. On this basis, the disturbance of materials during site redevelopment works, inclusive of soil and sediments (both within the land and water portions of the site) will be required to be conducted in accordance with an acid sulfate soils management plan (ASSMP).

- A remedial action plan (RAP) should be prepared to establish a suitable framework for management of potentially contaminated media such that upon completion of works, the site will be considered suitable for the proposed use.

1. Introduction

1.1 Background

JBS&G Australia Pty Ltd (JBS&G) was engaged by UrbanGrowth NSW Development Corporation (UrbanGrowth NSW, the client) to prepare an environmental site assessment (ESA) of the proposed new Sydney Fish Market located at the head of Blackwattle Bay between the Pyrmont Peninsula and the foreshore of Glebe (the site). The site is legally identified as Lots 3-5 in DP 1064339, part Lot 107 in DP 1076596 and part Lot 1 in DP835794 as shown on **Figures 1** and **2**. The individual lots fall within City of Sydney (CoS) local government area. The site area is approximately 3.7 Ha, of which 0.7 Ha consists of soil based materials present above the high water mark.

The proposed new Fish Market site is situated at the southern portion of Blackwattle Bay, which is one portion of the Bays Precinct Urban Transformation Area (BPUT) that comprises approximately 80 Ha of land, in addition to 94 Ha of water that is the subject of a NSW Government urban transformation project that will have the potential to deliver additional residential, commercial, recreational and community developments over a 20-30 year timeframe.

The ESA has been requested in anticipation of a development application for the construction of a new Sydney Fish Markets development at the site, to the south-west of the existing Fish Market site to address requirements under State Environmental Planning Policy No. 55 (SEPP55). The ESA has been prepared as consistent with current guidelines made or approved by the NSW EPA. Sampling and analysis data to support the ESA has been supported from a range of previous investigations.

1.2 Objective

The objective of the ESA is to identify potential site contamination issues that will require to be addressed during the construction works prior to the use of the site for a fish market. The findings of the ESA are proposed to inform the development of a Remedial Action Plan (RAP) to be implemented prior to the construction works such that the site can be demonstrated as suitable for the proposed land use as required under SEPP55.

1.3 Scope of Works

The scope of works completed comprised:

- Review of previous site contamination assessment/investigation reports as made available to JBS&G with respect to the suitability of the data for use in evaluating the current contamination conditions across the various properties within the extent of the proposed Fish Market site;
- Review of available geotechnical investigation reports as made available;
- Development of a conceptual site model (CSM) as specific to the environmental characterisation of the site and the proposed development; and
- Drawing conclusions with regard to the current suitability of the site from a contamination view point and providing recommendations on issues that will need to be addressed within a RAP to support the proposed redevelopment of the site.

1.4 Proposed Development

The most recent development plans for the proposed Fish Markets are provided as **Appendix A**. It is understood that statutory approval for the proposed development scheme will be sought in two stages, comprising the initial concept development application, being for the demolition of

existing structures and approval for the proposed development envelope for use of the site as a fish market. The second development application (Main Works) will seek approval for the construction of the new fish market and associated works.

Specifically, the Concept development application seeks approval for:

- the use of the site for the fish market including waterfront commercial and tourist facilities and ancillary uses and the distribution of uses;
- a gross floor area of up to 30,000m^2 contained within a defined building envelope;
- waterfront structures such as wharves;
- concepts for improvements to the public domain including promenades, access to Blackwattle Bay and landscaping;
- pedestrian cycle and road access and circulation principles; and
- principles for infrastructure provision and waste management.

The development application will also set out details of the first stage of the development being the demolition of land and water-based structures on the site including removal of marine piles and any resulting repairs to the existing sea wall, and related services relocations.

The Main Works development application seeks approval for:

- the construction of a new fish market including land and water-based structures.
- the use of the site for the fish market including waterfront commercial and tourist facilities and ancillary uses and the distribution of uses;
- a gross floor area of approximately 26,000m^2 as calculated according to the definition of GFA under SREP 26 (approximately 25,600m^2 as calculated according to the definition of GFA under the Standard Instrument).
- public domain works including promenades access to Blackwattle Bay and landscaping;
- pedestrian, cycle and road access and circulation;
- infrastructure provision and waste management; and
- associated works as required.

The proposed uses comprise:

Below Ground Level

- Parking for service and delivery, and private vehicles up to approximately 417 vehicles;
- Plant and storage;
- Waste Management facilities; and
- End of journey facilities.

Ground Level - Outside of Building Envelope

- Up to three operational wharves for fishing fleet servicing and product unloading/loading, multi-purpose wharf space, private-operated ferry stop, recreational vehicles and the like;
- Vehicular access driveways; and
- Publicly accessible promenade.

Ground Level - Within Building Envelope

- Wholesale services space including product storage and processing;
- Auction floor and associated refrigeration and handling space.
- Loading dock including time-limited delivery and service vehicle parking area;
- Waste management facilities;
- Office space including buyers room; and
- Staff amenities, plant and storage.

Upper Ground Level (L1)

- Retail premises including fresh food retail, food and drink premises including harbourside dining;
- External/shared dining space;
- Ancillary back of house space and staff amenities; and
- Circulation areas.

Upper Level 2 (Mezzanine)

- Catering space;
- The Sydney Seafood School;
- Tenant and subtenant office space; and
- Plant and storage space.

Specifically, the proposed development works as outlined in plans included in **Appendix A** will include:

- Retention, rehabilitation/repair of the existing sea wall structures.
- Removal/decommissioning of all existing industrial and wharf infrastructure.
- Construction of a new basement level carpark in front of the existing sea wall with appropriate measures to allow the continued discharge of stormwater through existing culverts.
- Foundations for the new structures will be completed as driven steel piles with the basement constructed as a precast stainless steel structure within which a membrane will be fitted and in-situ basement pavements poured resulting in a water tight structure.
- The proposed basement finished floor level (FFL) has been designed at -0.3 m AHD. Allowing for a hydrostatic slab and steel structure, JBS&G has conservatively assumed a base of structure of approximately -1.3 m AHD.
- A coffer dam will be installed around the construction footprint to enclose the site and enable temporary partial dewatering to facilitate construction requirements whilst ensuring that sediments remain saturated.
- To facilitate continued use of the existing stormwater culverts, etc the proposed works will include some dredging of sediment in the vicinity of an existing culvert within the new building footprint. These works will be completed to provide a gap of at least 1 m between the culvert mouth and the new basement structure. It is anticipated that

approximately 55 m^3 of sediment/silt will require movement to an elevation of -3.01 m RL. The sediment/silt movement will relocate excess material within the basement footprint so as to minimise the level of disturbance of both the material and ecological receptors. In addition, it is anticipated that approximately 470 m^3 of existing rock revetment will also require removal within the zone along the base of the sea wall. Given the inherent uncertainties associated with the survey methodology and the potential for movement of sediment/silt within the building footprint between the survey period and commencement of works, the reported volumes requiring removal should be preliminary estimates and contingency allowed should additional material required removal to achieve the drainage/construction objectives.

1.5 Previous Assessments

The ESA has been substantially prepared on the basis of a range of previous assessments. This has included:

- *Environmental Site Investigation Blackwattle Bay Maritime Precinct Blackwattle Bay Maritime Precinct, NSW*, March 2009, Parsons Brinkerhoff (PB 2009);
- *Report to Land and Property Management Authority C/- Government Architects Office on Preliminary Environmental Site Assessment for Proposed Redevelopment – Waterfront at Markets, 56-60 Pyrmont Bridge Road, Pyrmont, NSW.* Ref: E24125Krpt, EIS, August 2010 (EIS 2010b);
- *Sydney Bays Precinct Urban Growth NSW Geotechnical Desktop Review*, 6 August 2014, Jacobs Group (Australia) Pty Limited (Jacobs 2014);
- *UrbanGrowth NSW Environmental Site Assessment The Bays Precinct Urban Transformation Area rev 1*, 18 November 2015, JBS&G Australia Pty Ltd (JBS&G 2015a);
- *UrbanGrowth NSW Site Wide Remedial Concept Plan The Bays Precinct Urban Transformation Area rev 0*, 4 December 2015, JBS&G Australia Pty Ltd (JBS&G 2015b);
- *Bays Market Precinct: Blackwattle Bay & Wentworth Park History, Built Heritage, Archaeology & Landscape Study*, July 2017, City Plan Heritage (CPH 2017);
- *Contamination Investigation The Bays Precinct – Separable Portion 1 Blackwattle Bay, Pyrmont, NSW*, 12 July 2017, Environmental Investigation Services (EIS 2017);
- *Revised Geotechnical Report to Urbangrowth NSW on Geotechnical Investigation for Proposed Bays Market District at Blackwattle Bay & Wentworth Park, Pyrmont, NSW rev 2*, 14 September 2017, JK Geotechnics (JK 2017);
- *New Sydney Fish Market Maritime Heritage Impact Statement*. Comber Consultants Pty Ltd. March 2019, version: I. 2019 (Comber 2019); and
- *Heritage Impact Statement, The new Sydney Fish Market, Concept and Stage 1 Works and Stage 2 Main Works*. City Plan Heritage Pty Ltd, March 2019, 18-084 Rev 6, (CPH 2019).

2. Site Description

2.1 Site Identification

The site location is shown in **Figure 1**, and current site layout is shown in **Figure 2**. The site details are summarised in **Table 2.1** and described in the following sections. It is understood that the land site is currently zoned as Ports and Employment under State Environmental Planning Policy (SEPP) No. 26 – City West and Maritime Waters under Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005.

Table 2.1: Summary Site Details

Lot / DP	Lots 3-5 in DP 1064339 Part Lot 107 in DP1076596 Part Lot 1 in DP835794
Address	1A to 1C Bridge Road, Glebe NSW and part 56-60 Pyrmont Bridge Road, Pyrmont NSW
Local Government Authority	City of Sydney Council
Approximate MGA Coordinates (MGA 56)	Easting: 332669.678 Northing: 6250259.919
Site Zoning	Ports and Employment under State Environmental Planning Policy (SEPP) No. 26 – City West and Maritime Waters under Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005
Current Use	Various industrial and commercial uses (concrete batching plant and commercial boat hire operations).
Proposed Use	Commercial use (fish market)
Site Area	Approximately 3.7 Ha

2.2 Site Inspection

Inspections of the four properties within the extent of the proposed fish markets have been completed during the period from June 2014 to October 2017 by various JBS&G consultants suitably trained, qualified and experienced in the identification of site contamination issues. Whilst a number of the 2014 – 2015 inspections were limited to publicly accessible areas and/or government entity land, the 2017 inspections included access to a number of sites previously inaccessible with regard to inspection. During these most recent site visits, suitable inspections were completed to confirm previous observations on adjoining accessible lots remained applicable.

Details of site inspections as specific to each of the four current land-uses within the site are summarised following.

1A Bridge Road - A Hanson Cement concrete batching plant was located at the south-west extent of the site (Lot 5 DP1064339), that comprised several large bulk material silos, loading infrastructure, several washdown bays, and vehicle movement areas, vessel unloading facilities and a site office building. The northern portion of this premises was situated on a concrete deck wharf structure overlying hardwood girders, whilst the south-east portion appeared to have been constructed on retained fill to the rear of a sea wall. A number of conveyors connected the batch plant, four silos, and truck filling point infrastructure in addition to the adjoining weighbridge structure. Two designated bunded areas for chemical storage were located in the central portion and batch plant areas of the Blackwattle Bay Precinct. A two storey site office building was situated in the east most portion of the premises.

1B Bridge Road - The central premises, identified as Lot 4 DP 1064339 comprised infrastructure associated with commercial hire boat operations. These facilities included a wharf portion and associated finger jetty berths in the north, with vehicle parking areas a demountable office building and shipping containers used for storage of supplies and audio-visual equipment associated with harbour cruises. The wharf deck comprised a combination of concrete and

asphalt covered concrete pavement supported on timber beams and turpentine piles. The entire premises appeared paved with concrete, with the southern portion overlying fill material retained by a sea wall. Beyond the sea wall, services supporting the boats at dock were pinned to the underside of the wharves (including sewer, water and power). A sewer pump out facility was situated adjacent to the site entry, connected to the facilities beneath the wharves. One small old building of unknown former use was located at the eastern most extent of this premises. Inspection of the site pavements, limited by the presence of shipping containers, other equipment and vehicles did not identify indications of above (AGST) or underground fuel storage tanks (USTs).

1C Bridge Road - The east most premises (Lot 3 DP1064339) facing Bridge Road comprised the remnants of the former Jones Brothers coal loader facilities. The remnants include a rendered wall and timber framework adjacent to the street boundary and a paved yard area where structural steel infrastructure has been stockpiled. Several temporary building structures were also located in this area. A sandstone block retaining structure retained the land portion of this premises above the water line. Weed vegetation and several mid sized trees were situated in this portion of the BMD site.

Part 56-60 Pyrmont Bridge Road Pyrmont – the property located directly west of the current fish markets building comprises public open space and a wharf facility along the Blackwattle Bay foreshore area in the eastern portion of the site. The area is primarily used as an outdoor dining area for patrons at the current fish markets and a wharf facility for commercial fishing boat operators. The site is predominantly covered in hardstand with the exception of a small grassed area in the southern portion of the property and rocks/boulders lining the foreshore area. It is noted that the hardstand ground surface of the site comprises a deck that overlies a mixture of soils (above the high water level mark) and the surface waters of Blackwattle Bay.

2.3 Site History

From a review of the previous investigations, the following summarises the key aspects of the site history with respect to potential contaminating activities:

- The site and Blackwattle Bay were originally reclaimed between 1836 and 1891;
- The site was used for commercial purposes from 1900 that included timber merchants, abattoirs and garbage collectors;
- Lot 3 in DP1064339 located in the eastern portion of the site was used for unloading coal since before 1951. Coal fragments have been reported on the seafloor and within boreholes previously completed at the site;
- The site formerly had five underground storage tanks (USTs) which were removed from the site in 1995. The USTs contained gasoline, distillate, racing fuel, mineral spirit and mineral oil.
- During the UST removal, impacted soils were reportedly excavated and removed from the site. The resulting excavations were reportedly validated for total petroleum hydrocarbons (TPH), however it was further reported that heavy metal impacts remained in-situ at the limit of the completed investigations;
- Demolition of former site structures reportedly resulted in the removal of 700 m^2 of asbestos from the site; and
- The site is currently used as a concrete batching plant and for commercial boat hire operations.

Historical aerial photographs of the site and Blackwattle Bay surrounds are included in **Appendix D**.

2.4 Topography and Hydrology

The site is situated on predominantly flat terrain. Review of topographic information obtained from regional topographic maps available on NearMap spatial information database indicated that southern portion of the site that has been subject to land reclamation and has an elevation of approximately 2 m Australian Height Datum (AHD). The ground surface of the northern portion of the site is situated on piers overlying the surface waters of Blackwattle Bay. Site surface water is anticipated to drain directly into Blackwattle Bay.

2.5 Geology

Jacobs (2014) reported that review of existing geotechnical maps indicate that the area of the site is underlain by a significant depth (>3 m) of fill material, as consistent with historical reclamation of the area from Blackwattle Bay. This is consistent with Wentworth Park as located further south of the site. Hawkesbury Sandstone was anticipated under site filling.

JK (2017a) reported that the 1:100,000 Geological Map of Sydney indicated the site to be underlain by man-made fill and estuarine soils overlying Hawkesbury Sandstone of the Wianamatta Group. The Hawkesbury Sandstone comprises medium to coarse grained quartz sandstone with very minor shale and laminite lenses. It was further noted that at least two dykes were believed to extend through the site in a rough north-west to south-east alignment.

Boreholes in Blackwattle Bay undertaken for JK (2017a) disclosed a subsurface profile generally comprising natural clay and sandy clay soils of medium to high plasticity and clayey sand soil overlying sandstone bedrock. In the bay, the boreholes typically encountered no fill from the seabed level, except the boreholes close to the existing shoreline where fill extending up to 4.7m depth was encountered. There generally appeared to be a fill layer close to the southern shoreline. The fill was reported to comprise a clayey sand and silty clay with trace amounts of fine to medium grained sand and coal and plastic fragments. Boreholes in the adjoining Wentworth Park identified fill comprising silty sand or sandy clay containing varying amounts of inclusions such as sandstone and igneous gravel, also timber, tile, ceramic, glass, shell, concrete and brick fragments, slag and ash.

Natural soils were encountered either from seabed level or about 0.5m depth in the Bay comprised interbedded layers of silty clay, sandy clay and clayey sand soils. The predominantly clay samples were assessed as having moisture content greater than their plastic limits and based upon hand penetrometer tests completed on the samples, ranged in strength from very soft to very stiff. The clays were assessed as generally being of medium to high plasticity, although more sandy clays were generally of low to medium plasticity. The predominantly sandy samples were assessed as wet and ranged from very loose to dense relative density. The natural soils contained varying amounts of fine to coarse grained gravel, shell fragments and other organic materials.

Sandstone bedrock was encountered underlying natural soils at depths ranging from approximately 5.5 - 13.4 m below ground surface (bgs) being -9.1 to -18.5 m AHD.

2.5.1 Potential for Acid Sulfate Soils

Review of the Acid Sulfate Soil (ASS) Risk Map for Prospect/Parramatta[1] indicates that the subject site is located within an area of 'high probability' of acid sulfate soils within bottom sediments. In

[1] *'Acid Sulfate Soil Risk Map – Prospect/Parramatta, Edition 2',* 1997 1:25 000, NSW Department of Land and Water Conservation (DLWC), Ref 9130N3 (NSW DLWC)

such areas, there is the potential for severe environmental risk if bottom sediments are disturbed by activities such as dredging.

PB (2009) noted potential indicators of ASS comprising odorous marine sediments with sea shells in boreholes located in the southern portion of the site (overlying the land portion of the site) and within marine sediments in Blackwattle Bay. Similar observations were reported in JBS&G (2015) and EIS (2017), however no samples were analysed at a laboratory to confirm if the soils comprised actual ASS.

2.6 Hydrogeology

A review of the registered bore information (NSW DPI 2017 [2]) indicated that there are 14 registered bores within a 500 m radius of the site. The closest wells (approximately 250 m south-west of site) were constructed for monitoring purposes and were reported to contain a standing water level of approximately 0.6 m within shallow fill materials.

Groundwater monitoring as undertaken within the extent of the site as part of previous investigation and has identified:

- Site groundwater to have reported total dissolved solids (TDS) concentrations consistent with saline waters; and
- Standing water levels correspond with tidal surface water levels of Blackwattle Bay in which site groundwater is anticipated to discharge.

2.7 Meteorology

A review of average climatic data for the nearest Bureau of Meteorology monitoring location (Observatory Hill[3]) indicates the Site is located within the following meteorological setting:

- Average minimum temperatures vary from 8.1 ^{o}C in July to 18.8 ^{o}C in February;
- Average maximum temperatures vary from 16.4 ^{o}C in July to 26.0 ^{o}C in January;
- The average annual rainfall is approximately 1215.7 mm with rainfall greater than 1 mm occurring on an average of 99.9 days per year; and
- Monthly rainfall varies from 68.4 mm in September to 133.2 mm in June with the wettest periods occurring on average from January to June.

2.8 NSW EPA Public Register Search Records

A search of the NSW EPA's public register maintained under the *Protection of the Environment Operations Act (POEO) 1997* was undertaken and is included as **Appendix E**.

The search identified that, for the site, there were:

- One active Environmental Protection Licence (EPL), issued to Hanson Construction Materials, operating the concrete batching plant in the western portion of the site for Shipping in Bulk (3801);
- No prevention, clean up or prohibition notices;
- No suspension, surrender or revocation of an environmental protection licences.

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[2] NSW Department of Primary Industries, 2015. Groundwater Monitoring Overview Map. Http://allwaterdata.water.nsw.gov.au/water.stm. Accessed 13 February 2018

[3] http://www.bom.gov.au/climate/averages/tables/cw_066062.shtml, Commonwealth of Australia, 2013 Bureau of Meteorology,
Product IDCJCM0028 prepared on 29 December 2016 and accessed by JBS&G on 5 February 2018

A search was undertaken through the EPA's public contaminated land register and is included as **Appendix E**. The search identified that there have been no notices issued under the Contaminated Land Management Act 1997 (CLM Act) for the site.

The site has not been notified to the EPA under section 60 of the CLM Act with regards to contamination. It is noted that the former Council Works Depot (Fig and Wattle Depot) located at 14-26 Wattle St Pyrmont has previously been notified to the NSW EPA, however regulation under the CLM Act was not required. Review of the list of properties notified to the EPA did not identify any nearby properties that may represent a contamination migration risk to the site.

A search was also undertaken through the EPAs PFAS register of contaminated sites. The search identified that there are no sites within vicinity of the site notified to the EPA with regards to PFAS contamination.

3. Potential for Contamination

3.1 Areas of Potential Environmental Concern

Areas of Potential Environmental Concern (APEC) and Constituents of Potential Concern (COPC) have been identified for the site on the basis of the identified former and current sites uses. Constituents of Potential Concern have been identified in general accordance with DUAP (1998)[4] with consideration of the history of the site. APECs and COPCs are presented in **Table 3.1**.

Table 3.1: Site APECs and COPCs

Areas of Potential Environmental Concern (APECs)	Constituents of Potential Concern (COPCs)
Fill and reclaimed land	Heavy metals, total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), herbicides, polychlorinated biphenyls (PCBs), asbestos, acid sulphate soils (ASS) and ground gases
Former coal wharf	Heavy metals, TPH/VOCs, PAHs, asbestos and tributyltin (TBT)
Current and former concrete batch plants	Heavy metals, TPH/VOCs, PAHs, solvents, asbestos, TBT and organophosphate pesticides (OPPs),
Current and former industrial areas	Heavy metals, TPH/VOCs, PAHs, VOCs, OCPs, OPPs, herbicides, PCBs and asbestos
Marina Areas	Heavy metals, TPH/VOCs, PAHs, asbestos, OPPs, TBT and solvents

General potential sources of environmental impact across the site include:

- impacted fill material used during land reclamation activities;
- impacted fill material used to create existing site levels other than during reclamation activities;
- general industrial land uses;
- former fuel/oil storage and dispensing infrastructure including USTs;
- former buildings, pavements and foundations containing asbestos containing materials (ACM); and
- marina and marine vehicle maintenance/storage activities where TBT, creosote and heavy metals containing products/materials have been applied and/or removed from marine vehicles, infrastructure, and the wharves themselves as part of site activities.

Potential ground (landfill) gas sources are detailed in **Tables 3.1** and may be present in reclaimed land areas where high organic matter content material has been buried, used as fill material or otherwise disturbed so as to result in conditions favouring the generation of ground gases.

Potential acid sulfate soil sources are detailed in **Tables 3.1** and include the following:

- impacted fill material used during land reclamation activities;
- alluvial soil profiles buried during historical land reclamation activities; and

[4] *Managing Land Contamination: Planning Guidelines, SEPP 55-Remediation of Land*. Department of Urban Affairs and Planning, 1998 (DUAP 1998).

- alluvial soil profiles buried by overlying aeolian, estuarine and/or alluvial sediments in historical geological processes.

3.2 Potentially Impacted Media

Each of the APECs and corresponding COPCs identified in **Section 3.1** have the potential to impact:

- Soils;
- Sediments;
- Groundwater;
- Surface water; and
- Vapours (indoor and ambient air).

4. Data Quality Objectives

Data Quality Objective (DQO) were developed for the investigation, as discussed in the following sections.

4.1 State the Problem

The historical industrial site located at the head of Blackwattle Bay between the Pyrmont Peninsula and the foreshore of Glebe is proposed to be redeveloped for a new Sydney Fish Market development. The site has been formed by historical reclamation of Blackwattle Bay using material that was potentially previously contaminated. The site has further been used for a range of industrial uses which may have similarly caused the site to be contaminated. The development is proposed to comprise of a small land borne section with the remainder projected out over the surface waters of Blackwattle Bay.

A conceptual site model (CSM) requires to be developed of the environmental contamination status of the land borne and inundated areas and potential human and ecological interactions that may occur with the proposed development. Through review of the site environmental status and development of the CSM any potential unacceptable health impacts to users of the proposed development, or otherwise exacerbation of potential ecological effects to ecological receptors within and in proximity of the development, require to be identified. The mitigation of these potential impacts requires to be detailed within a Remedial Action Plan (RAP) to be developed for implementation as part of a development early works package.

Potential data gaps to the characterisation of the site will also require to be identified and an assessment made as to whether they are able to be reasonably dealt with in execution of a future RAP.

4.2 Identify the Decision

The following decisions have been identified for this assessment:

- Is sufficient existing data available in previous assessments to characterise soil, sediment, groundwater and surface water conditions in the area of the proposed development?
- Is the data available in the previous assessments considered reliable?
- By comparison to published assessment criteria, are any of the levels of environmental constituents measured at a concentration that may pose a potential health or ecological risk?
- What are the potential exposure routes to contaminants associated with the proposed development?
- On the basis of levels of constituents and potential exposure pathways, are there any potentially unacceptable health risks present with regard to the proposed development?
- Where the potential for unacceptable ecological impacts on, or in proximity of, the new development is identified, will the construction of the development cause these risk levels to increase?
- Where a potentially unacceptable health risk and/or a potential exacerbation of an ecological risk are identified, what measures are required to be implemented with the development to mitigate the risk(s)?

4.3 Identify Inputs to the Decision

- Previous environmental data as collected and presented in PB (2009), Jacobs (2014), JBS&G (2015a and 2015b), CPH (2017 and 2019), EIS (2010b), EIS (2017) and JK (2017);
- The proposed use of the site as detailed in site plans provided as **Appendix A**; and
- Assessment criteria made or approved by the NSW EPA.

4.4 Define the Study Boundaries

The study boundaries have been defined laterally as the extent of the proposed new Sydney Fish Market site as shown in **Appendix A**. The depth of assessment has been restricted to soil that will potentially be disturbed by the development, noting the likelihood of piling for installation of piers associated with the development, this is considered to be soils to the depth of competent rock in both land side and inundated areas of the site. Some small areas of sediment may be disturbed during site preparation works for construction of the basement floor slab, which are proposed to be managed below the water level via the transport to areas of the site footprint with a lower sediment surface elevation.

The temporal study boundaries were limited to the period of assessment works previously undertaken from approximately 2009 to 2017. Any data gaps identified in the assessment will be addressed through the execution of a site RAP.

4.5 Develop a Decision Rule

The following decision rules have been adopted in the completion of the assessment for potential human health effects:

- Soil data collected on site has been compared to:
  - Health screening levels for commercial / industrial land-uses as provided to *National Environment Protection (Assessment of Site Contamination) Measure, 1999 Amendment No 1*, National Environment Protection Council (NEPC 2013);
  - Soil health screening levels for vapour intrusion for TRH, BTEX and naphthalene as provided for sand based soils, surface depth and commercial / industrial land-uses as provided in NEPC (2013);
  - Soil health screening levels for TRH and naphthalene as provided for direct contact exposure pathways to CRCCARE Technical Report No. 10 Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater Part 2: Application Document, 2011, Friebel and Nadebaum (CRCCARE 2011) for recreational open space areas (HSL-C);
  - Generic ecological investigation and screening levels for commercial / industrial land-uses as provided to NEPC (2013); and
  - Aesthetic impacts have been interpreted by on-site observations of indicators of soil staining and/or ACM.
- Sediment data collected in proximity of the site has been compared to the health-based investigation levels for commercial / industrial land-uses for levels as provided to NEPC (2013) and health screening levels for direct contact for recreational open space areas (HSL-C) as provided to CRCCARE (2011). The direct contact exposures to soils and sediments will be limited to the proposed pool area in the south-eastern portion of the site.

- The assessment of groundwater and surface water data collected on and in proximity of the site has for the purposes of recreational exposure evaluation been compared to drinking water guidelines as summarised in NEPC (2013) as adjusted by an order of magnitude consistent with a recreational exposure being the most likely most sensitive potential exposure pathway. The marine nature of the water would prevent direct human consumption.
- The assessment of hazardous ground gas data collected on the site has been compared to guidelines as summarised (EPA 2012[5]) with reference to the Modified Wilson and Card Classification.

The following decision rules have been adopted in the completion of the assessment of potential ecological impacts:

- Soil data collected on the site has been compared to the Ecological investigation levels for areas of commercial and industrial land-use as provided to NEPC (2013).
- Sediment data has been assessed within the framework instructed to *Australian and New Zealand Guidelines for Sediment Quality* (ANZAST 2018). Sediment guidelines are provided in ANZAST (2018) as sediment quality guideline (GV) values on the basis of default and high guideline values corresponding to the statistical probability of effects. For the relevant organic constituents assessed, the reported concentrations have been normalised to 1% organic carbon;
- Groundwater and surface water data collected on and adjoining the site has been compared to guidelines provided to ANZAST (2018) for marine ecosystems protective of 95% of species and the lowest of the criteria provided to NEPC (2013) for the protection of marine ecosystems, aquatic foods, recreational uses and visual amenity as consistent with the water quality objectives for the Parramatta River and Sydney Harbour catchment.

Each of the adopted investigation levels are summarised for each analyte and media in the result summary tables provided as **Appendix B**, and are further summarised in **Section 4.9**.

A qualitative assessment of the whole of the data set has been made on the basis of the project objectives (**Section 1.2**) and conceptual site model (prepared as **Section 6**). This has not considered strict decision rules, but instead a consideration of an acceptable level of risk to human and ecological receptors. Site suitability has not been able to be demonstrated by this assessment.

4.6 Specify the Limits on Decision Error

This step is to establish the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data. Data generated during this project must be appropriate to allow decisions to be made with confidence.

There are two types of decision error identified in Australia Standards (AS) 4482.1-2005 '*Guide to the investigation and sampling of sites with potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds*.' This includes:

a) Deciding that the site is acceptable when it actually is not; and

b) Deciding that the site unacceptable when it is.

[5] *Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases*, NSW Environmental Protection Authority, NSW EPA 2012.

Limits are required to be set on each type of error presented here. AS4482.1-2005 nominates that a 5% probability of (a) and 20% probability of (b). It is noted that the application of this relationship assumes a uniform distribution of impact over the site area.

This is not the case for this site, as demonstrated in the conceptual site model, the site contamination is believed to have been caused my multiple point sources, more than likely heterogeneously distributed across the site area. This prevents the ready application of this method. The potential for decision errors requires to be qualitatively estimated. Sampling plans and works have been designed to attempt to minimise potential decision errors relating to these decisions. Recommendations for management and/or future works are cognisant of the potential errors in the interpretation of site data.

4.7 Develop a Sampling Plan

The following sampling and analysis works have been undertaken in PB (2009), JBS&G (2015a) and EIS (2017) and premise this assessment:

- PB (2009) conducted soil sampling via the advancement of boreholes at seven locations within the land portion of the site. Three boreholes were converted into groundwater monitoring wells and groundwater was subsequently sampled. The investigation also included the collection of sediment samples from 18 locations within Blackwattle Bay. The sampling locations were generally placed on a systematic grid, with certain locations skewed to target specific areas of environmental concern including the area of the former USTs. Samples were analysed for a variety of COPCs including heavy metals, PAHs, TPH, BTEX, OCPs, VOCs and TBT;
- EIS (2010b) included the collection of two surface water samples from Blackwattle Bay that were analysed for heavy metals, PAHs, TPH, VOCs and TBT;
- JBS&G (2015a) completed soil sampling at a single location within the south-western portion of the site. The borehole was converted into a groundwater monitoring well with lockable gas cap in which groundwater and ground gases were subsequently monitored. The soil and groundwater samples were analysed for heavy metals, PAHs, TPH, BTEX, OCPs, PCBs, asbestos (soil samples only) and VOCs (groundwater sample only); and
- EIS (2017) completed sediment sampling at 16 locations within, or in close proximity of the site as placed on a systematic grid in Blackwattle Bay. Samples were analysed for heavy metals, PAHs, TRH, BTEX and OCPs, PCBs, VOCs and asbestos.

4.8 Assessment Methodology

Soil sampling in PB (2009) was undertaken by advancing boreholes with solid flight augers (SFA) to a maximum depth of 6.5 m bgs and collecting samples directly off the auger with the exception of two hand augered locations at the east of the site as a result of limited access, where sampling was also undertaken directly from the auger head. Groundwater monitoring and sampling was undertaken by gauging the wells with an oil / water interface probe and purging at least 3 well volumes with a bailer. Groundwater physio-chemical parameters were measured in the field and when stable, the groundwater samples were placed into appropriate bottles for laboratory analysis. Sediment sampling was undertaken by lowering a weighted
100 mm aluminium tube to the bay floor – the contents of each tube was then placed directly into sample jars. In addition, sediment grab samples were collected by divers in areas inaccessible to the sampling vessel. All laboratory analysis was conducted at NATA accredited laboratory for the required analysis.

Little detail is provided within EIS (2010) with respect to the method of collecting surface water samples from Blackwattle Bay. In addition, there is no detail with respect to the filtering of

samples for heavy metal analysis. All laboratory analysis was conducted at a NATA accredited laboratory for the required analysis.

Soil and groundwater sampling in JBS&G (2015a) was undertaken by boreholes advanced by SFA and collected soil samples directly off the auger. The borehole was subsequently converted into a groundwater monitoring well and developed prior to sampling (at least 3 days after). Groundwater sampling was conducted by low-flow sampling methods comprising a peristaltic pump in which the physio-chemical parameters were measured and samples were placed into appropriate bottles for laboratory analysis when the parameters had stabilised. Landfill gas monitoring was undertaken with a gas analyser (GFM 435) in which gas flow rates were monitored for a period of approximately 5 minutes prior to monitoring landfill gas concentrations for a period of 10 minutes Benchmark Technique 16 '*Subsurface Gas Monitoring Program*' provided in NSW EPA (1996[6]).

EIS (2017) undertook sediment sampling within Blackwattle Bay by advancing boreholes with SFA and Standard Penetration Test (SPT) sampler equipment mounted on a floating barge. Samples were placed in glass jars with Teflon seals for laboratory analysis at a NATA accredited laboratory.

4.9 Assessment Criteria

The assessment criteria as adopted for this assessment have been considered by a review of the sources as nominated in **Section 4.5**.

The soil and groundwater assessment criteria are summarised in **Tables 4.1** to **4.3** following.

Table 4.1: Chemical Contaminants in Soil Health and Ecological Based Assessment Criteria (all units in mg/kg)

	Limit of Reporting	Laboratory Method	Health Based Assessment Criteria Commercial and Industrial[1]	Ecological Investigation/ Screening Levels Commercial and Industrial[2]
METALS				
Arsenic	2.0	ICP-AES (USEPA 200.7)	3000	160
Cadmium	0.4	ICP-AES (USEPA 200.7)	900	-
Total Chromium	1.0	ICP-AES (USEPA 200.7)	3600	310
Copper	1.0	ICP-AES (USEPA 200.7)	240 000	85
Nickel	1.0	ICP-AES (USEPA 200.7)	6000	55
Lead	1.0	ICP-AES (USEPA 200.7)	1500	1800
Zinc	1.0	ICP-AES (USEPA 200.7)	400 000	110
Mercury (inorganic)	0.05	Cold Vapour ASS (USEPA 7471A)	730	-
TRH				
F1 C_6-C_{10}	20	Purge Trap-GCMS (USEPA8260)	260	215
F2 >C_{10}-C_{16}	50	Purge Trap-GCMS (USEPA8260)	NL	170
F3 >C_{16}-C_{34}	100	Purge Trap-GCFID (USEPA8000)	-	1700
F4 >C_{34}-C_{40}	100	Purge Trap-GCFID (USEPA8000)		3300
BTEX				
Benzene	0.1	Purge Trap-GCMS (USEPA8260)	3	75
Toluene	0.1	Purge Trap-GCMS (USEPA8260)	NL	135

[6] *Environmental Guidelines: Solid Waste Landfills*. NSW Environment Protection Authority (1996)

	Limit of Reporting	Laboratory Method	Health Based Assessment Criteria Commercial and Industrial[1]	Ecological Investigation/ Screening Levels Commercial and Industrial[2]
Ethylbenzene	0.1	Purge Trap-GCMS (USEPA8260)	NL	165
Total Xylenes	0.3	Purge Trap-GCMS (USEPA8260)	230	180
Naphthalene	0.1	Purge Trap-GCMS (USEPA8260)	NL	370
OCPs				
DDT + DDD + DDE	0.3	GCECD (USEPA8140,8080)	3600	
Aldrin + Dieldrin	0.2	GCECD (USEPA8140,8080)	45	
Chlordane	0.1	GCECD (USEPA8140,8080)	530	
Endosulfan	0.3	GCECD (USEPA8140,8080)		
Endrin	0.1	GCECD (USEPA8140,8080)	100	
Heptachlor	0.1	GCECD (USEPA8140,8080)	50	
Hexachlorobenzene	0.1	GCECD (USEPA8140,8080)	80	
Methoxychlor	0.1	GCECD (USEPA8140,8080)	2500	
PAHs				
Carcinogenic PAHs (as B(a)P TPE)	0.5	GCMS (USEPA8270)	40	
Benzo(a)pyrene	0.5	GCMS (USEPA8270)	-	172
Total PAHs	0.5	GCMS (USEPA8270)	4000	
PCBS				
PCBs (total)	0.5	GCECD (USEPA8140,8080)	7	-
PHENOLICs				
Phenols (total)	0.5	GCMS (USEPA8270)	240 000	
CYANIDE				
Cyanide (Free)	0.5	Distillation/Colorimetric (APHA 4500-CN O)	-	

[1] Commercial and Industrial Health Based Investigation Levels (HIL-D) – Residential with accessible soils (NEPC 2013). The Soil Health Screening Levels for Vapour Intrusion are applicable to Sand Soils. Values presented are those for 0 to <1 m bgs as the most conservative level.

[2] Generic Ecological Investigation and Screening Levels – Commercial and Industrial (NEPC 2013) unless otherwise notated

[3] Derived Ecological Guideline – 95% confidence limits for fresh Benzo(a)pyrene contamination. *CRC Care Technical Report No. 39 Risk-based management and remediation guidance for benzo(a)pyrene*. CRC Care Pty Ltd, 2017

Asbestos in soil thresholds adopted for the site assessment are nominated in **Table 4.2** below.

Table 4.2: Asbestos in Soil Health Based Assessment Criteria (all units in mg/kg)

	Health Screening Level (w/w)
Form of Asbestos	Commercial/Industrial (D)
Bonded ACM	0.05 %
Fibrous asbestos or asbestos fines[3]	0.001 %
All forms of asbestos	No visible ACM for surface soil (0 – 0.1 m bgs).

The adopted groundwater investigation criteria are nominated in **Table 4.3** following.

Table 4.3: Groundwater and Surface Water Investigation Levels (all units are µg/L unless otherwise shown)

	Limit of Reporting	Laboratory Method	Recreational Criteria[1]	Aquatic Ecosystem Criteria[2]	Health Screening Levels – Commercial/Industrial (NEPC 2013) [3]
METALS					
Arsenic (As V)	1.0	ICP-AES (USEPA 200.8)	100[7]	2.3	-
Cadmium	0.1	ICP-AES (USEPA 200.8)	20	0.7	-
Chromium (Cr VI)	1.0	ICP-AES (USEPA 200.8)	500	4.4	-
Copper	1.0	ICP-AES (USEPA 200.8)	20000	1.3	-
Manganese	1.0	ICP-AES (USEPA 200.8)	5000	80[5]	-
Lead	1.0	ICP-AES (USEPA 200.8)	100	4.4	-
Nickel	1.0	ICP-AES (USEPA 200.8)	200	7	-
Zinc	1.0	ICP-AES (USEPA 200.8)	-	15	-
Mercury	0.5	ICP-AES (USEPA 200.8)	10	0.1	-
TOTAL RECOVERABLE HYDROCARBONS					
F1 C_6-C_{10}	250	P&T GC/MS (USEPA 8020A, 8000)	-	-	6000
F2 >C_{10}-C_{16}	250	P&T GC/MS (USEPA 8020A, 8000)	-	-	NL
BTEX					
Benzene	1.0	P&T GC/MS (USEPA 8020A)	10	500	5000
Toluene	1.0	P&T GC/MS (USEPA 8020A)	8000	180[5]	NL
Ethylbenzene	1.0	P&T GC/MS (USEPA 8020A)	3000	5[5]	NL
m-Xylene	1.0	P&T GC/MS (USEPA 8020A)	6000 (total Xylene)	75[4]	NL
p-Xylene	1.0	P&T GC/MS (USEPA 8020A)		200[4]	NL
o-Xylene	1.0	P&T GC/MS (USEPA 8020A)		350[4]	NL
POLYCYCLIC AROMATIC HYDROCARBONS					
Naphthalene	0.01	GCMS (USEPA8270)	-	50	NL
Fluoranthene	0.01	GCMS (USEPA8270)	-	1	-
Phenanthrene	0.01	GCMS (USEPA8270)	-	0.6	-
Benzo(a)pyrene	0.01	GCMS (USEPA8270)	0.1	0.2[4]	-

	Limit of Reporting	Laboratory Method	Recreational Criteria[1]	Aquatic Ecosystem Criteria[2]	Health Screening Levels – Commercial/Industrial (NEPC 2013) [3]
VOLATILE ORGANIC COMPOUNDS					
PCE	1.0	P&T GC/MS (USEPA 8020B)	500	70	-
TCE	1.0	P&T GC/MS (USEPA 8020B)	-	330[5]	-
Cis-1,2-DCE	1.0	P&T GC/MS (USEPA 8020B)	360[6]	-	-
Trans-1,2 DCE	1.0	P&T GC/MS (USEPA 8020B)	3600[6]	-	-
VC	1.0	P&T GC/MS (USEPA 8020B)	3	100	-
POLYCHLORINATED BIPHENYLS					
Total PCBs	0.01	GCMS (USEPA8270)	ND	ND[8]	-
Individual Compounds:					
Arochlor 1254	0.01	GCMS (USEPA8270)	-	0.01[8]	-
Arochlor 1242	0.01	GCMS (USEPA8270)	-	0.3[8]	-

Notes:
1. 10 times drinking water NHMRC (2011)
2. Ecological Criteria ANZAST (2018) 95% Marine Waters reliability, unless otherwise noted.
3. NEPC (2013) B1 – Table 1A(4) HSL D health screening values for vapour intrusion – sand soils 2 m to <4 m. NL: Non limiting
4. To account for the bioaccumulating nature of this toxicant, it is recommended that the 95% species protection level DGV is used for slightly to moderately disturbed ecosystems.
5. Insufficient data to derive a reliable trigger value. In these instances, reference has been made to low reliability trigger levels contained in ANZAST (2018).
6. US EPA Regional Screening Levels (RSL) For Chemical Contaminants at Superfund Sites Resident Tapwater Table. November 2018
7. Criteria for As (V) selected
8. 99% protection value adopted to account for bio-accumulative nature of toxicant.

Table 4.4: Chemical Contaminants in Sediment Based Assessment Criteria (all units in mg/kg dry weight unless noted otherwise)

	Limit of Reporting (mg/kg)	Sediment Quality Guideline – Default Value (D-GV)[1]	Sediment Quality Guideline – High Value (GV-high)[1]
METALS			
Arsenic	2.0	20	70
Cadmium	0.4	1.5	10
Total Chromium	1.0	80	370
Copper	1.0	65	270
Nickel	1.0	21	52
Lead	1.0	50	220
Zinc	1.0	200	410
Mercury (inorganic)	0.05	0.15	1.0
ORGANICS			
TPH	260	280	550
Total PAHs	0.1	10,000[2]	50,000[2]
Total DDT	0.05	1.2[2]	5.0[2]

	Limit of Reporting (mg/kg)	Sediment Quality Guideline – Default Value (D-GV)[1]	Sediment Quality Guideline – High Value (GV-high)[1]
p,p'-DDE	0.05	1.4[2]	7.0[2]
o,p'- + p,p'-DDD	0.1	3.5[2]	9.0[2]
Dieldrin	0.05	2.8[2]	7.0[2]
Chlordane	0.1	4.5[2]	9.0[2]
Endrin	0.05	2.7[2]	60[2]
PCBs (total)	0.1	34	280
ORGANOMETALLICS			
Tributyltin	0.5 ng/g	9.0[3]	70[3]

[1] *Australian and New Zealand Guidelines for Sediment Quality (ANZAST 2018)*.
[2] Normalised to 1% organic carbon within the limits of TOC 0.2 to 10 %. Units are therefore in µg/kg dry weight, 1% Total Organic Carbon, TOC.
[3] Normalised to 1% organic carbon within the limits of TOC 0.2 to 10 %. Units are therefore in µg Sn/kg dry weight, 1 % TOC.

4.10 Data Reliability

Data reliability has been assessed in PB (2009), JBS&G (2015a) and EIS (2017). Each of the environmental data sets as prepared and summarised in **Appendix B** are found to be reliable for the purposes of this assessment. It is noted that PB (2009) data is approximately eight years old, and there is a potential that this data set may underestimate levels of contaminants where significant contaminating activities have occurred on, or in proximity of, the site subsequent to 2009. This is discussed further in the review of the results.

5. Results

5.1 Soils

5.1.1 Field Observations

The lithology encountered at the site during intrusive programs within the land portion of the site is summarised below with borelogs included in **Appendix C**. Soil investigation works were as follows:

- A total of five boreholes were advanced via solid flight augers (SFA) as part of PB (2009) in addition to two shallow hand augered boreholes; and
- One borehole was advanced via SFA as part of JBS&G (2015).

Fill material was encountered at all sampling locations at depths ranging from 2.2-5.2 m bgs. The fill material typically comprised of sandy clay and gravelly sand with inclusions of sandstone and concrete. The fill was underlain by natural fine grained silt and clay material comprising marine sediments. Sandstone bedrock was encountered at a depth of 3.2 m bgs in the south-western portion of the site.

There was no significant evidence of staining observed within the soil/fill profile during the field works. Sulfidic odours and sea shells were observed within marine sediments in PB (2009) as consistent with potential ASS conditions.

5.2 Soils Analysis

Laboratory analysis results for soil samples completed for each investigation have been summarised in tables presented in **Appendix B**, with comments discussed below for the various analyte groups.

<u>Heavy Metals</u>

Heavy metal concentrations in all analysed samples were reported to be below the adopted health based criteria. In addition, the concentrations of heavy metals were below the adopted ecological criteria with the following exceptions:

- Copper in PBBH05 0.0-0.3 (86 mg/kg);
- Nickel in PBHA01 0.3-0.4 (60 mg/kg); and
- Zinc in samples PBBH04 4.0-4.1 (136 mg/kg), PBBH05 0.0-0.3 (201mg/kg), PBHA01 0.0-0.1 (153 mg/kg) and PBHA01 0.3-0.4 (181 mg/kg).

Statistical analysis of the data set (with respect to copper, nickel and zinc) available for fill materials across the site identified the maximum concentration of each compound was less than 250% of the adopted (ecological) criteria, the standard deviation was less than half of the respective criteria and 95% upper confidence limit (UCL) calculations were less than the adopted criteria with the exception of zinc (95 % UCL 126 mg/kg). As such, the above nominated results with respect to copper and nickel are considered to be below the adopted site assessment criteria, while zinc concentrations in fill only marginally exceed the ecological assessment criterion.

<u>TRH and BTEX</u>

TRH and BTEX concentrations were reported to be below the laboratory LOR or less than the adopted assessment criteria in all samples selected for analysis (JBS&G 2015).

The analytical results for TPH in PB (2009) were reported in NEPC (1999) fractions, which limits the application of the data to the current adopted criteria. All TPH concentrations were below

detection limits with the exception of samples collected at PBHA01 and PBHA02. The TPH impacts identified at these locations were found in shallow soils and comprised heavy end TPH fractions (C_{10}-C_{38}) with a maximum concentration of 2,170 mg/kg.

PAHs

All total PAH and carcinogenic PAHs as B(a)P concentrations were below the adopted health based site assessment criteria. In addition, the concentration of PAHs were below the adopted ecological criteria with the exception of B(a)P in HH BH01 0.5-0.6 (1.6 mg/kg) and PBBH01 0.0-0.3 (2.0 mg/kg). Statistical analysis of the B(a)P dataset available for fill materials across the site identified maximum concentration less than 250% of ecological criterion, a standard deviation less than half of the ecological criterion and 95% upper confidence limit (UCL) calculation in less than ecological criterion. As such, the above nominated results are considered not to exceed the assessment criteria with no further assessment/management required.

OCPs and PCBs

OCP and PCB concentrations were reported to be below the laboratory LOR in all samples selected for analysis and so less than the adopted site assessment criteria.

Asbestos

Asbestos in the form of fragments of ACM were not reported to have been observed within material at any of the sampling locations. It is noted that asbestos quantification was not conducted during the completed investigation activities and sampling was conducted via the advancement of boreholes, thereby resulting in limited volumes of drilling spoil for assessment. No asbestos fibres or asbestos fines were reported in soil samples analysed.

5.3 Sediments Sampling

5.3.1 Sediment Observations

PB (2009) reported the sediment to initially comprise clayey silt material, brown to dark brown in colour with some shell and organic material, including decomposing vegetation. At depths of approximately 0.5 m below the bed floor, the material was described as clayey sand brown to dark brown, with some shell and organic matter, or alternatively clay sediment, mottled red brown in colour and of medium plasticity. Coal fragments were observed on the bed floor in the vicinity of PBDSS02 and PDBSS04. Most samples were noted to have a sulfurous odour.

EIS (2017) samples collected via barge drilling described the material as either fill/sediment comprising silty clay or gravel with inclusions of sand, coal, river gravel, plastic fragments and shell, or natural soil comprising a range of clayey sand, silty clay, sandy clay, sand and silty sandy clay.

5.3.2 Sediment Laboratory Analysis

For the purposes of this assessment it has been assumed that samples collected within the inundated areas (i.e. Blackwattle Bay) of the site comprise sediments. The results of sediment analysis are discussed below with tabulated results presented in **Appendix B**.

Heavy Metals

Heavy metal concentrations in all analysed samples were reported to be below the adopted health-based criteria.

A variety of heavy metals were reported to exceed both the default and high guideline values protective of the environment in the majority of sediment samples collected within the investigation area. Sixteen of the seventy six arsenic analysis results exceeded the D-GV (20 mg/kg) with a maximum concentration of 36 mg/kg. Eighteen of the seventy-six cadmium analysis

results exceeded the D-GV (1.5 mg/kg) with a maximum concentration of 7 mg/kg. Two of the twenty-seven copper analysis results exceeded the D-GV (50 mg/kg), with eleven exceeding the GV-high (270 mg/kg) and a maximum concentration of 386 mg/kg. Seven of the seventy-six lead analysis results exceeded the D-GV (50 mg/kg), with twenty-six results exceeding the GV-high (220 mg/kg) and a maximum concentration of 1270 mg/kg. Seven of the seventy-six mercury analysis results exceeded the D-GV (0.15 mg/kg), with twenty-seven exceeding the GV-high value (1 mg/kg) and a maximum concentration of 14.8 mg/kg. Sixteen of the seventy-six nickel analysis results exceeded the D-GV (21 mg/kg) with a maximum concentration of 44 mg/kg. Three of the twenty-seven zinc analysis results exceeded the D-GV (200 mg/kg), with eighteen exceeding the GV-high (410 mg/kg) and a maximum concentration of 1660 mg/kg.

The lateral distribution of heavy metal impacts within sediments appear to extend across the extent of the investigation area. In addition, the vertical extent of heavy metal impacted sediments extend to a depth of at least 1-1.5 m whereby sediment samples collected at depth (0.5-1.0 m and/or 1.0-1.5 m) at locations PBSS01, PBSS05, PBSS07, PBSS09 and PBSS11 are impacted with similar levels of the same heavy metals as the surface sample (0-0.4 m) at each location.

TRH and BTEX

TRH and BTEX concentrations were reported to be less than the adopted health assessment criteria in all samples selected for analysis.

However, TRH (C_{10}-C_{36}) was reported in all twenty-seven samples collected and analysed as part of PB (2009) at concentrations ranging from 310 to 5,000 mg/kg that were found to exceed the D-GV and GV-high criteria of 280 and 550 mg/kg respectively.

PAHs

All total PAH and carcinogenic PAHs as B(a)P concentrations were below the adopted health based site assessment criteria.

Total PAH compound concentrations were normalised to 1% OC and then compared to the low and high trigger value sediment quality guideline values protective of the environment.

Twelve of the seventy six normalised total PAH sample results were reported at concentrations that exceeded the DGV-low value (of 10,000 µg/kg/10mg/kg), with two samples reported to have concentrations exceeding the GV-high value (of 40,000 µg/kg/40mg/kg). The highest sample concentration was reported at 76,256 µg/kg total PAHs (BH14 7.73-7.85m, EIS 2017).

OCPs

All individual OCP concentrations were reported to be below the laboratory LOR (EIS 2017 - 100 µg/kg, and PB 2009 - 1 µg/kg) in all samples selected for analysis. With consideration to the normalised values, all PB (2009) data were reported at concentrations less than the adopted guidelines (the EIS LORs did not provide for direct comparison with guideline values).

PCBs

Total PCB concentrations were reported in two samples at concentrations above the LOR for the EIS (2017) investigation. Normalisation of the reported concentrations for samples BH8 (1.25-1.75) and BH10 (1.9-2.35) reported concentrations of 76.9 µg/kg and 51.3 µg/kg (based on the averaged TOC of 3.9 %), both of which exceeded the D-GV of 34 µg/kg.

Tributyltin

Twenty seven sediment samples were analysed for tributyltin. Reported concentrations ranged from LOR (8 samples) to 27.6 µg Sn/kg (normalised to 1% OC). This highest concentration

(PBDS01) was the only sample reported to have concentrations above the adopted D-GV value of 9 µg Sn/kg. No samples exceeded the GV-high value (70 µg Sn/kg).

Total Organic Carbon

Twenty seven samples from PB (2009) were analysed for TOC. Reported concentrations ranged from 0.6 % to 7.2 % with an average of 3.9 % (0.5 substituted for LOR values), with a median value of 3.8 % and a standard deviation of 2.2 %. The average value for this data set was adopted for normalisation calculations where individual samples TOC values were not available.

5.4 Groundwater Sampling

5.4.1 Field Observations

Groundwater sampling was conducted at monitoring wells as shown on **Figure 3** as follows:

- PB (2009) included the sampling of four monitoring wells including MW01 (upgradient), PBMW02a, PBMW03a and PBMW04; and
- JBS&G (2015) included the sampling of a single monitoring well HHMW1.

Review of the field parameters recorded for the samples indicate that the groundwater has a relatively neutral pH, is saline and relatively low in oxygen. The standing water levels recorded within the wells corresponded closely to the prevailing tide level.

No odours or sheens were observed within groundwater extracted during sampling.

5.4.2 Groundwater Analysis

The water sampling locations are shown on **Figure 3** and summarised laboratory results are presented in **Appendix B**. Analytical results are discussed in the following sections.

Heavy Metals

Heavy metal concentrations were reported to be below the site assessment criteria with the exception of copper in HHMW01 (0.002 mg/L) and zinc in MW1 (0.186 mg/L) and PBMW03 (0.041 mg/L). The concentration of copper in HHMW01 exceeded the marine ecosystem criterion of 0.0013 mg/L by less than one order of magnitude. MW01 located hydraulically up-gradient of the site, recorded the highest zinc concentration, thus indicating that the elevated zinc levels reported are likely to reflect local urban background conditions and are not representative of past site activities.

PAHs

All PAH concentrations were recorded equal to or below the adopted criteria with the exception of phenanthrene (0.004 mg/L) and fluoranthene (0.004 mg/L) in PBMW02a which marginally exceeded the adopted marine ecosystem criteria.

TRH and BTEX

TRH and BTEX concentrations were reported to be below the laboratory LOR in all sample and therefore less than the adopted site assessment criteria.

VOCs

All individual VOC compound concentrations were reported below the laboratory LOR in HHMW1.

5.5 Surface Water Sampling

The water sampling locations are shown on **Figure 4F** and summarised laboratory results are presented in **Appendix B**. Analytical results are discussed in the following sections.

Heavy Metals

Heavy metal concentrations were reported to be below the site assessment criteria with the exception of copper and zinc in SWB (0.008 and 0.024 mg/L respectively) and SWC (0.008 and 0.029 mg/L respectively) which marginally exceeded the criteria protective of aquatic ecosystems. It is not detailed if the samples were filtered as recommended by guidance provided in ANZAST (2018) to allow for a robust assessment of the potential toxic affects these compounds may exhibit within the environment. If the samples were not filtered as per the recommendation, it is likely the reported results are higher than would otherwise have been reported and as such the copper and zinc exceedances may be a conservative conclusion.

Organic Analysis

All organic constituents (PAHs, TPH, BTEX and VOCs) were reported at concentrations below the laboratory LOR.

5.6 Landfill Gas Sampling Event

The monitoring well HHMW1 installed as part of JBS&G (2015) was monitored for gas flow rates and concentrations on 24 September 2015 with summarised results presented in **Appendix B**.

There were no reportable gas flow rate measurements at the time of the monitoring event. It is noted that the instrument has a capability of measuring flow rates of greater than 0.1 L/h, and as such, the flow rate was assumed to be 0.1 L/h as a conservative measure.

In accordance with the requirements of EPA (2012), the completion of a gas risk assessment for the current land use requires the calculation of a 'Gas Screening Value' (GSV) to generate a characteristic gas situation such that the level of gas protection measures required may be defined.

The GSV is equivalent to the maximum borehole flow rate (L/h) multiplied by the maximum gas concentration (%) and is required to be calculated for both methane and carbon dioxide with the worst case adopted.

Based on the preliminary data set, GSVs have been calculated for HHMW1. Only carbon dioxide was recorded above the instrument level of reporting, whereby reference to the Modified Wilson and Card Classification (EPA 2012), indicates that a GSW of 0.005 L/h CO_2 falls within 'characteristic gas situation 1', comprising very low risk conditions.

6. Conceptual Site Model

NEPC (2013) identifies a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The development of a CSM is an essential part of all site assessments.

NEPC (2013) identifies the essential elements of a CSM as including:

- Known and potential sources of contamination and contaminants of concern including the mechanism(s) of contamination;
- Potentially affected media (soil, sediment, groundwater, surface water, indoor and ambient air);
- Human and ecological receptors;
- Potential and complete exposure pathways; and
- Any potential preferential pathways for migration.

The following sections present these elements for the site which when considered together comprise the site CSM for the purposes of this assessment.

6.1 Current Extent of Known Impacts

Soil

The concentration of COPCs within all historical soil samples were below the adopted health based criteria. In addition, with the exception of zinc, the concentration of all COPCs were reported below the adopted ecological criteria. It is noted that under the proposed development there is unlikely to be any land based ecological receptors (see **Section 6.2**) within the site. On this basis, there are no identified impacts to site soils that require management or remediation with respect to making the site suitable for the proposed development.

It is noted that TPH impact was identified in shallow soils at locations PBHA01 and PBHA02 and comprised heavy end TPH fractions (C_{10}-C_{38}) in which the reported fractions did not allow for a direct comparison to the current adopted criteria. To this extent, additional assessment is recommended to establish the potential risks to any receptors from the impact, noting that it is unlikely to pose a health risk in the absence of any exposure pathways (owing to the presence of site pavements and the non-volatile nature of the impact).

Potential indicators of ASS comprising odorous marine sediments and the presence of sea shells were observed within boreholes conducted at the site. Given that the site is located within an area of high probability for the presence of ASS, a default position that fill material and/or natural soils exposed or otherwise disturbed during works will require management for acid sulfate soil has been adopted prior to further assessment to delineate the extent of such soil/sediments.

Groundwater

Groundwater with elevated levels of copper, zinc and PAH compounds has been recorded at the site. The elevated zinc levels are considered to most likely reflect urban background conditions or a potential off-site source (possibly comprising fill material underlying Bridge Road and Wentworth Park), as the highest reported concentration was located off-site and hydraulically upgradient from the site. Elevated PAH compounds in groundwater were found to marginally exceed the adopted ecosystem criteria at a single location (PBMWH2) within the central portion of the site.

It is noted that the adopted groundwater criteria have been conservatively applied to this assessment whereby they are intended to be applied at the point of discharge within receiving

waters. It is important to note that that the adopted screening criteria are not threshold values at which an environmental problem is likely to occur if exceeded, rather, if the criteria are exceeded, then further action is required which may include additional assessment.

Sediments

Heavy metals, total PAH, (limited) total PCBs and TRH contaminated sediments have been identified within the extent of the development site. A baseline ecological assessment (UNSW 2017[7]) was conducted within the Bays Precinct and included sediment sampling within the greater area of Blackwattle Bay. The report found that the sediments of Blackwattle Bay had significant metal and nutrient contamination that were indicative of highly disturbed conditions. On this basis, the elevated contaminant concentrations reported in sediments within the subject site are likely reflective of conditions throughout the extent of Blackwattle Bay as a result of historical industrial activities along the foreshore of the Bay.

Surface Water

Surface water with elevated levels of copper and zinc has previously been recorded within the eastern portion of the site. The elevated copper and zinc levels are considered to most likely reflect background urban conditions from stormwater discharge and surface water runoff and are unlikely to be a result of contaminating activities on-site. Notwithstanding, additional water assessment has been recommended within **Section 6.5** to further investigate the levels of COPCs within site groundwater that has the potential to discharge from the site and impact the surface waters of Blackwattle Bay.

Ground Gases and Vapour

Ground gases were identified as a potentially impacted media in **Section 3.1** due to potentially reclaimed land areas containing high organic matter content as used as fill material or otherwise disturbed so as to result in conditions favouring the generation of ground gases. A screening level gas monitoring event was undertaken at a single location (HHMW1) in September 2015, in which the reported result was indicative of very low risk conditions with reference to the Modified Wilson and Card Classification (EPA 2012).

In addition, VOCs were identified as a COPC in **Section 3.1**. Whilst completed soil and groundwater investigation have not identified the occurrence of significant volatile compound impacts in soil and/or groundwater at the site, to date there has been no specific vapour sampling or analysis undertaken to verify the absence of conditions that would require management prior to, or following the proposed construction works.

6.2 Human and Ecological Receptors

Table 6.1 summarises potential human receptors and associated exposure pathways for the site, based on the range of exposure scenarios that may occur under the proposed commercial redevelopment of the site.

[7] *Baseline Assessment of Ecological Structure and Environmental Conditions at the Bays Precinct*, University of New South Wales, March 2017 (UNSW 2017).

Table 6.1: Summary of Potential Human Exposures

Receptor	Location (redeveloped site)	Media	Potential Exposure Pathways
Commercial patron (adult or child) and Commercial Worker (adult)	Commercial building and land area of the site	Soils	Inhalation (vapours)
		Groundwater	Inhalation (vapours)
Construction worker or intrusive maintenance worker (short duration)	Excavations	Soils	Inhalation (vapours and particulates) Oral Dermal
		Groundwater	Inhalation (vapours) Oral (infiltrating seepage water) Dermal (infiltrating seepage water)
		Sediments	Inhalation (vapours and particulates) Oral Dermal

On-site ecological receptors are limited as it is understood that the whole land area of the site will be paved, with either a building above, or high pedestrian load public domain areas. Potential off-site ecological receptors have the potential to be impacted as a result of groundwater or surface water (if present) migrating from the site to the surface waters of Blackwattle Bay. These receptors can be identified from the water quality objectives (WQO) from the Parramatta River/Sydney Harbour catchment and include:

- Aquatic ecosystems; and
- Aquatic foods.

Typical ecological exposure pathways to sediments are identified in *Handbook for Sediment Quality Assessment, 2005*, CSIRO Environmental Trust (CSIRO 2005). It is reported here that sediment-dwelling organisms receive contaminant exposures from four sources: overlying water, pore water, sediment particles and food.

6.3 Potential and Complete Exposure Pathways

Future commercial human receptors on the site will be potentially exposed to soil and groundwater contaminants by inhalation pathways only.

Direct contact pathways (oral and dermal) will be limited for most site users. Site plans have revealed that the majority of the site will be sealed, and as such direct contact to contaminated soils or groundwater is limited. In addition, direct contact with sediments underlying the proposed building will also be unlikely owing to the depth of the materials underlying the bay.

It is noted that there is a surface water feature in the south-eastern portion of the site where it is unclear if the pool will be lined such that there will be no direct contact exposures to soils/sediments, or also if swimming in this area will be permitted. Notwithstanding, soil and sediment data were compared to direct contact criteria (where available), whereby all results were identified to be below the adopted criteria under a recreational use scenario.

Potential construction and future intrusive / excavation worker exposures could occur for soils, groundwater and sediments.

Inhalation pathways will only be relevant where asbestos, volatile or semi-volatile COPCs and ground gases are present. The results of soil, groundwater and ground gas investigations to date indicate concentrations of COPCs are less than relevant screening assessment criteria.

With regard to potentially completed ecological exposure pathways on-site, the majority of the site will be sealed as a result of building and/or accessway construction. If present, vegetation will likely be constructed in raised planter beds or similar, rather than within site soils. As such there are considered to be no direct exposure pathways for ecological receptors to soil.

It is further noted that the proposed development will include construction of a suspended basement structure at or above the approximate sediment bed level within the site. As such, it reasonable to presume that there will be no complete ecological exposure pathways to marine life and/or aquatic foods within the site upon completion of development works.

6.4 Potential for Migration from Site

Contaminants generally migrate from site via a combination of windblown dusts, rainwater infiltration, groundwater migration, lateral vapour/gas migration and surface water runoff. The potential contaminants of concern identified as part of the site history review and site inspection are in solid (e.g.: asbestos, metals), dissolved (e.g.: TPH, VOCs) and/or gas form.

The ground surface of the land area of the site will be covered in hardstand. As such, there is a low potential for windblown contaminants or entrainment in surface runoff to migrate from the site, or for contaminants to leach through the soil profile and impact and subsequently migrate via groundwater.

The groundwater encountered during investigations is inferred to comprise a shallow system in which all wells contained groundwater with total dissolved solids consistent with marine levels. The standing water levels were observed to be influenced by tidal movements of Blackwattle Bay, where site groundwater is anticipated to ultimately discharge.

As discussed in **Section 6.1**, groundwater with elevated levels of copper, zinc and PAH compounds have been recorded at the site. It has not been established whether these impacts are relatively isolated or have the potential to be migrating from site.

In-situ sediment within the site has previously been considered generally consistent in contaminant character to sediments across the broader Blackwattle Bay area. It is anticipated that the potential for migration of sediments will primarily occur via suspension as a result of disturbance during construction works, which will require addressing during works. However, it is also noted that the proposed development will result in changes in sediment bed levels and the movement of vessels within the Bay. This may lead to changes in hydrodynamic flow conditions, such that surficial sediments may at times be disturbed/re-suspended in different areas of the Bay, resulting in localised changes in sediment/water chemistry and ecosystem condition. Further consideration as to the potential environmental impacts of such changes are beyond the scope of this assessment, but may require further consideration during the broader design of the development.

6.5 Data Gaps

With consideration to the proposed development and the CSM developed herein, the only potential human health exposure pathways for commercial users of the site will comprise inhalation (of gas/vapour) pathways. To date, only a limited hazardous ground gas assessment has been completed at the site. Additional investigation is required to assess any spatial or temporal variations within ground gas conditions that may exist within the land portion of the site. In addition, a soil vapour survey is required to assess for the presence of potential VOCs in vapour that were identified as potential COPCs as part of the initial site history review (**Section 3**).

With respect to data gaps surrounding the assessment of potential risks to ecological receptors at the site, this is limited to potential groundwater migrating from the site (if any) and discharging to Blackwattle Bay as soil conditions are sufficiently well understood from an ecological view point

with respect to site suitability. An additional groundwater assessment is required at locations downgradient of previously identified heavy metal and PAH impacts to assess for potential off-site migration. In addition, the risk posed to groundwater from previously identified TPH impacts (PBHA01 and PBHA02) in shallow soils requires assessment.

The current development proposal will result in the movement of current sediments within the development footprint to facilitate continued use of stormwater discharge culverts and enable construction of the proposed basement level. The existing data set is considered sufficient to characterise conditions with regard to site suitability, however to ensure sediment conditions are suitably understood from a contamination and acid sulfate soils viewpoint, such that appropriate management measures may be employed during the proposed construction works, it is recommended that further characterisation activities be completed prior to the commencement of any activities that may result in disturbance of the sediment bed within the site. During these activities, additional surface water quality data should also be collected to provide a baseline data set by which to monitor the success of management measures to be implemented during construction activities.

Further data gaps with respect to characterisation of site soils are listed following:

- The sampling density within the land-based portion of the site, with approximate area of 0.72 Ha is less than the recommended number of sampling locations. For sites with an approximate area of 0.72 Ha, EPA (1995[8]) sampling guidelines recommend a minimum of 19 sampling points. To date, only 8 sample points have been completed within the land portion of the site. On this basis, the density of investigation completed for statistical assessment of certain COPCs has not been adequately addressed. Whilst any potential soil impacts as present may not affect site suitability (under the proposed development), the impacts (if any) may require appropriate management during development and construction works;
- Characterisation of fill materials for the presence of asbestos via quantification in accordance with the procedures included in NEPC (2013) as derived from DOH (2009)[9] is recommended to evaluate potential asbestos management requirements (if any) during the site development works;
- There is uncertainty as to the historical location of fuel infrastructure known to have previously been located at the site. Whilst there is indirect evidence that such facilities were removed, the original documentation associated with the remediation and validation works is no longer available. As such, there remains uncertainty as to the nature and extent of any residual impacts that may remain in the vicinity of these former features. Given the current characterisation data, further investigation to address the density of soil sampling data available for the site should consider the potential for fuel infrastructure related contamination;
- Characterisation of fill material and natural soils for ASS has not been completed to date and is required to verify the extent of material requiring management in future development works and assist with refinement of the acid sulfate soil management plan (ASSMP) required to be implemented during development activities; and

[8] *Contaminated Sites Sampling Design Guidelines*, NSW Environment Protection Authority, September 1995 (EPA 1995).

[9] *Guidelines for the Assessment Remediation and Management of Asbestos Contaminated Sites in Western Australia.* May 2009, Western Australia Depart of Health (WA DOH) (DOH 2009)

- Additional leachate data will be required to confirm waste classifications for the potential off-site disposal of surplus materials as part of the development works.

7. Conclusions and Recommendations

7.1 Conclusions

Based on the scope of work completed for this assessment and subject to the Limitations in **Section 8**, the following is concluded:

- Review of currently available previous site assessment documents has identified that there is sufficient existing data to characterise soil, sediment and groundwater conditions within the area of the proposed development in order to establish a CSM. Notwithstanding, a number of data gaps were identified as follows that will require additional data to refine specific management/remedial actions during application of a future RAP:
    - Shallow soils at PBHA01 and PBHA02 with TPH impacts that may pose a risk to groundwater quality discharging from the site;
    - Groundwater assessment hydraulically downgradient from identified PAH and heavy metal impacts and potential risks to off-site ecological receptors;
    - Additional ground gas and soil vapour investigation to assess the inhalation risks to future site users of the commercial building;
    - Additional characterisation of sediment conditions, particularly in areas where proposed construction activities will result in movement or otherwise, disturbance of sediments to facilitate the implementation of appropriate management measures in relation to contaminant concentrations and acid sulfate soil conditions; and
    - Characterisation of site soils with respect to sampling density as provided in EPA (1995) guidance for the land portion of the site and consideration as to the uncertainty associated with the status of historical remediation of former fuel storage facilities. Whilst any potential soil impacts may not affect site suitability (under the proposed development), the impacts (if any) may require appropriate management during development and construction works. Such potential impacts requiring further assessment include asbestos in soils, characterisation of fill material and natural soils for such that material requiring management in future development works can be refined and leachate data of soils to inform potential waste classification of surplus soils to the development.
- Each of the environmental data sets (as sourced from PB (2009), JBS&G (2015a) and EIS (2017) were found to be reliable for the purposes of making decisions as part of this assessment. It is noted that data collected as part of PB (2009) is approximately eight years old. However, from a review of the site history since 2009, the site use and immediate surrounds have remained relatively unchanged and therefore the data is considered to be sufficiently representative of current conditions for the purposes of developing the CSM. Groundwater analytical results as reported in PB (2009) were also found to have elevated laboratory LORs that did not allow for a direct comparison to the adopted criteria, whilst some sediment analysis data in EIS (2017) had elevated LORs once consideration was given to normalisation to organic carbon levels as per CSIRO (2013);
- Based on the CSM presented in **Section 6**, the potential exposure pathways for commercial users of the site will include inhalation (gas or vapours) pathways. On-site ecological receptors will be limited as the whole site will be covered in hardstand. Exposure pathways for off-site receptors will include contaminated groundwater (if any) migrating off-site and contaminant up-take from sediments;

- Based on the results and CSM presented herein, there were no potential unacceptable health risks identified with respect to the proposed development. Notwithstanding, this is required to be confirmed with the results of a data gaps assessment;
- Heavy metal, PAH and TRH contaminated sediments have been identified within the extent of the development site that were reported to exceed both low and high trigger value sediment quality guidelines protective of ecological communities. UNSW (2017) reported sediments within Blackwattle Bay had significant metal and nutrient contamination that were indicative of highly disturbed conditions. This is supported by the results reported in EIS (2017) in which sediment data collected from sampling points outside the proposed development area (but in Blackwattle Bay) had similar levels of impact to those reported within sediments of the site.

  As reported in ANZECC/ARMCANZ (2000) sediment remediation is not straightforward and should only be undertaken where absolutely warranted. To this extent, UNSW (2017) recommended the following with respect to increasing biodiversity and restore ecosystem services within the Bays Precinct:

  - Reduction of contaminant loads through the treatment of storm water and land runoff; and
  - Prevention of the resuspension of sediments during development by minimising sediment disturbance and using sediment curtains during construction activities.
- Consistent with EPA (2017) guidance, in which remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site in its current condition with regard to contamination, it is considered that sediments should not be actively remediated as it will likely result in adverse impacts through requirements for excavation, dewatering, ASS treatment and off-site disposal of the resulting stabilised material to landfill. Moreover, it will likely not result in any meaningful environmental outcomes within the context of the highly disturbed conditions of Blackwattle Bay in which sediments with elevated levels of contaminants have been reported throughout the entire Bay.
- It is noted that a small area of sediments adjacent to the existing sea wall, beneath the proposed new Sydney Fish Market building envelope will require adjustment in location within the current site extent to facilitate continued discharge from existing stormwater culverts. It is understood that the adjustment sediments will extend to a maximum depth of approximately 1.4 m in minor areas of the site. Given the limited spatial movement area, no specific characterisation data is currently available for this material. Review of the broader sediment characteristics at the site, it is expected that material to be moved will have concentrations of heavy metals, PAHs and possibly TRH consistent with surrounding sediments. Whilst this will require specific confirmatory sampling/analysis prior to the commencement of works, based on the available data it is considered that these sediments will be suitable from a contamination perspective to placed elsewhere within the proposed basement footprint. In addition, the removal of the surface sediments from within these locations is not expected to expose any underlying sediments (at depth) with greater contaminant concentrations that would result in a net-increase in contaminant exposure risks to ecological receptors on or in the vicinity of the site.

  Consistent with the previous point, the potential for resuspension of sediments during development works is required to be minimised such that mobilisation of contaminants and associated short-term ecological risks are appropriately managed. To enable an

appropriate understanding of sediment characteristics within areas of disturbance, it is recommended that further site investigation activities be undertaken across the development works footprint prior to the commencement of any works that will result in disturbance of the sediments. These additional works will be designed to provide a suitable data set to guide management and if required, rehabilitation of these sediments during/following the required disturbance activities.

- A temporary a coffer dam will be constructed at the limits of the development works area prior to construction activities that will isolate the construction works footprint from the balance of the Bay. This will minimise the risk of any environmental impacts beyond the site boundary. Within the site, potential environmental impacts associated with localised movement of the sediment to achieve the construction requirements will be managed via selection of a methodology to minimise the suspension of sediments in the water column. It is expected that this will include use of either a long arm excavator, clam shell apparatus or similar to collect and locally transport small quantities of saturated sediment across the bed floor, within a silt curtain surround, followed by gentle placement at the final location. Resuspension of sediment will be minimised and with consideration to the continued saturated condition of the sediment, the low concentration of oxygen in water when compared to the atmosphere, the high buffering capacity of the marine Bay waters and the isolated nature of the works area from the balance of the surrounding environment, it is considered that the environmental (contamination and acid sulfate soil) risks associated with disturbance of the sediments may be suitably managed.
- The site is situated within an area of high probability of ASS. Indicators of potential ASS comprising sulfide odours and the presence of sea shells were observed within media inspected from boreholes conducted on both the land and water portion of the site. On this basis, the disturbance of materials during site redevelopment works, inclusive of soil and sediments (both within the land and water portions of the site) will be required to be conducted in accordance with an acid sulfate soils management plan (ASSMP).
- A remedial action plan (RAP) should be prepared to establish a suitable framework for management of potentially contaminated media such that upon completion of works, the site will be considered suitable for the proposed use.

8. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

9. References

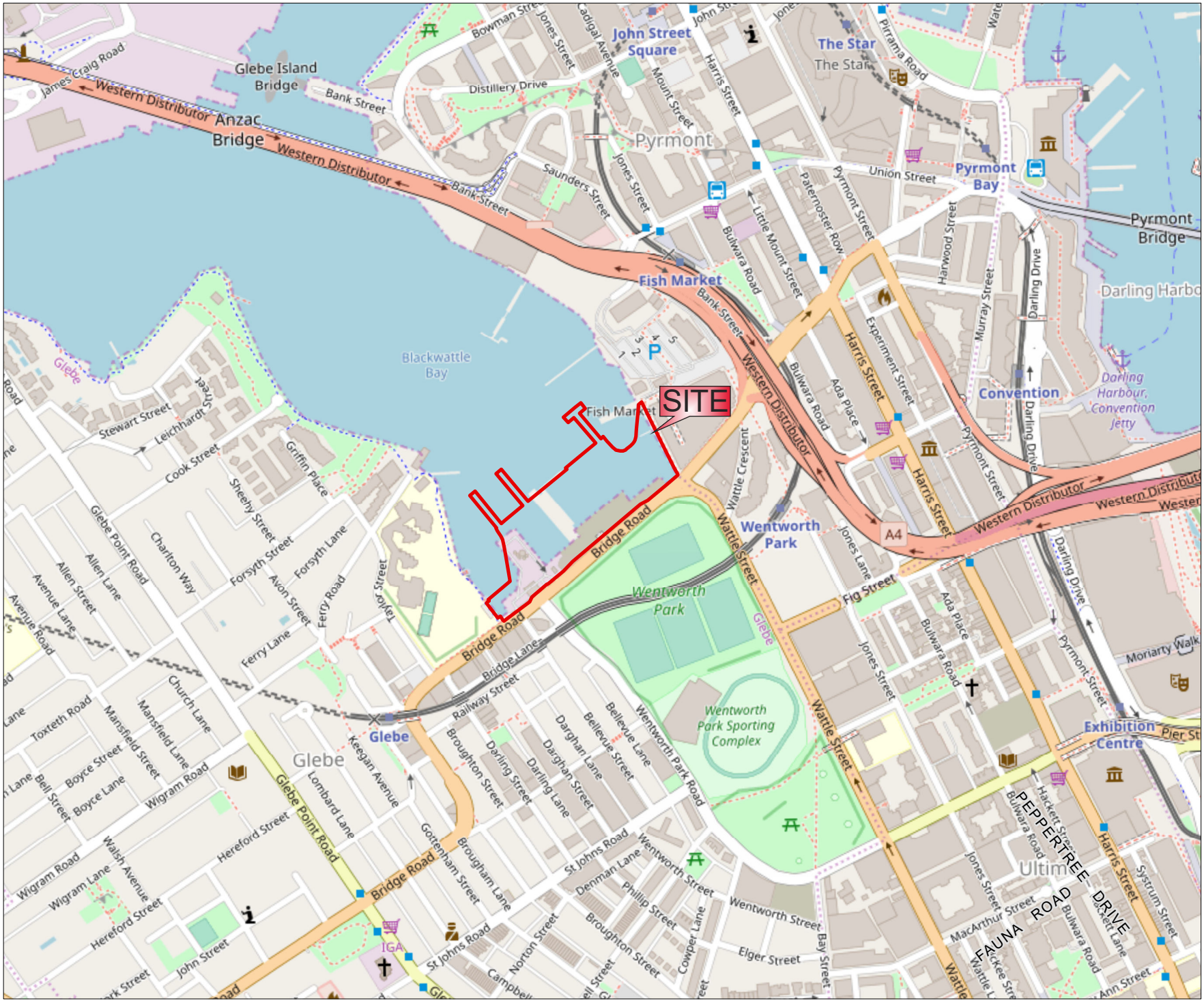
Spreadsheet data retrieved from early historical reports:

- *Review of Environmental Factors Pier Demolition at Blackwattle Bay, Pyrmont*. Umwelt Australia Pty Ltd. June 2008. (Umwelt 2008) incorporating *Report on Marine Sediment Contamination Assessment – Hymix Wharf Blackwattle Bay, Pyrmont*. Douglas Partners Pty Ltd, June 2008, Ref: 45560 (DP 2008)
- *Report to Sydney Fish Market Pty Ltd on Environmental Site Assessment and Acid Sulfate Soil Assessment for Proposed Redevelopment at Sydney Fish Markets, 56-60 Pyrmont Bridge Road, Pyrmont, NSW.* June 2010, Ref: E23982Krpt, Environmental Investigation Services (EIS), June 2010 (EIS 2010a)
- *Report to Land and Property Management Authority C/- Government Architects Office on Preliminary Environmental Site Assessment for Proposed Redevelopment – Waterfront at Markets, 56-60 Pyrmont Bridge Road, Pyrmont, NSW.* Ref: E24125Krpt, EIS, August 2010 (EIS 2010b)
- *Report to Sydney Fish Market Pty Ltd and Land and Property Management Authority on Additional Environmental Site Assessment and Remediation Action Plan for Proposed Redevelopment at Sydney Fish Markets, 56-60 Pyrmont Bridge Road, Pyrmont, NSW.* EIS, August 2010, Ref: E23982Krpt2, (EIS 2010c)
- *Limited Phase 2 Investigation, 5 Bank Street, Pyrmont NSW*. E3 Consulting Australia Pty Ltd. 16 July 2012. (E3C 2012a)
- *Environmental Site Investigation, Blackwattle Bay Maritime Precinct, Blackwattle Bay Maritime Precinct, NSW*. March 2009, Parsons Brinckerhoff (PB 2009).
- *Long-term Environmental Management Plan, 5 Bank Street Pyrmont, NSW*. CDM Smith Australia Pty Ltd. 30 October 2012. (CDM 2012b)
- *Limited Phase 2 Environmental Site Investigation, Bank Street, Pyrmont NSW*. June 2011, RCA Australia Pty Ltd. (RCA 2011)
- *Soil Contamination Investigation, 1 Bank Street, Pyrmont NSW*. June 2010, Noel Arnold and Associates Pty Ltd (NAA 2010)
- *Report to UrbanGrowth NSW on The Bays Precinct Urban Transformation Area – Environmental Site Assessment,* November 2015, JBS&G Australia Pty Ltd, Reference: 50460-101699 (Rev 1), JBS&G (2015)
- *Report to UrbanGrowth NSW on Separable Portion 1 – The Bays Precinct, Blackwattle Bay, Pyrmont, NSW*, Environmental Investigation Services, Reference: E29245KletRev1-SP1, EIS (2017) *Review of Environmental Factors Pier Demolition at Blackwattle Bay, Pyrmont*. Umwelt Australia Pty Ltd. June 2008. (Umwelt 2008) incorporating *Report on Marine Sediment Contamination Assessment – Hymix Wharf Blackwattle Bay, Pyrmont*. Douglas Partners Pty Ltd, June 2008, Ref: 45560 (DP 2008)
- *Environmental Site Investigation, Blackwattle Bay Maritime Precinct, Blackwattle Bay Maritime Precinct, NSW*. March 2009, Parsons Brinckerhoff (PB 2009).
- *Soil Contamination Investigation, 1 Bank Street, Pyrmont NSW*. June 2010, Noel Arnold and Associates Pty Ltd (NAA 2010)
- *Limited Phase 2 Environmental Site Investigation, Bank Street, Pyrmont NSW*. June 2011, RCA Australia Pty Ltd. (RCA 2011)

- *Limited Phase 2 Investigation, 5 Bank Street, Pyrmont NSW*. E3 Consulting Australia Pty Ltd. 16 July 2012. (E3C 2012a)
- *Stage 1 Preliminary Site Investigation, 1 Bank Street, Pyrmont NSW*. E3 Consulting Australia Pty Ltd. 27 July 2012. (E3C 2012b)
- *Phase 2 Environmental Site Assessment, 1 Bank Street, Pyrmont NSW*. 27 November 2012. Draft. CDM Smith Australia Pty Ltd. (CDM 2012a).
- *Long-term Environmental Management Plan, 5 Bank Street Pyrmont, NSW*. CDM Smith Australia Pty Ltd. 30 October 2012. (CDM 2012b)
- *Report to Sydney Fish Market Pty Ltd on Environmental Site Assessment and Acid Sulfate Soil Assessment for Proposed Redevelopment at Sydney Fish Markets, 56-60 Pyrmont Bridge Road, Pyrmont, NSW.* June 2010, Ref: E23982Krpt, Environmental Investigation Services (EIS), June 2010 (EIS 2010a)
- *Report to Land and Property Management Authority C/- Government Architects Office on Preliminary Environmental Site Assessment for Proposed Redevelopment – Waterfront at Markets, 56-60 Pyrmont Bridge Road, Pyrmont, NSW.* Ref: E24125Krpt, EIS, August 2010 (EIS 2010b)
- *Report to Sydney Fish Market Pty Ltd and Land and Property Management Authority on Additional Environmental Site Assessment and Remediation Action Plan for Proposed Redevelopment at Sydney Fish Markets, 56-60 Pyrmont Bridge Road, Pyrmont, NSW.* EIS, August 2010, Ref: E23982Krpt2, (EIS 2010c)
- *Report to Sydney Fish Market Pty Ltd and Land and Property Management Authority on Acid Sulfate Soil Management Plan for Proposed Redevelopment at Sydney Fish Markets, 56-60 Pyrmont Bridge Road, Pyrmont, NSW.* EIS, August 2010, Ref: E23982FrptASSMP, (EIS 2010d)
- *Environmental Site Assessment, The Bays Precinct Urban Transformation Area*. Draft 30 September 2015, Rev 0 (JBS&G 2015b)
- *Evaluation of Existing Site Characterisation Data, The Bays Precinct Urban Renewal Program*. JBS&G Australia Pty Ltd, 16 November 2015, Rev 0 (JBS&G 2015a).
- *Site Wide Remedial Concept Plan, The Bays Precinct Urban Transformation Area*, JBS&G Australia Pty Ltd, 4 December 2015, Rev 0 (JBS&G 2015b)

Figures

Appendices



Legend:

New Sydney Fish Market Development Footprint

JBS&G

Job No: 54578	
Client: UrbanGrowth NSW	
Version: R01 Rev 3	Date: 08-Apr-2019
Drawn By: RF	Checked By: JR
Scale 1:8,000	

0 100 200
metres

Coor. Sys. GDA 1994 MGA Zone 56

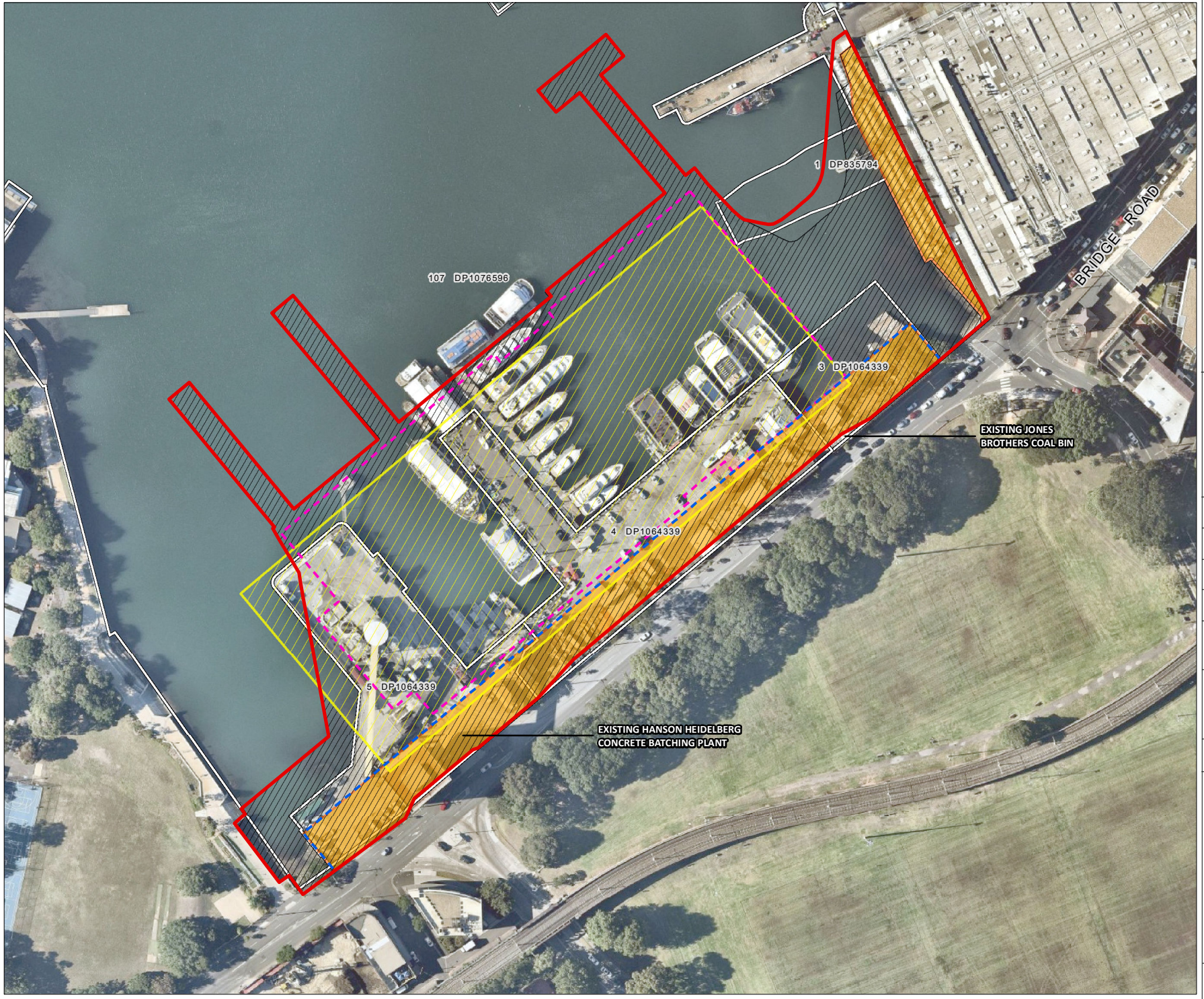
1A-1C Bridge Road, Glebe, and part 56-60 Pyrmont Bridge Road, Pyrmont, NSW

SITE LOCATION

FIGURE 1

File Name: 54578_01

Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA



Legend:

- New Sydney Fish Market Development Footprint
- Cadastral Boundary
- Approximate Land Area
- Approximate Seawall Extent

Proposed Landuse

- Fish Market Building Envelope
- Public Domain
- Approximate Fish Market Basement Footprint

JBS&G

Job No: 54578

Client: UrbanGrowth NSW

Version: R01 Rev 3	Date: 08-Apr-2019
Drawn By: RF	Checked By: JR

Scale 1:2,000

0 25 50
metres

Coor. Sys. GDA 1994 MGA Zone 56

1A-1C Bridge Road, Glebe, and part 56-60 Pyrmont Bridge Road, Pyrmont, NSW

SITE LAYOUT

FIGURE 2

File Name: 54578_02
Reference: Near Map - http://www.nearmap.com.au/. Imagery - 18-01-2018.

Legend:

- New Sydney Fish Market Development Footprint
- Approximate Land Area
- Approximate Seawall Extent

Proposed Landuse

- Fish Market Building Envelope
- Public Domain
- Approximate Fish Market Basement Footprint

Sample Locations

- BAYS MARKET DISTRICT - EIS (2017)
- BAYS MARKET DISTRICT - EIS (2010b)
- BAYS MARKET DISTRICT - EIS (2010c)
- BAYS MARKET DISTRICT - PB (2009)
- BAYS MARKET DISTRICT - Umwelt (2008)
- Soil Sampling / Monitoring Well - JBS&G 2015

JBS&G

Job No: 54578	
Client: UrbanGrowth NSW	
Version: R01 Rev 3	Date: 08-Apr-2019
Drawn By: RF	Checked By: JR

Scale 1:2,000

0 25 50
metres

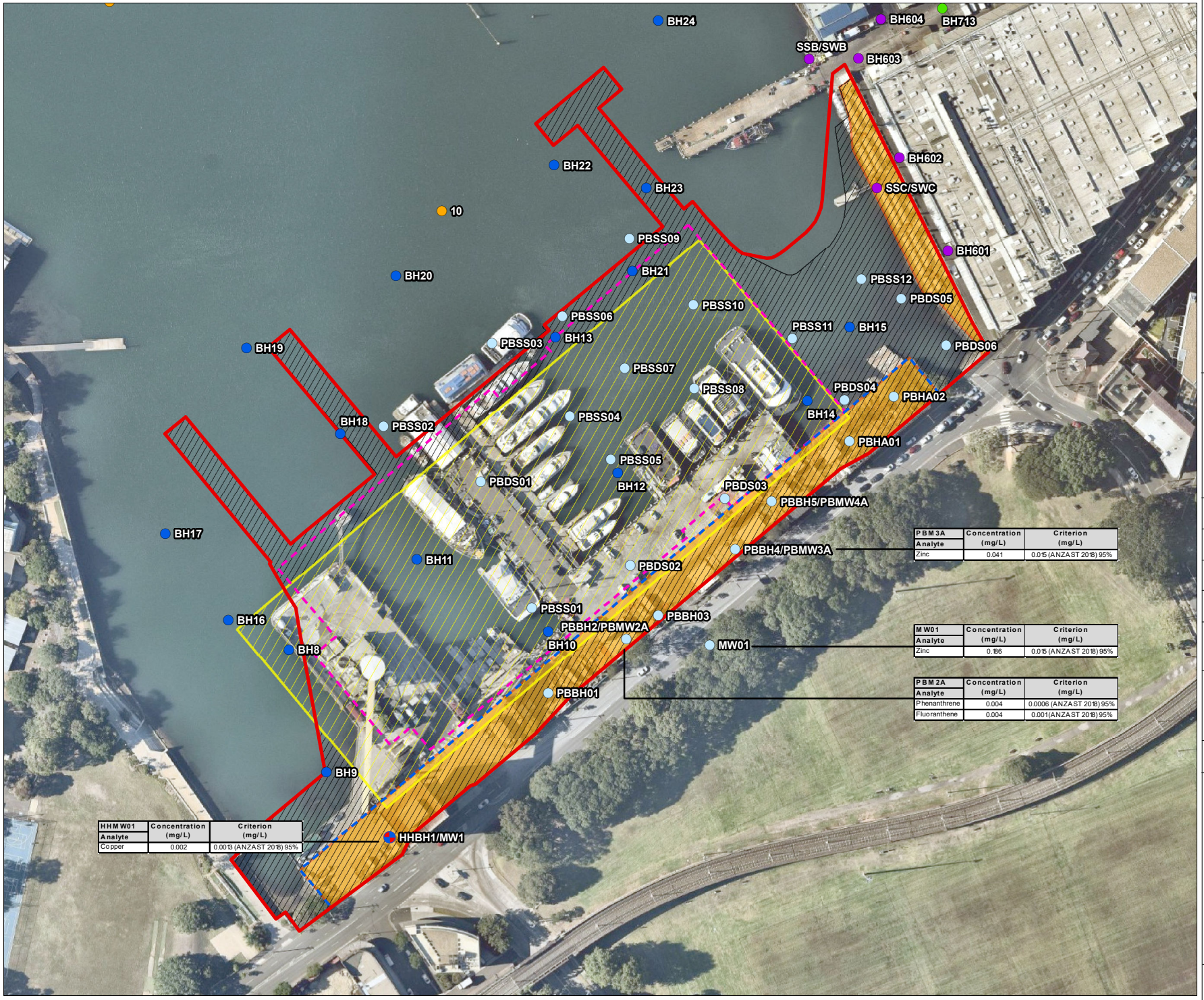
Coor. Sys. GDA 1994 MGA Zone 56

1A-1C Bridge Road, Glebe, and part 56-60 Pyrmont Bridge Road, Pyrmont, NSW

HISTORICAL SAMPLE LOCATIONS

FIGURE 3

File Name: 54578_03
Reference: Near Map - http://www.nearmap.com.au/. Imagery - 18-01-2018.



PBM3A	Concentration (mg/L)	Criterion (mg/L)
Analyte		
Zinc	0.041	0.015 (ANZAST 2018) 95%

MW01	Concentration (mg/L)	Criterion (mg/L)
Analyte		
Zinc	0.166	0.015 (ANZAST 2018) 95%

PBM2A	Concentration (mg/L)	Criterion (mg/L)
Analyte		
Phenanthrene	0.004	0.0006 (ANZAST 2018) 95%
Fluoranthene	0.004	0.001 (ANZAST 2018) 95%

HHMW01	Concentration (mg/L)	Criterion (mg/L)
Analyte		
Copper	0.002	0.0013 (ANZAST 2018) 95%

Legend:

- New Sydney Fish Market Development Footprint
- Approximate Land Area
- Approximate Seawall Extent

Proposed Landuse

- Fish Market Building Envelope
- Public Domain
- Approximate Fish Market Basement Footprint

Sample Locations

- BAYS MARKET DISTRICT - EIS (2017)
- BAYS MARKET DISTRICT - EIS (2010b)
- BAYS MARKET DISTRICT - EIS (2010c)
- BAYS MARKET DISTRICT - PB (2009)
- BAYS MARKET DISTRICT - Umwelt (2008)
- Soil Sampling / Monitoring Well - JBS&G 2015

JBS&G

Job No: 54578

Client: UrbanGrowth NSW

Version: R01 Rev 3 | Date: 08-Apr-2019

Drawn By: RF | Checked By: JR

Scale 1:2,000

0 25 50
metres

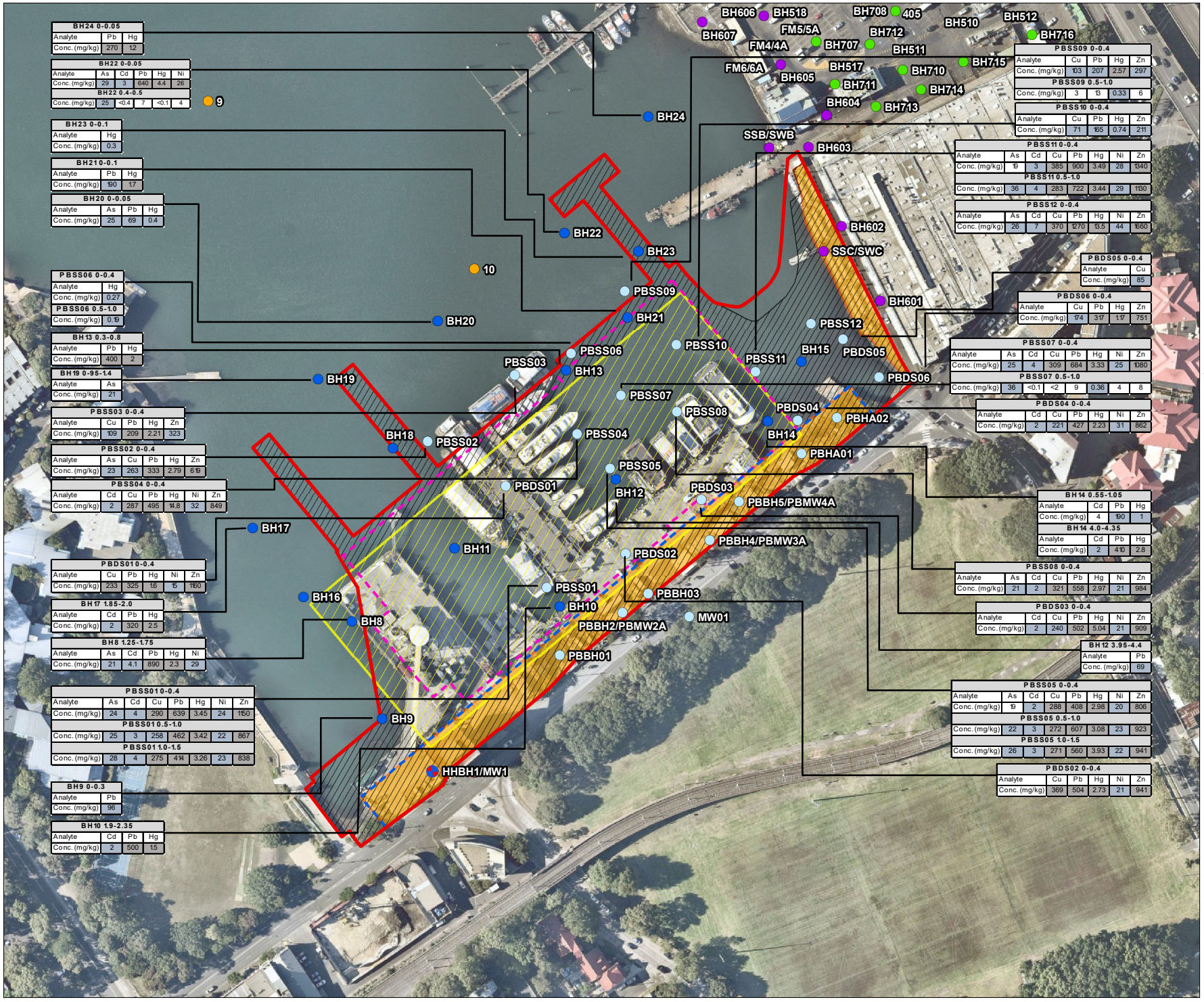
Coor. Sys. GDA 1994 MGA Zone 56

1A-1C Bridge Road, Glebe, and part 56-60 Pyrmont Bridge Road, Pyrmont, NSW

GROUNDWATER EXCEEDANCES

FIGURE 4A

File Name: 54578_04A
Reference: Near Map - http://www.nearmap.com.au/. Imagery - 18-01-2018.



Legend:

- New Sydney Fish Market Development Footprint
- Approximate Land Area
- Approximate Seawall Extent

Proposed Landuse

- Fish Market Building Envelope
- Public Domain
- Approximate Fish Market Basement Footprint

Sample Locations

- BAYS MARKET DISTRICT - EIS (2017)
- BAYS MARKET DISTRICT - EIS (2010b)
- BAYS MARKET DISTRICT - EIS (2010c)
- BAYS MARKET DISTRICT - PB (2009)
- BAYS MARKET DISTRICT - Umwelt (2008)
- Soil Sampling / Monitoring Well - JBS&G 2015

Result — Highlighted value is equal to or exceeds D-GV (ANZAST 2018)

Result — Highlighted value is equal to or exceeds GV-High (ANZAST 2018)

All other results were reported at concentrations less than the laboratory LOR.
As = Arsenic, Cd = Cadium, Cu = Copper, Pb = Lead, Hg = Mercury, Ni = Nickel, Zn = Zinc

JBS&G

Job No: 54578

Client: UrbanGrowth NSW

Version: R01 Rev 3 | Date: 08-Apr-2019

Drawn By: RF | Checked By: JR

Scale 1:2,500

0 30 60
metres

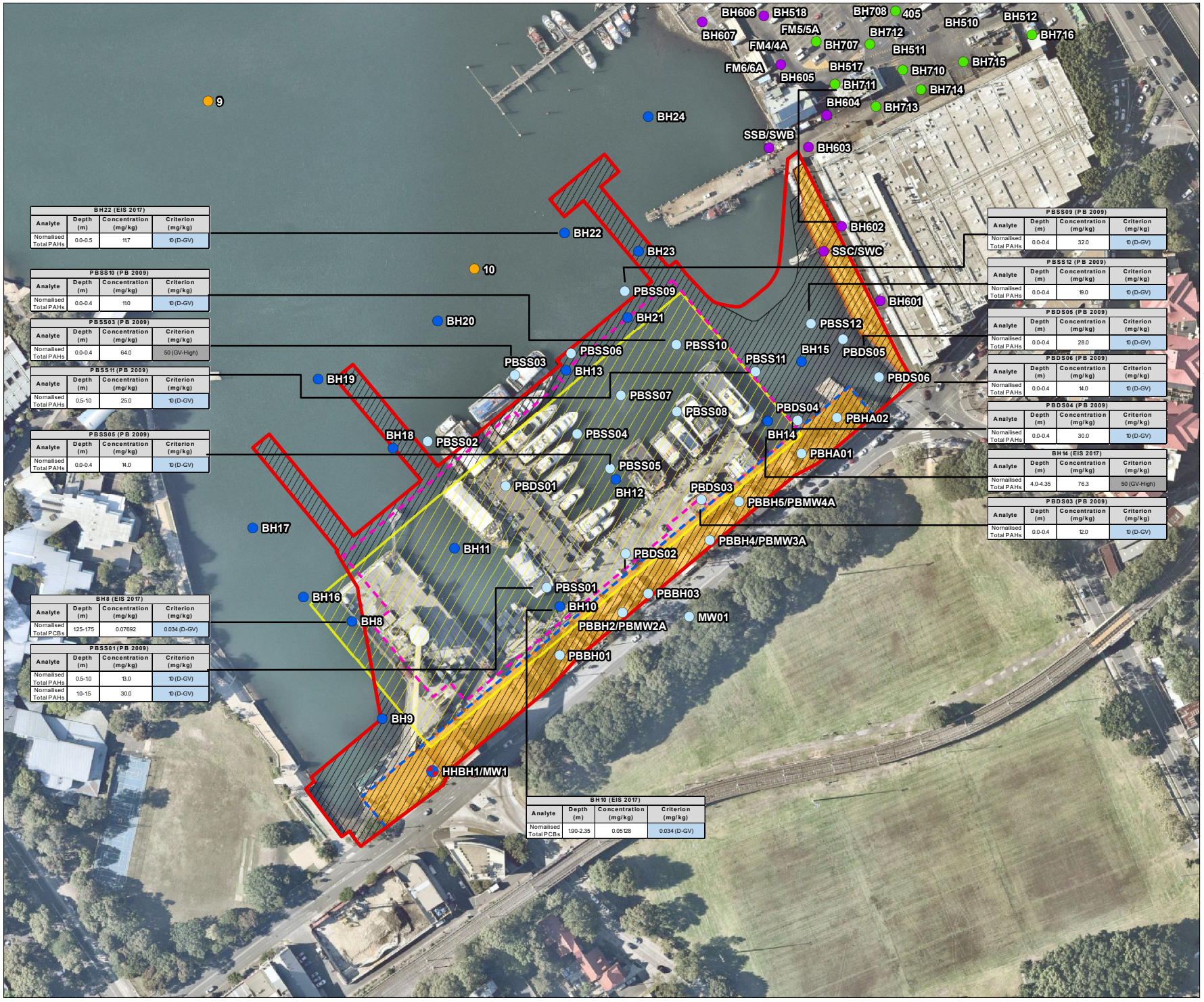
Coor. Sys. GDA 1994 MGA Zone 56

1A-1C Bridge Road, Glebe, and part 56-60 Pyrmont Bridge Road, Pyrmont, NSW

HEAVY METAL SEDIMENT EXCEEDANCES

FIGURE 4B

File Name: 54578_04B
Reference: Near Map - http://www.nearmap.com.au/. Imagery - 18-01-2018.



BH22 (EIS 2017)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PAHs	0.0-0.5	11.7	10 (D-GV)

PBSS10 (PB 2009)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PAHs	0.0-0.4	11.0	10 (D-GV)

PBSS03 (PB 2009)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PAHs	0.0-0.4	64.0	50 (GV-High)

PBSS11 (PB 2009)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PAHs	0.5-1.0	25.0	10 (D-GV)

PBSS05 (PB 2009)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PAHs	0.0-0.4	14.0	10 (D-GV)

BH8 (EIS 2017)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PCBs	1.25-1.75	0.07692	0.034 (D-GV)

PBSS01 (PB 2009)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PAHs	0.5-1.0	13.0	10 (D-GV)
Nornalised Total PAHs	1.0-1.5	30.0	10 (D-GV)

BH10 (EIS 2017)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PCBs	1.90-2.35	0.05128	0.034 (D-GV)

PBSS09 (PB 2009)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PAHs	0.0-0.4	32.0	10 (D-GV)

PBSS12 (PB 2009)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PAHs	0.0-0.4	19.0	10 (D-GV)

PBDS05 (PB 2009)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PAHs	0.0-0.4	28.0	10 (D-GV)

PBDS06 (PB 2009)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PAHs	0.0-0.4	14.0	10 (D-GV)

PBDS04 (PB 2009)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PAHs	0.0-0.4	30.0	10 (D-GV)

BH14 (EIS 2017)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PAHs	4.0-4.35	76.3	50 (GV-High)

PBDS03 (PB 2009)			
Analyte	Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
Nornalised Total PAHs	0.0-0.4	12.0	10 (D-GV)

Legend:

- New Sydney Fish Market Development Footprint
- Approximate Land Area
- Approximate Seawall Extent

Proposed Landuse

- Fish Market Building Envelope
- Public Domain
- Approximate Fish Market Basement Footprint

Sample Locations

- BAYS MARKET DISTRICT - EIS (2017)
- BAYS MARKET DISTRICT - EIS (2010b)
- BAYS MARKET DISTRICT - EIS (2010c)
- BAYS MARKET DISTRICT - PB (2009)
- BAYS MARKET DISTRICT - Umwelt (2008)
- Soil Sampling / Monitoring Well - JBS&G 2015

Result — Highlighted value is equal to or exceeds D-GV (ANZAST 2018)

Result — Highlighted value is equal to or exceeds GV-High (ANZAST 2018)

JBS&G

Job No: 54578

Client: UrbanGrowth NSW

Version: R01 Rev 3 | Date: 08-Apr-2019

Drawn By: RF | Checked By: JR

Scale 1:2,500

0 30 60
metres

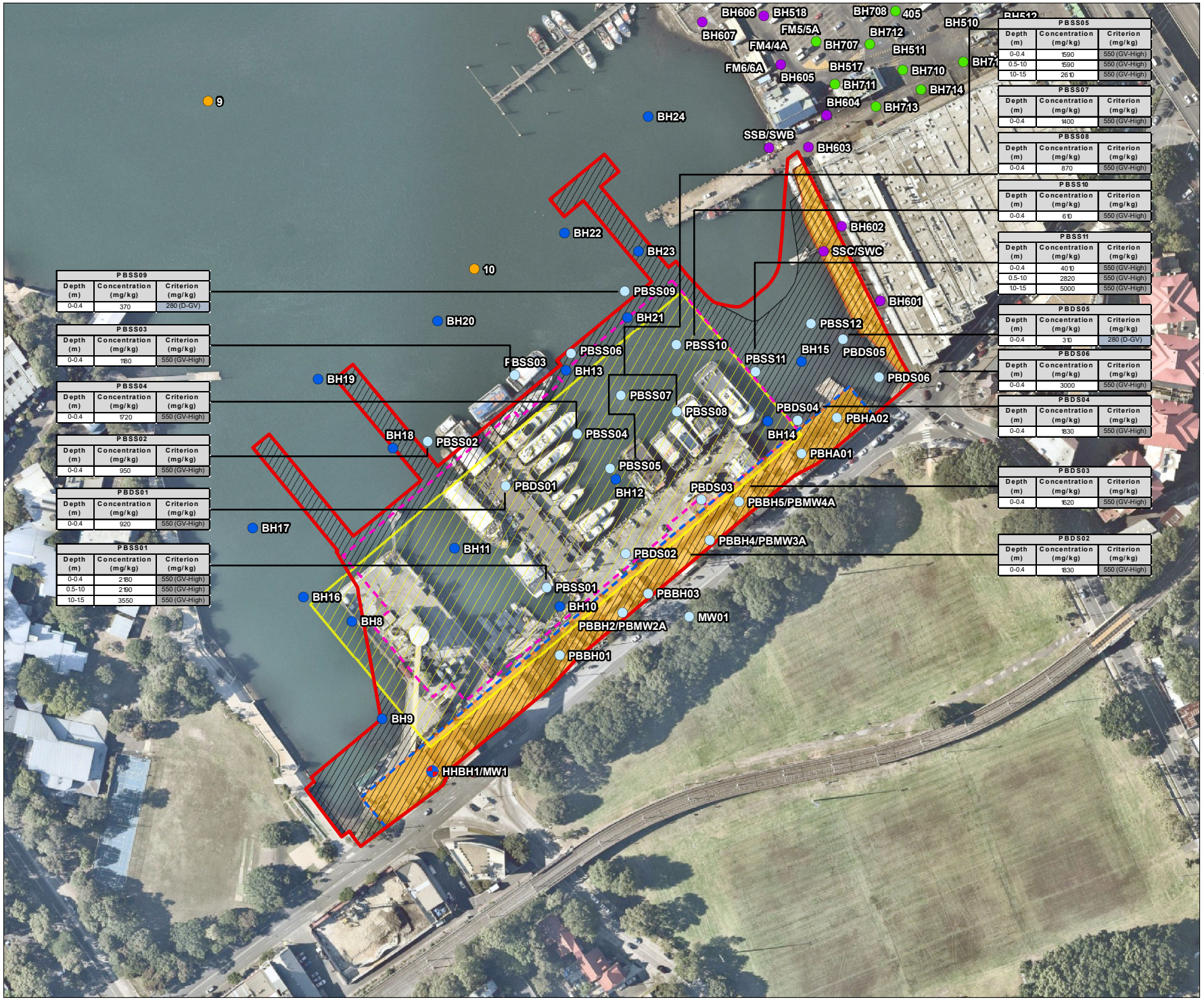
Coor. Sys. GDA 1994 MGA Zone 56

1A-1C Bridge Road, Glebe, and part 56-60 Pyrmont Bridge Road, Pyrmont, NSW

PAHS AND PCBS SEDIMENT EXCEEDANCES

FIGURE 4C

File Name: 54578_04C
Reference: Near Map - http://www.nearmap.com.au/. Imagery - 18-01-2018.



PBSS09		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	370	280 (D-GV)

PBSS03		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	1180	550 (GV-High)

PBSS04		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	1720	550 (GV-High)

PBSS02		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	950	550 (GV-High)

PBDS01		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	920	550 (GV-High)

PBSS01		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	2180	550 (GV-High)
0.5-1.0	2190	550 (GV-High)
1.0-1.5	3550	550 (GV-High)

PBSS05		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	1590	550 (GV-High)
0.5-1.0	1590	550 (GV-High)
1.0-1.5	2610	550 (GV-High)

PBSS07		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	1400	550 (GV-High)

PBSS08		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	870	550 (GV-High)

PBSS10		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	610	550 (GV-High)

PBSS11		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	4010	550 (GV-High)
0.5-1.0	2820	550 (GV-High)
1.0-1.5	5000	550 (GV-High)

PBDS05		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	310	280 (D-GV)

PBDS06		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	3000	550 (GV-High)

PBDS04		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	1830	550 (GV-High)

PBDS03		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	1620	550 (GV-High)

PBDS02		
Depth (m)	Concentration (mg/kg)	Criterion (mg/kg)
0-0.4	1830	550 (GV-High)

Legend:

- New Sydney Fish Market Development Footprint
- Approximate Land Area
- Approximate Seawall Extent

Proposed Landuse

- Fish Market Building Envelope
- Public Domain
- Approximate Fish Market Basement Footprint

Sample Locations

- BAYS MARKET DISTRICT - EIS (2017)
- BAYS MARKET DISTRICT - EIS (2010b)
- BAYS MARKET DISTRICT - EIS (2010c)
- BAYS MARKET DISTRICT - PB (2009)
- BAYS MARKET DISTRICT - Umwelt (2008)
- Soil Sampling / Monitoring Well - JBS&G 2015

Result — Highlighted value is equal to or exceeds D-GV (ANZAST 2018)

Result — Highlighted value is equal to or exceeds GV-High (ANZAST 2018)

JBS&G

Job No: 54578

Client: UrbanGrowth NSW

Version: R01 Rev 3 | Date: 08-Apr-2019

Drawn By: RF | Checked By: JR

Scale 1:2,500

0 30 60
metres

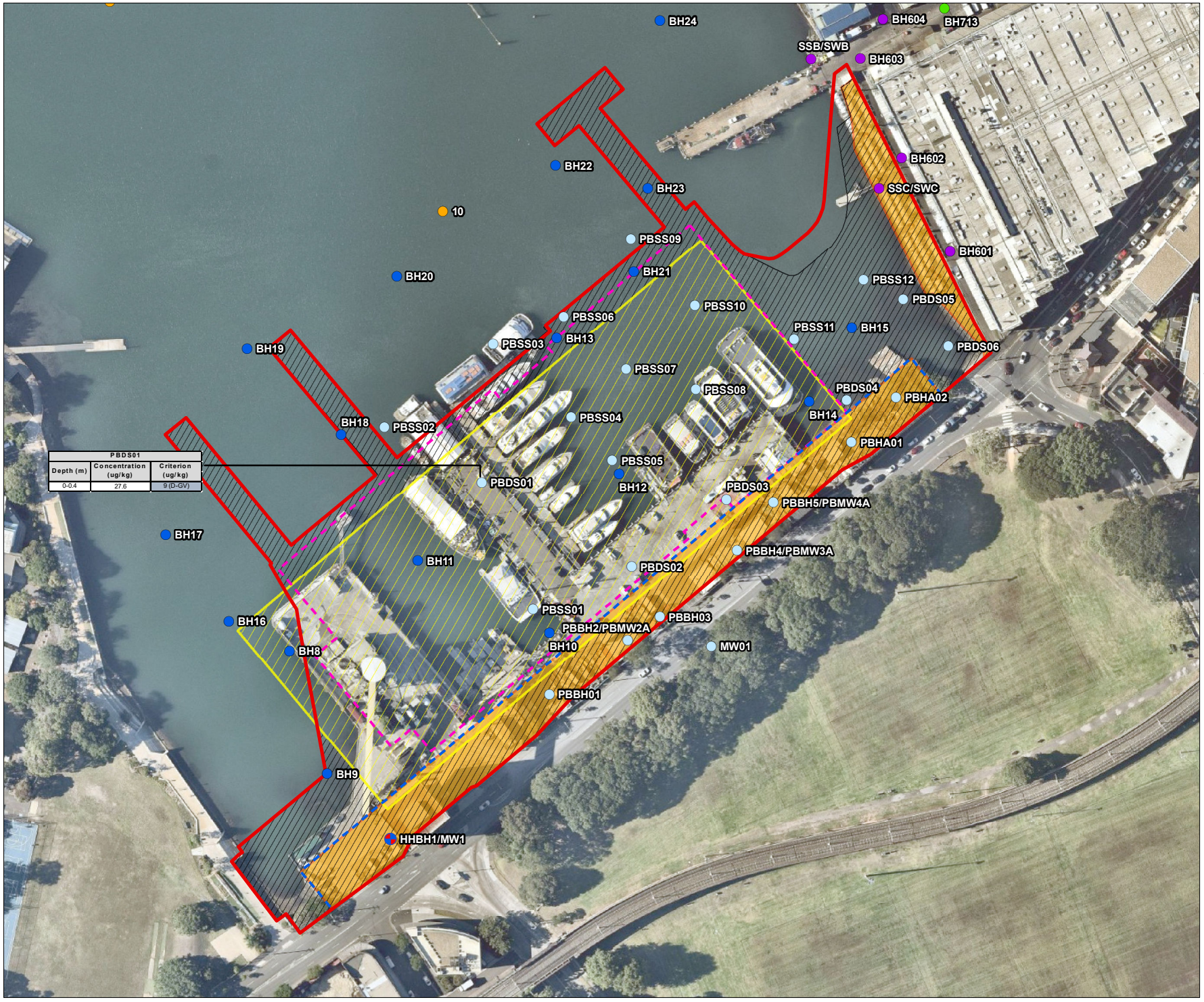
Coor. Sys. GDA 1994 MGA Zone 56

1A-1C Bridge Road, Glebe, and part 56-60 Pyrmont Bridge Road, Pyrmont, NSW

TPH SEDIMENT EXCEEDANCES

FIGURE 4D

File Name: 54578_04D
Reference: Near Map - http://www.nearmap.com.au/. Imagery - 18-01-2018.



PBDS01		
Depth (m)	Concentration (ug/kg)	Criterion (ug/kg)
0-0.4	27.6	9 (D-GV)

Legend:

- New Sydney Fish Market Development Footprint
- Approximate Land Area
- Approximate Seawall Extent

Proposed Landuse

- Fish Market Building Envelope
- Public Domain
- Approximate Fish Market Basement Footprint

Sample Locations

- BAYS MARKET DISTRICT - EIS (2017)
- BAYS MARKET DISTRICT - EIS (2010b)
- BAYS MARKET DISTRICT - EIS (2010c)
- BAYS MARKET DISTRICT - PB (2009)
- BAYS MARKET DISTRICT - Umwelt (2008)
- Soil Sampling / Monitoring Well - JBS&G 2015
- Result — Highlighted value is equal to or exceeds D-GV (ANZAST 2018)
- Result — Highlighted value is equal to or exceeds GV-High (ANZAST 2018)

JBS&G

Job No: 54578

Client: UrbanGrowth NSW

Version: R01 Rev 3	Date: 08-Apr-2019
Drawn By: RF	Checked By: JR

Scale 1:2,000

0 25 50
metres

Coor. Sys. GDA 1994 MGA Zone 56

1A-1C Bridge Road, Glebe, and part 56-60 Pyrmont Bridge Road, Pyrmont, NSW

TRIBUTYLTIN SEDIMENT EXCEEDANCES

FIGURE 4E

File Name: 54578_04E
Reference: Near Map - http://www.nearmap.com.au/. Imagery - 18-01-2018.

SWB Analyte	Concentration (mg/L)	Criterion (mg/L)
Copper	0.008	0.0013 - (ANZAST 2018) 95%
Zinc	0.024	0.015 - (ANZAST 2018) 95%

SWC Analyte	Concentration (mg/L)	Criterion (mg/L)
Copper	0.008	0.0013 - (ANZAST 2018) 95%
Zinc	0.029	0.015 - (ANZAST 2018) 95%

Legend:

- New Sydney Fish Market Development Footprint
- Approximate Land Area
- Approximate Seawall Extent

Proposed Landuse

- Fish Market Building Envelope
- Public Domain
- Approximate Fish Market Basement Footprint

Sample Locations

- BAYS MARKET DISTRICT - EIS (2017)
- BAYS MARKET DISTRICT - EIS (2010b)
- BAYS MARKET DISTRICT - EIS (2010c)
- BAYS MARKET DISTRICT - PB (2009)
- BAYS MARKET DISTRICT - Umwelt (2008)
- Soil Sampling / Monitoring Well - JBS&G 2015

JBS&G

Job No: 54578

Client: UrbanGrowth NSW

Version: R01 Rev 3 | Date: 08-Apr-2019

Drawn By: RF | Checked By: JR

Scale 1:2,000

0 25 50
metres

Coor. Sys. GDA 1994 MGA Zone 56

1A-1C Bridge Road, Glebe, and part 56-60 Pyrmont Bridge Road, Pyrmont, NSW

SURFACE WATER EXCEEDANCES

FIGURE 4F

File Name: 54578_04F
Reference: Near Map - http://www.nearmap.com.au/. Imagery - 18-01-2018.

Appendix A – Development Plans

N E W S Y D N E Y F I S H M A R K E T

STATE SIGNIFICANT DEVELOPMENT APPLICATION STAGE 1

SHEET LIST_STAGE 1

SHEET NUMBER	SHEET NAME	REVISION	REVISION DATE	A1 SCALE	REVISION DESCRIPTION
S1-A00 AAA-01	COVER SHEET	A	22/03/19	NTS	ISSUE FOR SSD-DA
S1-A20 AAA-01	SITE SURVEY	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S1-A20 AAA-02	LOCALITY / CONTEXT PLAN	A	22/03/19	1:2500	ISSUE FOR SSD-DA
S1-A20 AAA-03	SITE PLAN	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S1-A21 L00-01	DEMOLITION PLAN	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S1-B10 L00-01	FLOOR PLAN GROUND	A	22/03/19	1:500	ISSUE FOR SSD-DA
S1-B10 L01-01	FLOOR PLAN UPPER GROUND	A	22/03/19	1:500	ISSUE FOR SSD-DA
S1-B10 L02-01	FLOOR PLAN MEZZANINE	A	22/03/19	1:500	ISSUE FOR SSD-DA
S1-B10 L10-01	TOP OF BUIDLING ENVELOPE	A	22/03/19	1:500	ISSUE FOR SSD-DA
S1-C10 AAA-01	EAST & WEST ELEVATION	A	22/03/19	1:500	ISSUE FOR SSD-DA
S1-C10 AAA-02	NORTH & SOUTH ELEVATION	A	22/03/19	1:500	ISSUE FOR SSD-DA

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CLIENT NUMBER
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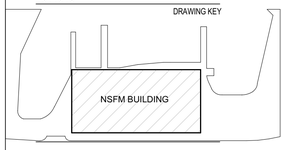
PROJECT
NEW SYDNEY FISH MARKET
1B BRIDGE RD, GLEBE NSW

BVN PROJECT NUMBER
1611013

DRAWING KEY



GRAPHIC SCALE

SCALE
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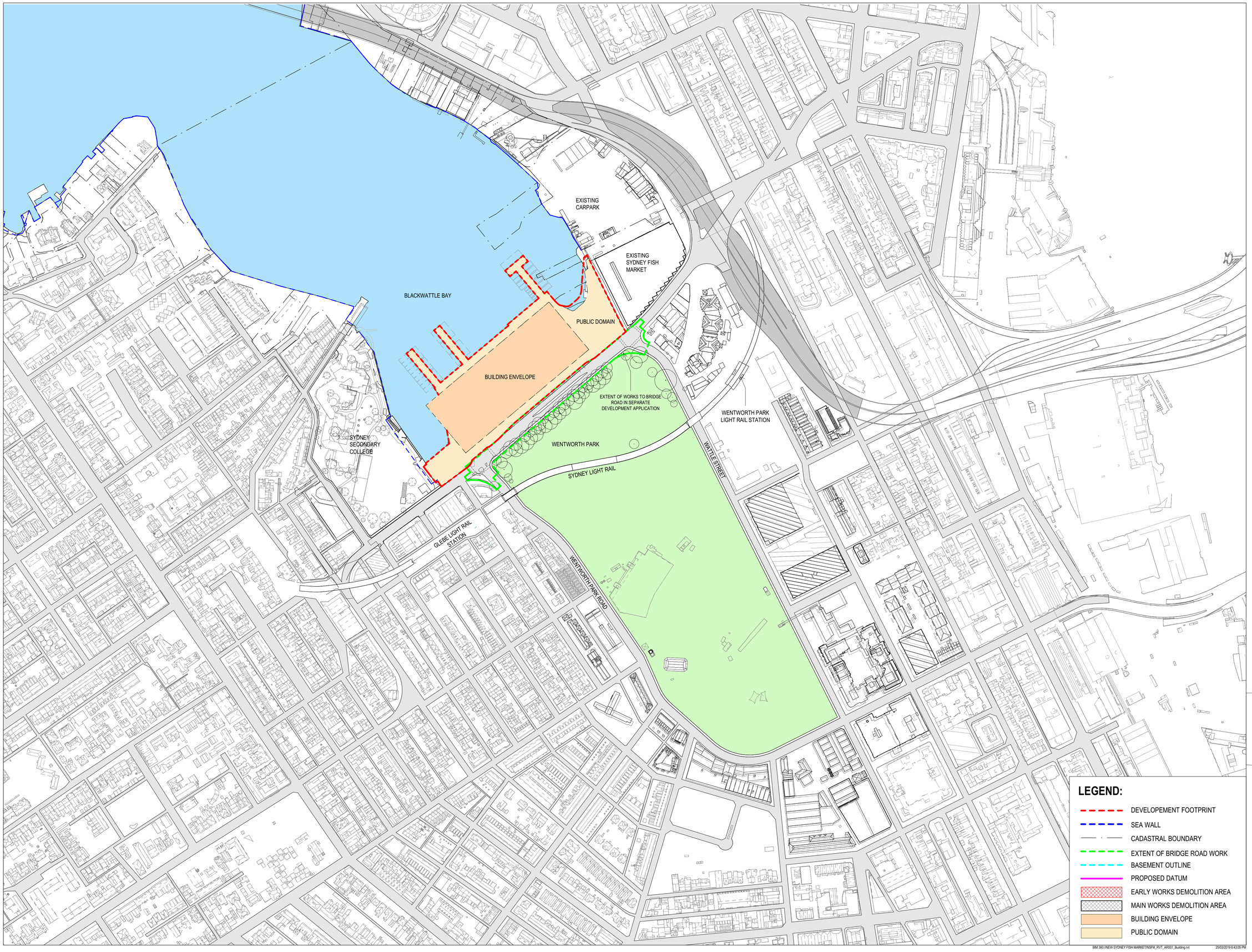
STATUS
STATE SIGNIFICANT DEVELOPMENT APPLICATION

DRAWING
COVER SHEET

AR-S1-A00 AAA-01 | ISSUE A



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NEW SYDNEY FISH MARKET
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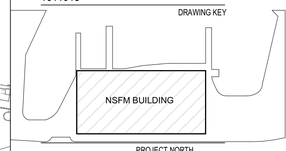

PROJECT NORTH

GRAPHIC SCALE
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SCALE
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STATUS
STATE SIGNIFICANT DEVELOPMENT APPLICATION

DRAWING
LOCALITY / CONTEXT PLAN

AR-S1-A20 AAA-02 | ISSUE A

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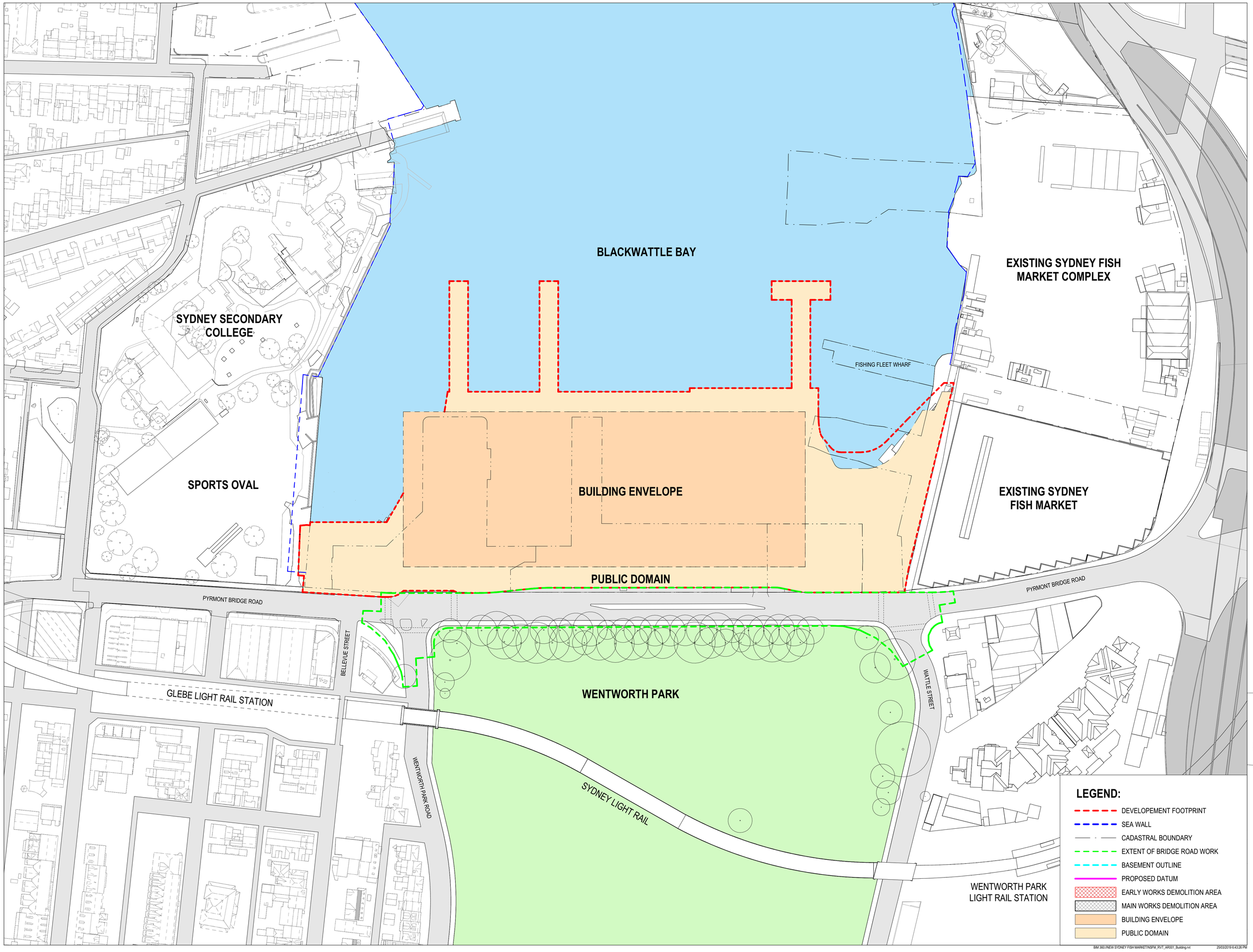

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1B BRIDGE RD, GLEBE NSW

BVN PROJECT NUMBER
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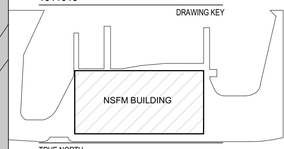

TRUE NORTH

GRAPHIC SCALE
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SCALE
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STATUS
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DRAWING
SITE PLAN

AR-S1-A20 AAA-03

ISSUE
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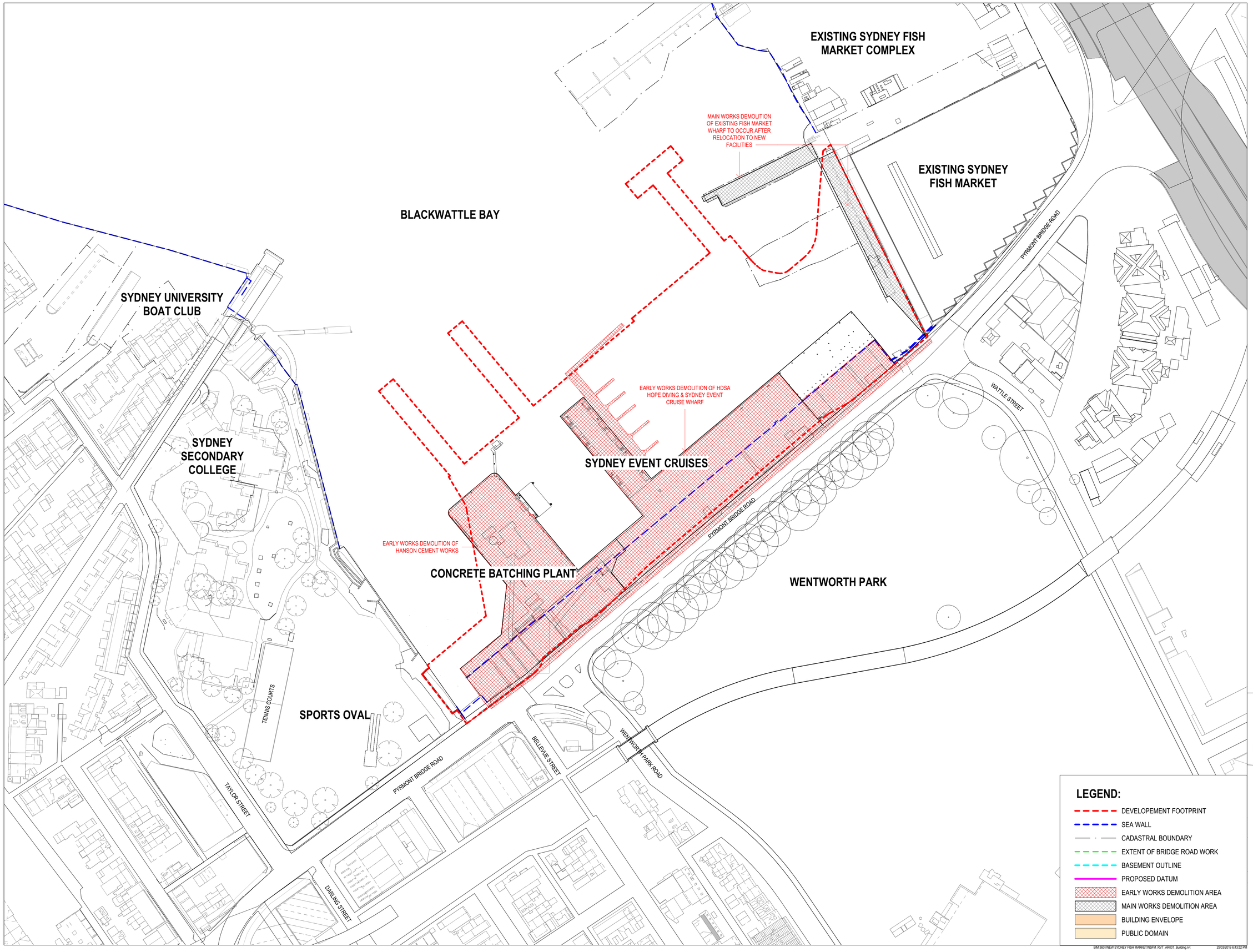

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PROJECT
NEW SYDNEY FISH MARKET
1B BRIDGE RD, GLEBE NSW

BVN PROJECT NUMBER
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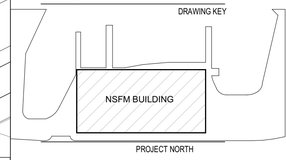

PROJECT NORTH

GRAPHIC SCALE
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SCALE
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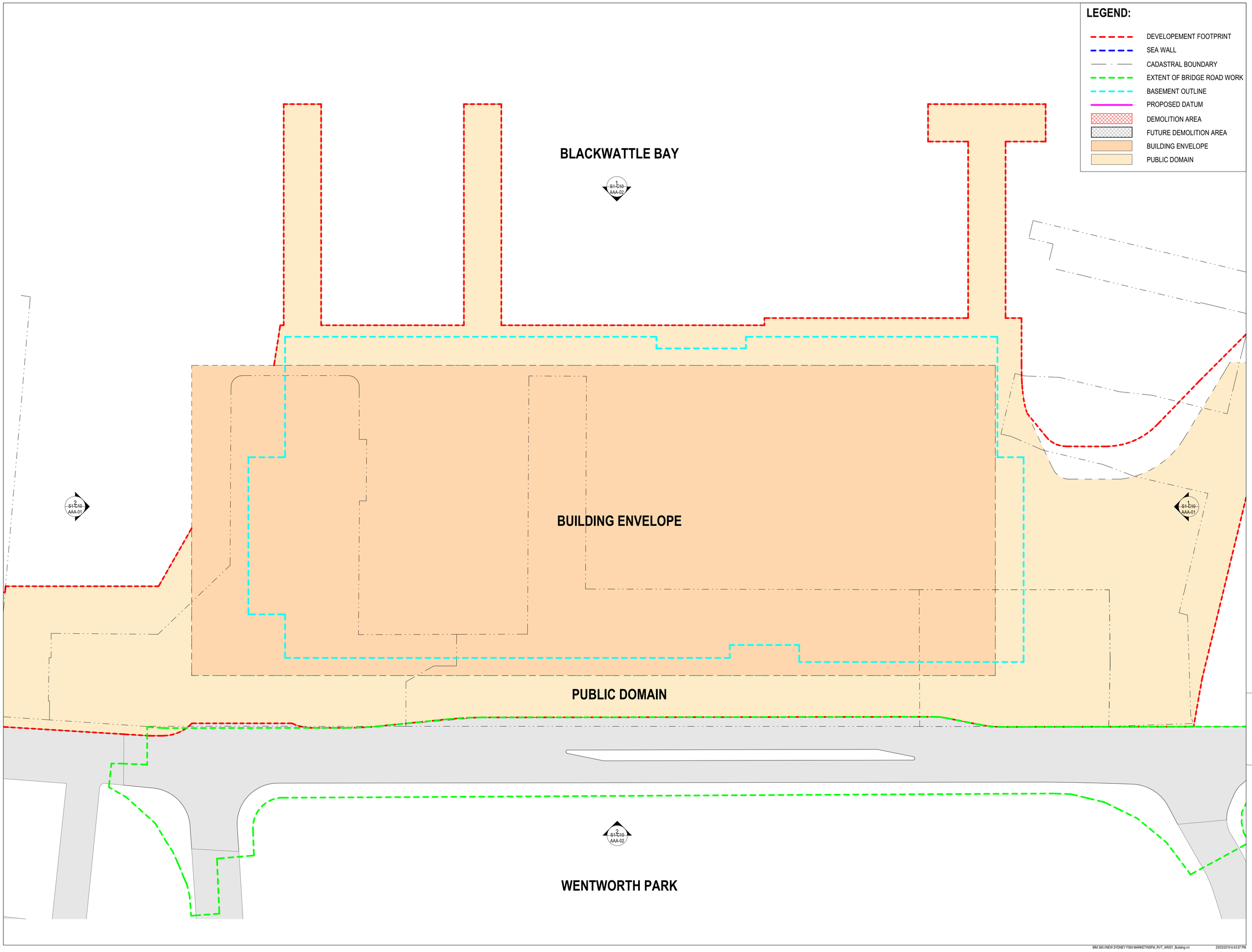
STATUS
STATE SIGNIFICANT DEVELOPMENT APPLICATION

DRAWING
DEMOLITION PLAN

ISSUE
AR-S1-A21 L00-01 A



LEGEND:

- DEVELOPEMENT FOOTPRINT
- SEA WALL
- CADASTRAL BOUNDARY
- EXTENT OF BRIDGE ROAD WORK
- BASEMENT OUTLINE
- PROPOSED DATUM
- DEMOLITION AREA
- FUTURE DEMOLITION AREA
- BUILDING ENVELOPE
- PUBLIC DOMAIN

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PROJECT
NEW SYDNEY FISH MARKET
1B BRIDGE RD, GLEBE NSW

BVN PROJECT NUMBER
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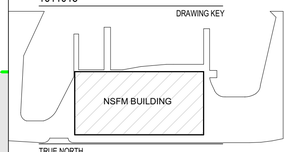

TRUE NORTH

GRAPHIC SCALE
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SCALE
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STATUS
STATE SIGNIFICANT DEVELOPMENT APPLICATION

DRAWING
FLOOR PLAN GROUND

ISSUE
AR-S1-B10 L00-01 A

BIM 360://NEW SYDNEY FISH MARKET/NSFM_R/VT_AR001_Building.rvt 25/03/2019 6:43:57 PM

N E W S Y D N E Y F I S H M A R K E T

STATE SIGNIFICANT DEVELOPMENT APPLICATION STAGE 2

DRAWING INDEX

SHEET LIST_STAGE 2

SHEET NUMBER	SHEET NAME	REVISION	REVISION DATE	A1 SCALE	REVISION DESCRIPTION
S2-A00 AAA-01	COVER SHEET	A	22/03/19	NTS	ISSUE FOR SSD-DA
S2-A20 AAA-01	SITE SURVEY	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-A20 AAA-02	LOCALITY / CONTEXT PLAN	A	22/03/19	1:2500	ISSUE FOR SSD-DA
S2-A20 AAA-03	SITE PLAN	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S2-A20 L01-01	PUBLIC DOMAIN GROUND	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S2-A20 L02-01	PUBLIC DOMAIN UPPER GROUND	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S2-B10 L00-01	FLOOR PLAN GROUND	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-B10 L01-01	FLOOR PLAN UPPER GROUND	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-B10 L02-01	FLOOR PLAN MEZZANINE	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-B10 L03-01	MEZZANINE ROOF PLAN	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-B10 L10-01	ROOF PLAN	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-B10 LB1-01	FLOOR PLAN BASEMENT	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-C10 AAA-01	EAST AND WEST ELEVATION	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-C10 AAA-02	NORTH AND SOUTH ELEVATION	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-D10 AAA-01	CROSS SECTIONS	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-D10 AAA-02	LONG SECTIONS	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-E43 AAA-01	AUCTION & OFFICE SECTION	A	22/03/19	1:50	ISSUE FOR SSD-DA
S2-E43 AAA-02	FOOD & BEVERAGE SECTION	A	22/03/19	1:50	ISSUE FOR SSD-DA
S2-E43 AAA-03	STAGING & OFFICE SECTION	A	22/03/19	1:50	ISSUE FOR SSD-DA
S2-E43 AAA-04	WHOLESALE & CATERING SECTION	A	22/03/19	1:50	ISSUE FOR SSD-DA
S2-L10 AAA-01	GFA MEASUREMENT SREP 26	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S2-L10 AAA-02	GFA STANDARD INSTRUMENT	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S2-L10 AAA-03	OPERATIONAL AREAS	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S2-L10 AAA-04	RETAIL AREAS	A	22/03/19	1:1000	ISSUE FOR SSD-DA

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CLIENT NUMBER
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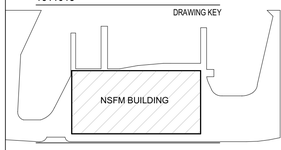
PROJECT
NEW SYDNEY FISH MARKET
1B BRIDGE RD, GLEBE NSW

BVN PROJECT NUMBER
1611013

DRAWING KEY



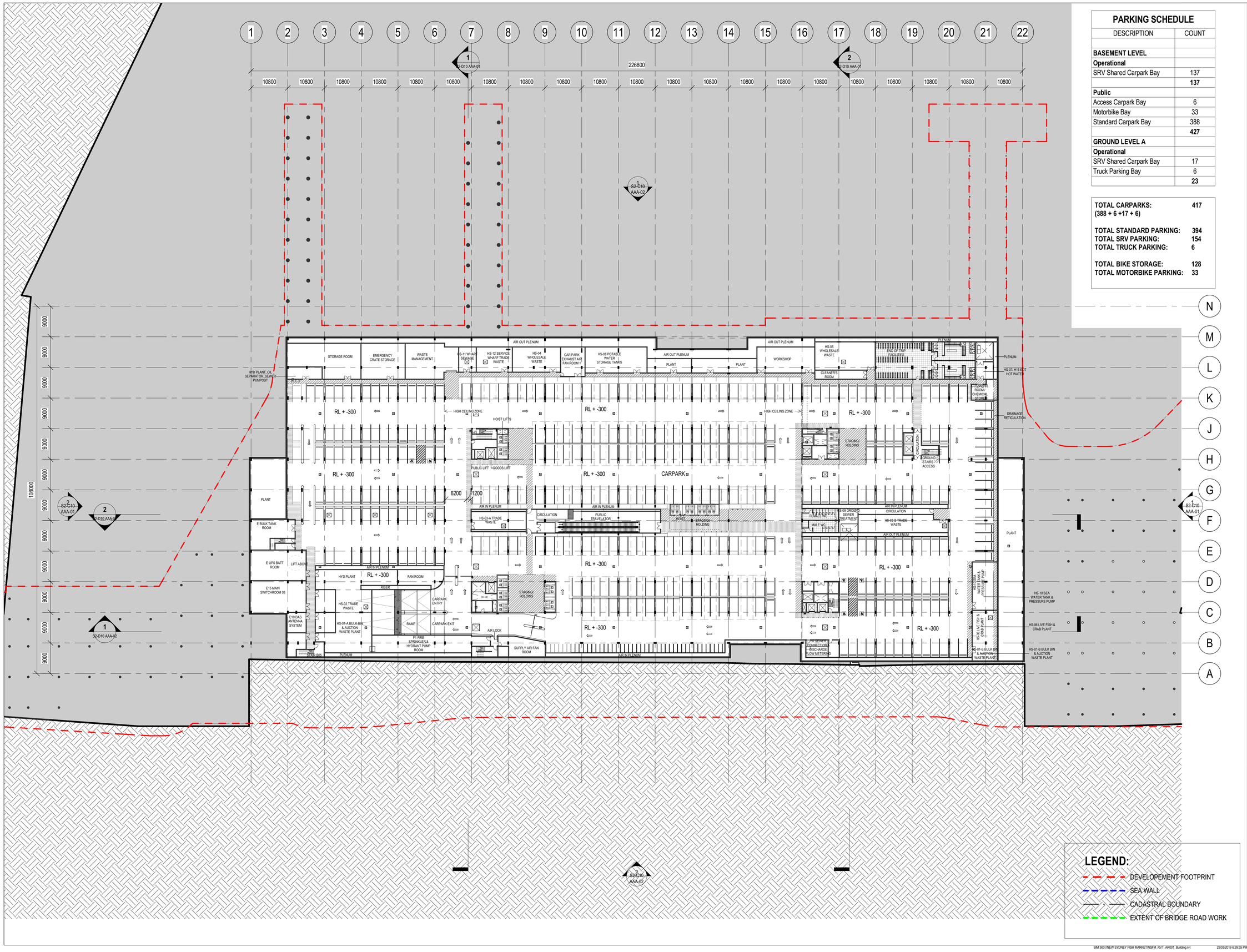
GRAPHIC SCALE

SCALE
@A1

STATUS
STATE SIGNIFICANT DEVELOPMENT APPLICATION

DRAWING
COVER SHEET

AR-S2-A00 AAA-01 | ISSUE A



PARKING SCHEDULE

DESCRIPTION	COUNT
BASEMENT LEVEL	
Operational	
SRV Shared Carpark Bay	137
	137
Public	
Access Carpark Bay	6
Motorbike Bay	33
Standard Carpark Bay	388
	427
GROUND LEVEL A	
Operational	
SRV Shared Carpark Bay	17
Truck Parking Bay	6
	23

TOTAL CARPARKS:	**417**
(388 + 6 +17 + 6)	
TOTAL STANDARD PARKING:	**394**
TOTAL SRV PARKING:	**154**
TOTAL TRUCK PARKING:	**6**
TOTAL BIKE STORAGE:	**128**
TOTAL MOTORBIKE PARKING:	**33**

LEGEND:

- DEVELOPEMENT FOOTPRINT
- SEA WALL
- CADASTRAL BOUNDARY
- EXTENT OF BRIDGE ROAD WORK

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BVN PROJECT NUMBER
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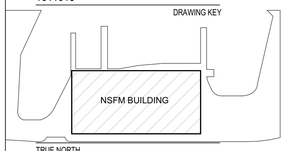

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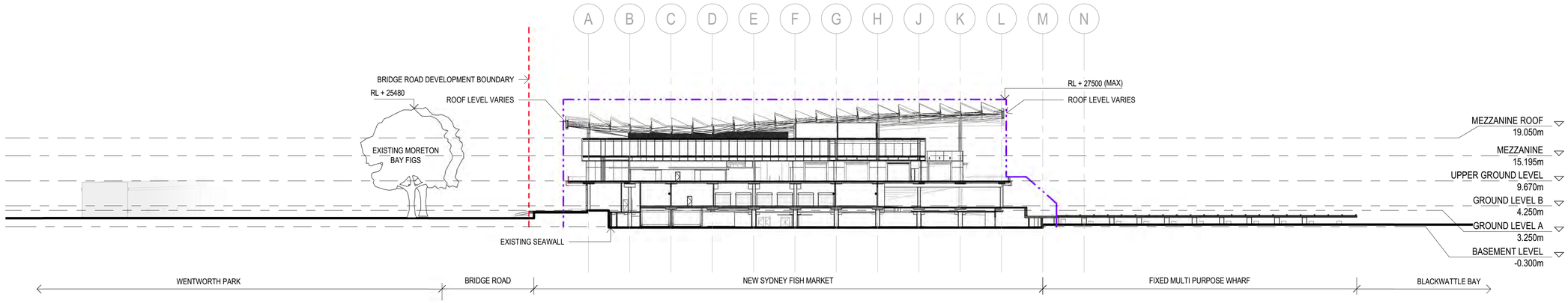

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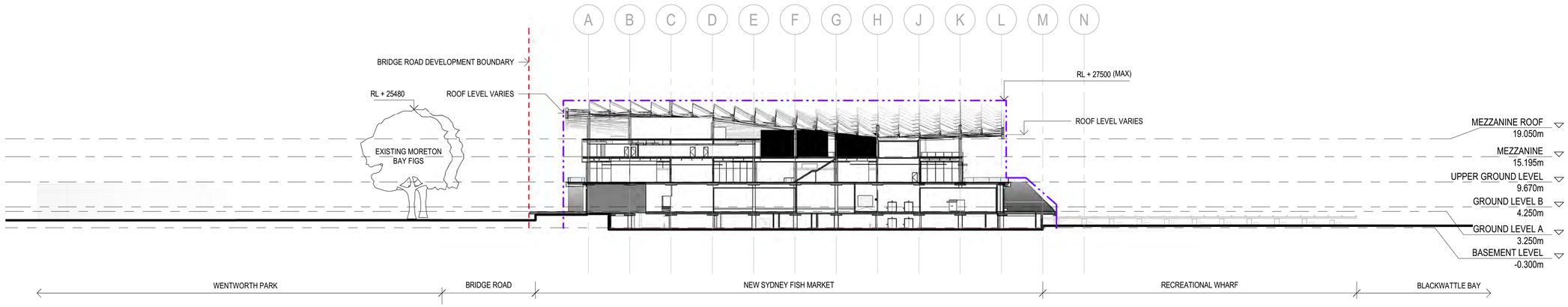

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- BRIDGE ROAD DEVELOPMENT BOUNDARY

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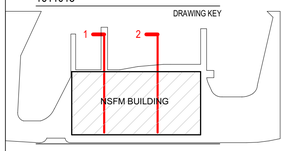

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DRAWING
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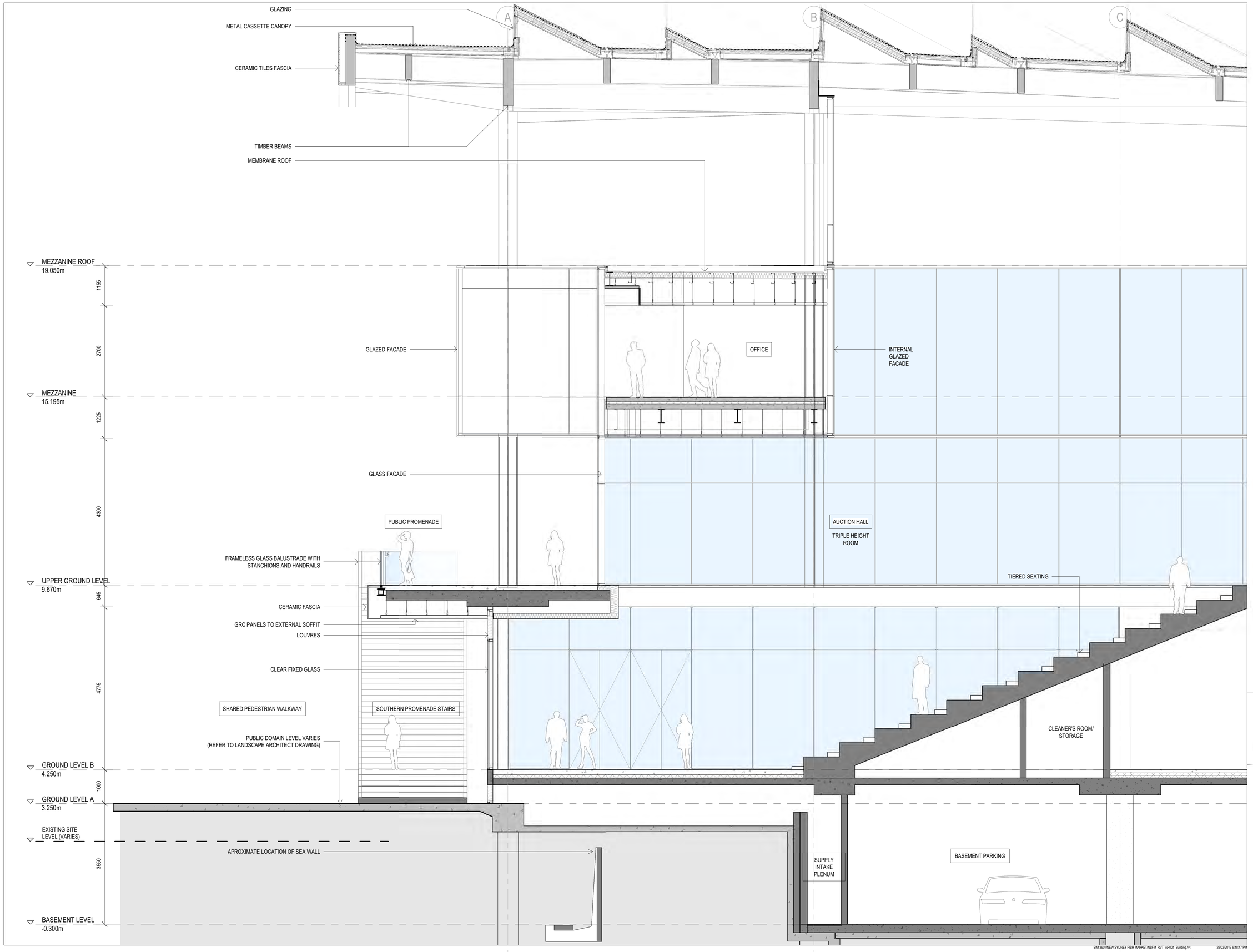
ISSUE
AR-S2-D10 AAA-01 A



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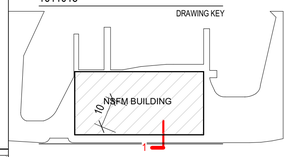

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DEVELOPMENT APPLICATION

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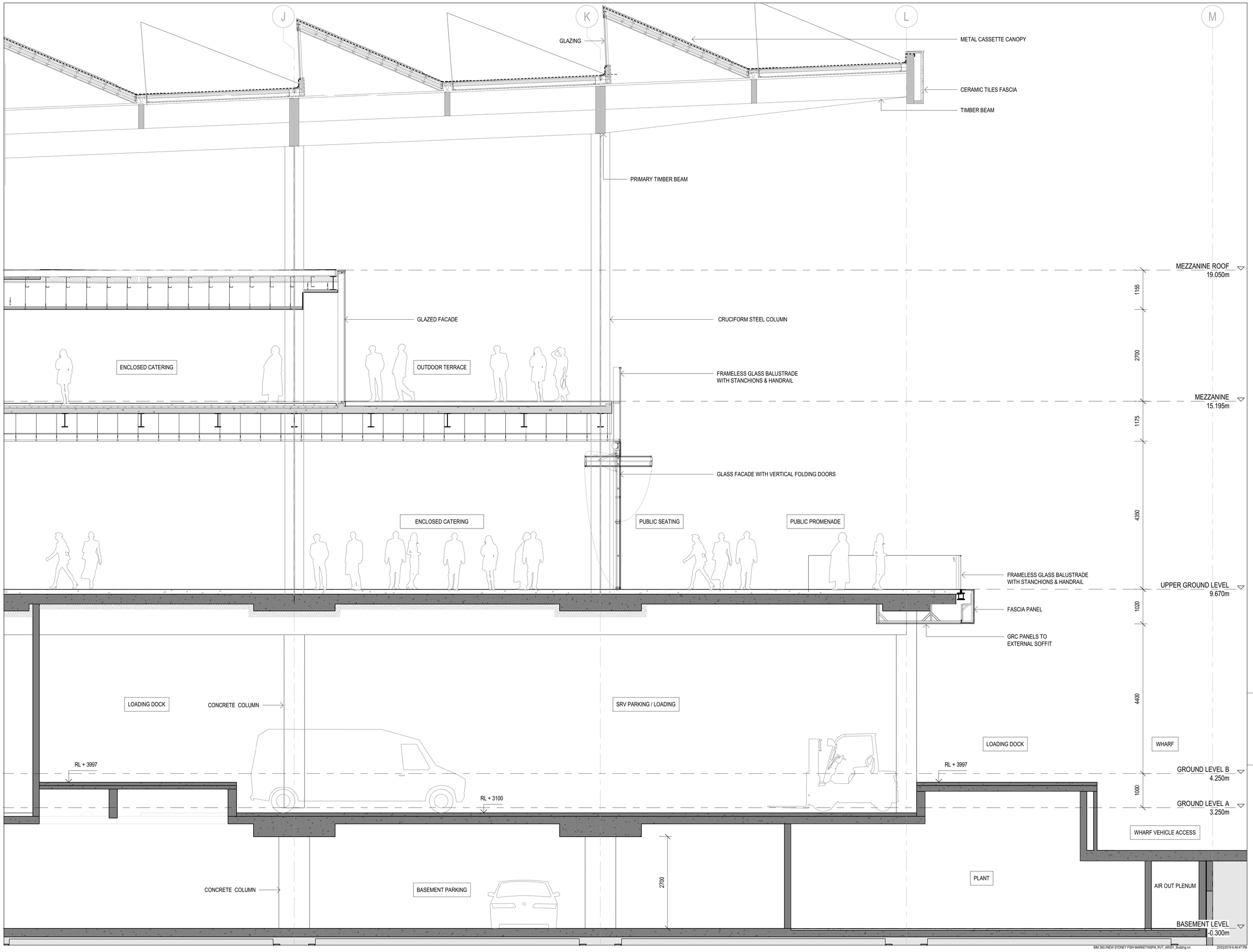
AUCTION & OFFICE SECTION

ISSUE
AR-S2-E43 AAA-01 A



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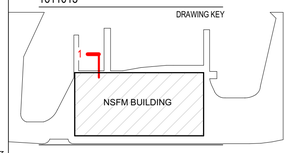

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STATUS
STATE SIGNIFICANT
DEVELOPMENT APPLICATION

DRAWING
FOOD & BEVERAGE SECTION

ISSUE
AR-S2-E43 AAA-02 A

Appendix B – Summary of Historical Site Investigation Results

Table A1: Historical Soil Analytical Results

			Metals & Metalloids								Polycyclic Aromatic Hydrocarbons																				TPHs (NEPC 1999)				
			Arsenic (Total)	Cadmium	Chromium (Total)	Copper	Lead	Mercury (Inorganic)	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (lower bound)*	Benzo(a)pyrene TEQ (medium bound)*	Benzo(a)pyrene TEQ (upper bound)*	Benzo(b,j)fluoranthene	Benzo(b,k)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Total)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			2.00	0.40	1.00	1.00	1.00	0.05	1.00	1.00	0.10	0.10	0.10	0.10	0.05	0.50	0.50	0.50	0.50		0.10	0.50	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.50	20.00	20.00	50.00	50.00	50.00
NEPM 2013 Mgnt Limits - Commercial and Industrial, Coarse																																				
NEPM 2013 Soil HIL D			3000[#3]	900	3600[#4]	240000	1500[#5]	730[#6]	6000	400000						40	40	40													4000[#7]					
NEPM 2013 EIL/ESL Commercial Industrial (generic, coarse)			160		310	85	1800		55	110					172[#10]													370								
NEPM 2013 Soil HSL D for Vapour Intrusion - Sand 0 to <1m																												NL								
Field_ID	**Sampled_Date-Time**	**Matrix_Type**																																		
JBS&G (2015)																																				
HH BH01 0.12-0.2	14/08/2015	SOIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HH BH01 0.5-0.6	14/08/2015	SOIL	<2	<0.4	25	25	65	0.09	22	82	<0.5	<0.5	<0.5	1.6	1.6	2.2	2.5	2.7	2.1	-	1.4	1.5	1.4	<0.5	2.3	<0.5	0.8	<0.5	1.6	2.4	17	<20	31	570	400	1000
HH BH01 3.0-3.1	14/08/2015	SOIL	5.5	<0.4	12	28	93	0.14	6.4	55	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<20	60	<50	60
HH QC01	14/08/2015	SOIL	4.5	<0.4	17	24	150	0.24	9	99	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	0.7	1.4	<20	<20	<50	<50	<50
HHQC01A	14/08/2015	SOIL	15	<0.4	20	21	69	0.1	12	66	<0.1	<0.1	<0.1	0.2	0.2	-	-	-	-	0.3	0.1	-	0.2	<0.1	0.4	<0.1	0.1	<0.1	0.2	0.4	2.1	<25	<50	<100	<100	-
HH BH01 4.0-4.1	14/08/2015	SOIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HH BH01 6.0-6.1	14/08/2015	SOIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PB (2009)																																				
PBBH01 0.0-0.3	17/12/2008	SOIL	3	0.1	11	27	71	0.15	9	78	<0.5	<0.5	0.5	2.2	2	-	-	-	-	3	1	2.3	-	<0.5	3.9	<0.5	0.9	<0.5	1.7	4.1	21.6	<10	<50	170	130	300
PBBH01 4.0-4.1	17/12/2008	SOIL	4	<0.1	18	6	11	<0.05	2	21	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	<1	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<8	<10	<50	<100	<100	<250
PBBH02 0.0-0.1	18/12/2008	SOIL	2	<0.1	11	25	41	0.05	11	49	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	<1	<0.5	<0.5	-	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	0.7	1.2	<10	<50	<100	<100	<250
PBBH02 4.0-4.1	18/12/2008	SOIL	4	0.1	10	31	79	0.23	6	80	<0.5	<0.5	<0.5	1.7	1	-	-	-	-	0.8	<0.5	0.7	-	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	1.2	0.5	<10	<50	<100	<100	<250
PBBH03 1.0-1.1	18/12/2008	SOIL	11	0.1	16	18	63	0.15	10	71	<0.5	<0.5	<0.5	0.5	0.6	-	-	-	-	<1	<0.5	0.6	-	<0.5	0.9	<0.5	<0.5	<0.5	0.5	1.2	4.3	<10	<50	<100	<100	<250
PBBH03 6.0-6.1	18/12/2008	SOIL	4	<0.1	10	25	60	0.09	1	31	0.6	<0.5	0.7	1.1	0.9	-	-	-	-	1	<0.5	1	-	<0.5	2.3	0.5	<0.5	0.5	2	2.4	13	<10	<50	<100	<100	<250
PBBH04 0.5-0.6	17/12/2008	SOIL	5	<0.1	8	22	53	0.1	16	67	<0.5	<0.5	<0.5	0.6	0.6	-	-	-	-	1	<0.5	0.7	-	<0.5	1.1	<0.5	<0.5	<0.5	0.5	1.1	5.6	<10	<50	<100	<100	<250
PBBH04 4.0-4.1	17/12/2008	SOIL	4	<0.1	19	43	121	0.25	15	136	<0.5	<0.5	<0.5	0.6	0.8	-	-	-	-	1	0.5	0.7	-	<0.5	1	<0.5	<0.5	<0.5	<0.5	1.1	5.7	<10	<50	<100	<100	<250
PBBH05 0.0-0.3	17/12/2008	SOIL	4	0.2	11	86	425	0.9	17	201	<0.5	<0.5	<0.5	1	0.8	-	-	-	-	1	<0.5	1.1	-	<0.5	1.9	<0.5	<0.5	<0.5	0.5	1.9	8.2	<10	<50	<100	<100	<250
PBBH05 6.0-6.1	17/12/2008	SOIL	11	<0.1	18	21	46	0.25	7	54	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	<1	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<8	<10	<50	<100	<100	<250
PBHA01 0.0-0.1	12/01/2009	SOIL	3	0.3	12	40	216	0.23	15	153	<0.5	<0.5	0.6	1.5	1.3	-	-	-	-	2	0.9	1.7	-	<0.5	2.7	<0.5	0.7	<0.5	1.9	2.6	15.9	<10	<50	610	1560	**2170**
PBHA01 0.3-0.4	12/01/2009	SOIL	2	0.4	8	37	77	0.17	60	181	<0.5	<0.5	<0.5	<0.5	0.5	-	-	-	-	<1	1.1	0.6	-	<0.5	0.7	<0.5	0.7	<0.5	0.6	0.7	4.9	<10	<50	210	880	**1090**
PBHA02 0.0-0.1	12/01/2009	SOIL	2	<0.1	4	41	559	0.09	9	82	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	<1	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<8	<10	<50	130	940	**1070**

Table A1: Historical Soil Analytical Results

TRHs (NEPC 2013)									BTEX						Polychlorinated Biphenyls								Organochlorine Pesticides																								
C6-C10 Fraction	>C10-C16 Fraction	>C10-C16 Fraction (Silica Gel Cleanup)	>C16-C34 Fraction	>C16-C34 Fraction (Silica Gel Cleanup)	>C34-C40 Fraction	>C34-C40 Fraction (Silica Gel Cleanup)	C6 - C10 less BTEX (F1)	>C10 - C16 less Naphthalene (F2)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene (Total)	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	PCBs (Total)	Aldrin	Dieldrin	DDD	o.p-+p.p DDD	4,4-DDE	DDT	alpha-BHC	beta-BHC	delta-BHC	Chlordane	Chlordane (trans)	alpha-Chlordane	gamma-Chlordane	Endosulfan alpha	Endosulfan beta	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	Heptachlor	Heptachlor Epoxide	Hexachlorobenzene	Lindane	Methoxychlor	Toxaphene
mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	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
20.00	50.00	50.00	100.00	100.00	100.00	100.00	20.00	50.00	0.10	0.10	0.10	0.20	0.10	0.30	0.10		0.10	0.10	0.10	0.10	0.10	0.10	0.05	0.05	0.05	0.10	0.05	0.05	0.05	0.05	0.05	0.10				0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.05	0.10	1.00
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			1700		3300		215	170	75	135	165			180														640																				
							260[#15]	NL[#16]	3	NL	NL			230																																			
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-		-	-	-
<20	<50	-	980	-	160	-	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1		-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05	<0.2	<1
<20	<50	-	<100	-	<100	-	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1		-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05	<0.2	<1
<20	<50	-	<100	-	<100	-	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1		-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05	<0.2	<1
<25	<50	-	<100	-	<100	-	<25	<50	<0.2	<0.5	<1	<2	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1		<0.1	<0.1	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-		-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-		-	-	-
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	<1.5	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	-	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	<0.05	<0.05	<0.05	<0.2	-
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	<1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	<1.5	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	-	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	<0.05	<0.05	<0.05	<0.2	-
-	-	-	-	-	-	-	-	-	0.2	<0.5	<0.5	<1	<0.5	<1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	<1.5	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	-	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	<0.05	<0.05	<0.05	<0.2	-
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	<1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	<1.5	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	-	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	<0.05	<0.05	<0.05	<0.2	-
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	<1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	<1.5	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.005	-
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	<1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	<1.5	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.005	-

Table A2: Soil Asbestos Analytical Results

			Asbestos											Asbestos - Comments				
			Approx. Sample Mass	Mass ACM	Mass Asbestos in ACM	Asbestos from ACM in soil	Mass FA	Mass Asbestos in FA	Mass AF	Mass Asbestos in AF	Mass Asbestos in FA & AF	Asbestos from FA & AF in soil	Asbestos Fibres	ACM - Comment	FA - Comment	AF - Comment	Organic Fibres - Comment	Respirable Fibres - Comment
			g	g	g	%w/w	g	g	g	g	g	%w/w		Comment	Comment	Comment	Comment	Comment
EQL																		
NEPM 2013 Soil HIL D						0.05						0.001						
Field_ID	**Sampled_Date-Time**	**Matrix_Type**																
JBS&G (2015)																		
HH BH01 0.12-0.2	14/08/2015	SOIL	1021	0	0	0	0	0	0	0	0	0		No asbestos detected at the reporting limit of 0.001% w/w.	NIL	NIL	Organic fibre detected.	No respirable fibres detected
PB (2009)																		
PBBH01	17/12/2008	SOIL	-	-	-	-	-	-	-		-	-	No Asbestos Detected	-	-	-	-	
PBBH01	17/12/2008	SOIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PBBH02	18/12/2008	SOIL	-	-	-	-	-	-	-	-	-	-	No Asbestos Detected	-	-	-	-	-
PBBH02	18/12/2008	SOIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PBBH03	18/12/2008	SOIL	-	-	-	-	-	-	-	-	-	-	No Asbestos Detected	-	-	-	-	-
PBBH03	18/12/2008	SOIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PBBH04	17/12/2008	SOIL	-	-	-	-	-	-	-		-	-	No Asbestos Detected	-	-	-	-	
PBBH04	17/12/2008	SOIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PBBH05	17/12/2008	SOIL	-	-	-	-	-	-	-	-	-	-	No Asbestos Detected	-	-	-	-	-
PBBH05	17/12/2008	SOIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PBHA01	12/01/2009	SOIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PBHA01	12/01/2009	SOIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PBHA02	12/01/2009	SOIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table B: Historical Groundwater Analytical Results

		Heavy Metals									Petroleum Hydrocarbons					TRHs (NEPC 2013)						Non-Metallic Inorganics				Major Cations			Volatile Organic Contaminants (VOCs)2									
		Arsenic (As III)	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Phenolics (Total)	C6-C9	C10-C14	C15-C28	C29-C36	Total TPHs (C10-C36)	C6-C10 Fraction	>C10-C16 Fraction	>C16-C34 Fraction	>C34-C40 Fraction	C6 - C10 less BTEX (F1)	>C10 - C16 less Naphthalene (F2)	Nitrate & Nitrite (as N)	Total Nitrogen (as N)	Phosphorus	Total Kjeldahl Nitrogen (as N)	Calcium	Potassium	Magnesium	Benzene	Toluene	Ethyl Benzene	Total xylenes	o-xylene	m+p-xylene	Isopropylbenzene	n-Propylbenzene	tert -Butylbenzene	sec- Butylbenzene
Unit		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR		0.001	0.0001	0.001	0.001	0.001	0.0001	0.001	0.001	0.001	0.01	0.05	0.1	0.1															0.001	0.001	0.001	0.003	0.001	0.002	0.001	0.001	0.001	0.001
ANZAST 2018 (95% Eco Marine Waters or as discussed i		0.023	0.0007	0.0044	0.0013	0.0044	0.00001	0.007	0.015																				0.5	0.18	0.005		0.35	0.75				
NEPC (2013) HSL Vapour intrusion											6000	NL																	5000	NL	NL	NL	NL	NL				
NHMRC (2011) (as amended December 2014) (Factor 10) – Health																													0.001	0.8	0.3							
Sample ID	Date																																					
PB (2009)																																						
MW01	12/01/2009	**<0.02**	<0.0002	**<0.005**	<0.01	0.001	<0.0001	**<0.01**	**0.186**	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-	-	-	-	-	-	-	-				<0.001	<0.001	<0.001	-	<0.002	<0.001	-	-	-	-
PBMW02a	12/01/2009	**<0.02**	<0.0001	**<0.005**	<0.01	<0.001	**<0.0005**	**<0.01**	<0.01	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-	-	-	-	-	-	-	-				<0.001	<0.001	<0.001	-	<0.002	<0.001	-	-	-	-
PBMW03a	12/01/2009	**<0.02**	<0.0002	**<0.005**	<0.01	0.002	<0.0001	**<0.01**	**0.041**	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-	-	-	-	-	-	-	-				<0.001	<0.001	<0.001	-	<0.002	<0.001	-	-	-	-
PBMW04a	12/01/2009	**<0.02**	<0.0002	**<0.005**	<0.01	<0.001	<0.0001	**<0.01**	<0.01	-	<0.05	<0.05	<0.2	<0.05	-	-	-	-	-	-	-	-	-	-	-				<0.001	<0.001	<0.001	-	<0.002	<0.001	-	-	-	-
JBS&G (2015)																																						
HHMW01	14/09/2015	0.005	<0.0001	<0.001	0.002	<0.001	<0.0001	0.001	<0.005	-	<0.02	<0.05	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.02	<0.05	<0.05	11	2.2	11	300	310	1300	<0.001	<0.001	<0.001	<0.003	<0.001	<0.002	-	-	-	-

Table B: Historical Groundwater Analytical Results

				Polycyclic Aromatic Hydrocarbons (PAHs)																								Chlorinated Alkanes										
		n-Butylbenzene	Total VOCs	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(a)pyrene	1-Methylnaphthalene	2-Methylnaphthalene	Benzo(b+k)fluoranthene	Benzo(k)fluoranthene	Benzo(b,j)fluoranthene	Benzo(g,h,i)perylene	Dibenz(a,h)anthracene	Indeno(1,2,3-c,d)pyrene	Total PAHs	Hardness	Total Cyanide	Oil and Grease	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	2,2-dichloropropane	bromodichloromethane
Unit		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L				mg/L	ng/CaCO3/l	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR		0.001	0.001	0.001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002						-	1	0.005	5												
ANZAST 2018 (95% Eco Marine Waters or as discussed i				0.05				0.0006	0.0001	0.001				0.0001																								
NEPC (2013) HSL Vapour intrusion				NL																																		
NHMRC (2011) (as amended December 2014) (Factor 10) – Health														0.0001																				0.03				2.5
Sample ID	Date																																					
PB (2009)																																						
MW01	12/01/2009	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.002			<0.001	<0.001	<0.001	-	-	-	-												
PBMW02a	12/01/2009	-	-	<0.001	<0.001	<0.001	<0.001	**0.004**	<0.001	**0.004**	0.003	<0.001	<0.001	<0.001	-	-	<0.002			<0.001	<0.001	<0.001	0.011	-	-	-												
PBMW03a	12/01/2009	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	0.003			<0.001	<0.001	<0.001	0.003	-	-	-												
PBMW04a	12/01/2009	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.002			<0.001	<0.001	<0.001	-	-	-	-												
JBS&G (2015)																																						
HHMW01	14/09/2015	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.0001	0.0001	0.0001	0.0001	0.0001	-	-	-	0.0001	0.0001	0.0001	<0.00001	<0.00001	0.0008	6100	-	-	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	<0.001

Table B: Historical Groundwater Analytical Results

										Chlorinated Alkenes												Chlorinated Benzenes					Monocyclic Aromatic Hydrocarbons											
		Carbon tetrachloride	Chloroethane	Chloroform	Chloromethane	Dibromochloromethane	Dichlorodifluoromethane	Dichloromethane	Trichlorofluoromethane	1,1,2,2-tetrachloroethylene	1,1-Dichloroethene	1,1-dichloropropene	2-chlorotoluene	3-chloropropene	4-chlorotoluene	cis-1,2-dichloroethene	cis-1,3-dichloropropene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Trichloroethene	Vinyl Chloride	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-Dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	1,2,4-trimethyl benzene	1,3,5-trimethyl benzene	4-isopropyl toluene	Bromobenzene	Isopropylbenzene	n-butyl benzene	n-propyl benzene	sec-butyl benzene	Styrene	Tert-butyl benzene	1,2-dibromoethane	2-Butanone (MEK)
Unit		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR																																							
ANZAST 2018 (95% Eco Marine Waters or as discussed i																																							
NEPC (2013) HSL Vapour intrusion																																							
NHMRC (2011) (as amended December 2014) (Factor 10) – Health		0.03		2.5		2.5		0.04		0.5	0.3									0.2[#3]	0.003			15		0.4									0.3		0.01	
Sample ID	Date																																						
PB (2009)																																							
MW01	12/01/2009																																						
PBMW02a	12/01/2009																																						
PBMW03a	12/01/2009																																						
PBMW04a	12/01/2009																																						
JBS&G (2015)																																							
HHMW01	14/09/2015	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	-	-	<0.001	-	<0.001	<0.001

Table B: Historical Groundwater Analytical Results

		Miscellaneous Hydrocarbons							
		2-Propanone (Acetone)	4-Methyl-2-pentanone (MIBK)	Bromoform	Bromomethane	Cyclohexane	Dibromomethane	Iodomethane	Carbon disulfide
Unit		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR									
ANZAST 2018 (95% Eco Marine Waters or as discussed i									
NEPC (2013) HSL Vapour intrusion									
NHMRC (2011) (as amended December 2014) (Factor 10) – Health				2.5	0.01				
Sample ID	Date								
PB (2009)									
MW01	12/01/2009								
PBMW02a	12/01/2009								
PBMW03a	12/01/2009								
PBMW04a	12/01/2009								
JBS&G (2015)									
HHMW01	14/09/2015	-	<0.001	<0.001	<0.001	-	<0.005	<0.001	<0.001

Table C: Sediment Analytical Results

Field_ID	Sampled_Date-Time	Matrix_Type	Metals & Metalloids								Polycyclic Aromatic Hydrocarbons																							TPHs (NEPC 1999)				
			Arsenic (Total)	Cadmium	Chromium (Total)	Copper	Lead	Mercury (Inorganic)	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ Calc (zero)	Benzo(a)pyrene TEQ Calc (half)	Benzo(a)pyrene TEQ Calc (PQL)	Benzo(b,j)fluoranthene	Benzo(b,k)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Total)	TOC Value	Normalised Total PAHs	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Total)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			2.00	0.40	1.00	1.00	1.00	0.05	1.00	1.00	0.10	0.10	0.10	0.10	0.05	0.50	0.50	0.50	0.50		0.10	0.50	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.50		0.50	20.00	20.00	50.00	50.00	50.00
NEPM 2013 Soil HIL D			3000#3	900	3600#4	240000	1500#5	730#6	6000	400000						40	40	40													4000#7							
DGV (ANZAST 2018)			20	1.5	80	65	50	0.15	21	200																							10					280
GV-high (ANZAST 2018)			70	10	370	270	220	1	52	410																							50					550
NEPM 2013 Soil HSL D for Vapour Intrusion - Sand 0 to <1m																												NL										
EIS (2017)																																						
BH8 1.25-1.75	29/05/2017	Fine	21	4.1	58	-	890	2.3	29	-	0.1	0.1	0.3	1.9	2	2.9	2.9	2.9	-	-	-	-	1.5	0.2	3.5	0.1	-	0.1	1	4.8	21.2	3.9	5.4	-	-	-	-	-
BH8 3.2-3.65	29/05/2017	Fine	<4	<0.4	13	-	14	<0.1	2	-	<0.1	<0.1	<0.1	0.1	0.07	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	0.2	<0.1	-	<0.1	<0.1	0.2	0.57	3.9	0.1	-	-	-	-	-
BH8 12.42-12.6	29/05/2017	Coarse	<4	<0.4	<1	-	<1	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH9 0-0.3	2/06/2017	Coarse	<4	<0.4	15	-	96	<0.1	8	-	<0.1	0.1	0.3	2	1.6	2.3	2.3	2.3	-	-	-	-	1.5	0.1	3.3	<0.1	-	<0.1	0.6	3.2	16.7	3.9	4.3	-	-	-	-	-
BH9 3.75-4.2	2/06/2017	Fine	<4	<0.4	23	-	12	<0.1	2	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH9 9.38-9.5	2/06/2017	Coarse	<4	<0.4	1	-	<1	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH10 11.37-11.5	1/06/2017	Coarse	<4	<0.4	15	-	9	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH10 1.9-2.35	1/06/2017	Coarse	10	2	26	-	500	1.5	12	-	<0.1	<0.1	0.2	1	1.4	2	2	2	-	-	-	-	0.7	0.1	1.5	0.1	-	0.2	0.6	3.1	12.7	3.9	3.3	-	-	-	-	-
BH10 4.55-5.0	1/06/2017	Fine	5	<0.4	9	-	17	<0.1	2	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH11 1.6-2.05	31/05/2017	Fine	<4	<0.4	14	-	11	<0.1	3	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH11 9.14-9.25	31/05/2017	Coarse	<4	<0.4	7	-	3	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH12 3.95-4.4	31/05/2017	Fine	<4	<0.4	17	-	69	<0.1	3	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH12 8.75-9.2	31/05/2017	Fine	9	0.5	13	-	14	<0.1	9	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH12 15.05-15.15	31/05/2017	Coarse	<4	<0.4	<1	-	2	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH13 0.3-0.8	30/05/2017	Fine	18	1	47	-	400	2	17	-	0.1	0.3	0.6	2.6	2.7	3.8	3.8	3.8	-	-	-	-	1.9	0.3	5	0.4	-	0.1	3.7	6.7	31.2	3.9	8.0	-	-	-	-	-
BH13 3.2-3.7	30/05/2017	Fine	<4	<0.4	20	-	17	<0.1	4	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH13 13.96-14.05	30/05/2017	Coarse	<4	<0.4	<1	-	1	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH14 0.55-1.05	5/06/2017	Fine	4	0.8	9	-	190	1	9	-	0.3	0.2	1	3.3	3.1	4.5	4.5	4.5	-	-	-	-	2.6	0.4	6.1	0.3	-	0.3	2.5	8.6	36.7	3.9	9.4	-	-	-	-	-
BH14 4.0-4.35	5/06/2017	Fine	19	2	15	-	410	2.8	14	-	5.3	0.5	16	23	13	21	21	21	-	-	-	-	21	2	59	7.9	-	5.2	52	57	297.4	3.9	76.3	-	-	-	-	-
BH14 7.73-7.85	5/06/2017	Coarse	<4	<0.4	<1	-	<1	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH15 4.72-5.17	14/02/2017	Coarse	<4	<0.4	7	-	13	<0.1	1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH15 5.49-5.6	14/02/2017	Coarse	<4	<0.4	1	-	8	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH16 0.85-1.3	6/02/2017	Fine	<4	<0.4	8	-	18	<0.1	1	-	<0.1	<0.1	<0.1	0.1	0.1	<0.5	<0.5	<0.5	-	-	-	-	0.1	<0.1	0.2	<0.1	-	<0.1	<0.1	0.5	1.4	3.9	0.4	-	-	-	-	-
BH16 3.9-4.25	6/02/2017	Fine	<4	<0.4	7	-	8	<0.1	1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH16 14.13-14.25	6/02/2017	Coarse	<4	<0.4	6	-	13	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH17 1.85-2.0	7/02/2017	Fine	17	2	31	-	320	2.5	12	-	0.3	<0.1	0.5	1.3	2	3.1	3.1	3.1	-	-	-	-	1.4	0.3	2.6	0.1	-	0.1	0.9	4	22.2	3.9	5.7	-	-	-	-	-
BH17 5.6-6.0	7/02/2017	Fine	<4	<0.4	19	-	4	<0.1	4	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH17 7.21-7.35	7/02/2017	Coarse	<4	<0.4	2	-	10	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH18 0.37-0.82	8/02/2017	Fine	<4	<0.4	12	-	7	<0.1	4	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH18 13.6-13.75	9/02/2017	Coarse	<4	<0.4	1	-	4	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH19 0.95-1.4	8/02/2017	Fine	21	<0.4	24	-	11	<0.1	3	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH19 7.5-7.95	8/02/2017	Coarse	<4	<0.4	13	-	2	<0.1	1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH19 9.86-9.95	13/02/2017	Coarse	<4	<0.4	13	-	4	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH20 0.0-0.05	9/02/2017	Fine	25	<0.4	34	-	69	0.4	11	-	0.2	<0.1	0.3	0.6	0.82	1.3	1.3	1.3	-	-	-	-	0.6	0.1	1.6	<0.1	-	<0.1	0.4	2.7	10.82	3.9	2.8	-	-	-	-	-
BH20 1.2-1.65	9/02/2017	Coarse	8	<0.4	8	-	7	<0.1	2	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH20 15.59-13.7	10/02/2017	Coarse	<4	<0.4	1	-	4	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH20 15.59-13.7	10/02/2017	Coarse	<4	<0.4	1	-	4	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH21 0.0-0.1	13/02/2017	Fine	16	<0.4	22	-	190	1.7	10	-	0.3	<0.1	0.6	0.9	1	1.7	1.7	1.7	-	-	-	-	1.1	0.2	2.7	0.2	-	0.1	1.1	3	15.8	3.9	4.1	-	-	-	-	-
BH21 0.4-0.5	13/02/2017	Fine	14	<0.4	29	-	19	<0.1	6	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH21 12.51-12.61	13/02/2017	Coarse	<4	<0.4	2	-	18	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH22 0.0-0.05	10/02/2017	Fine	29	3	65	-	640	4.4	26	-	0.8	<0.1	0.9	2.2	4.7	7.4	7.4	7.4	-	-	-	-	2.1	0.7	4	0.3	-	0.3	1.6	7.3	45.7	3.9	11.7	-	-	-	-	-
BH22 0.4-0.5	13/02/2017	Fine	25	<0.4	23	-	7	<0.1	4	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH22 9.4-9.55	10/02/2017	Coarse	<4	<0.4	2	-	9	<0.1	<1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH23 0.0-0.1	13/02/2017	Coarse	7	<0.4	10	-	50	0.3	4	-	<0.1	<0.1	<0.1	<0.1	0.1	<0.5	<0.5	<0.5	-	-	-	-	0.1	<0.1	0.1	<0.1	-	<0.1	<0.1	0.2	1.1	3.9	0.3	-	-	-	-	-
BH23 1.5-1.95	13/02/2017	Fine	<4	<0.4	25	-	17	<0.1	7	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH23 10.01-10.15	13/02/2017	Coarse	<4	<0.4	3	-	10	<0.1	5	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
BH24 0.0-0.5	15/02/2017	Fine	<4	0.7	27	-	270	1.2	9	-	0.7	<0.1	0.7	1.9	1.6	2.5	2.5	2.5	-	-	-	-	1.9	0.2	4.5	0.3	-	0.3	1.6	5	23.5	3.9	6.0	-	-	-	-	-
BH24 1.0-1.5	15/02/2017	Coarse	<4	<0.4	12	-	9	<0.1	2	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	0.1	0.1	3.9	0.0	-	-	-	-	-
BH24 5.71-5.81	15/02/2017	Coarse	<4	<0.4	12	-	16	<0.1	7	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	3.9	LOR	-	-	-	-	-
PB (2009)																																						
Field_ID	Sampled_Date-Time	Depth (m)																																				
PBSS01	14-31/01/2009	0.0-0.4	24	4	65	290	639	3.45	24	1150	<0.5	0.07	0.17	0.51	1.03	-	-	-	-	1.67	0.65	-	0.51	0.22	0.93	<0.5	0.58	0.08	0.4	1.51	60.1	7.2	8	<10	<50	1100	1080	2180
PBSS01	14-31/01/2009	0.5-1.0	25	3	55	258	462	3.42	22	867	<0.5	0.1	0.98	0.8	1.59	-	-	-	-	2.37	0.93	-	0.73	0.31	1.31	0.08	0.86	0.14	1.03	2.17	79.1	5.9	13	<10	<50	1150	1040	2190
PBSS01	14-31/01/2009	1.0-1.5	28	4	67	275	414	3.26	23	838	0.09	0.25	0.6	1.96	4.21	-	-	-	-	6.04	2.09	-	1.96	0.74	3.64	0.19	2.19	0.15	1.13	5.13	16.1	5.3	30	<10	<50	1970	1580	3550
PBSS02	14-31/01/2009	0.0-0.4	23	1	53	263	333	2.79	15	619	<0.5	0.08	0.13	0.48	1.32	-	-	-	-	1.83	0.78	-	0.5	0.25	0.88	<0.5	0.75	<0.5	0.28	1.18	50.9	6	8	<10	<50	420	530	950
PBSS03	14-31/01/2009	0.0-0.4	20	1	31	109	209	2.21	11	323	<0.5	0.38	0.83	3.75	9.17	-	-	-	-	12.5	4.63	-	3.63	1.54	8.92	0.21	4.71	<0.5	1.08	12.75	153.8	2.4	64	<10	<50	670	510	1180
PBSS04	14-31/01/2009	0.0-0.4	19	2	61	287	495	14.8	32	849	<0.5	0.1	0.15	0.45	1.15	-	-	-	-	1.77	0.71	-	0.5	0.26	0.81	<0.5	0.68	<0.5	0.31	1.13	49.6	6.2	8	<10	<50	780	940	1720
PBSS05	14-31/01/2009	0.0-0.4	19	2	53	288	408	2.98	20	806	<0.5	0.09	0.15	0.47	1.2	-	-	-	-	1.82	0.65	-	0.53	0.24	0.91	<0.5	0.67	<0.5	0.33	1.22	45.5	5.5	8	<10	<50	670	920	1590
PBSS05	14-31/01/2009	0.5-1.0	22	3	64	272	607	3.08	23	923	<0.5	0.09	0.19	0.55	1.34	-	-	-	-	2.07	0.71	-	0.67	0.26	1.1	<0.5	0.72	<0.5	0.43	1.81	57.7	5.8	10	<10	<50	780	810	1590
PBSS05	14-31/01/2009	1.0-1.5	26	3	60	271	560	3.93	22	941	<0.5	0.1	0.27	0.94	1.87	-	-	-	-	2.69	0.87	-	1.02	0.31	1.85	<0.5	0.88	<0.5	0.54	2.71	73	5.2	14	<10	<50	1330	1280	2610
PBSS06	14-31/01/2009	0.0-0.4	16	<0.1	27	9	22	0.27	7	34	<0.5	<0.5	<0.5	0.69	0.88	-	-	-	-	1.25	0.38	-	0.81	LPQL	2.56	<0.5	0.38	<0.5	<0.5	2.63	15.3	1.6	10	<10	<50	<100	<100	--
PBSS06	14-31/01/2009	0.5-1.0	6	<0.1	11	6	19	0.19	2	20	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.3	<0.5	<0.5	<10	<50	<100	<100	--
PBSS07	14-31/01/2009	0.0-0.4	25	4	60	309	684	3.33	25	1080	<0.5	<0.5	0.17	0.44	1.15	-	-	-	-	1.67	0.6	-	0.42	0.21	0.79	<0.5	0.58	<0.5	0.33	1.6	38.2	4.8	8	<10	<50	690	710	1400
PBSS07	14-31/01/2009	0.5-1.0	36	<0.1	21	<2	9	0.36	4	8	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100	--
PBSS08	14-31/01/2009	0.0-0.4	21	2	60	321	558	2.97	21	984	LPQL	<0.5	0.12	0.37	0.75	-	-	-	-	1.18	0.47	-	0.43	0.12	0.75	<0.5	0.39	<0.5	0.27	1.06	30.1	5.1	6	<10	<50	400	470	870
PBSS09	14-31/01/2009	0.0-0.4	12	0	16	103	207	2.57	9	297	0.24	0.21	1	2.59	2.38	-	-	-	-	3.45	1.14	-	2.55	0.34	6.83	0.48	0.97	0.17	2.59	6.79	92	2.9	32	<10	<50	260	110	370
PBSS09	14-31/01/2009	0.5-1.0	16	<0.1	29	3	13	0.33	3	6	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	<10	<50	<100	<100	--
PBSS10	14-31/01/2009	0.0-0.4	8	1	25	71	165	0.74	6	211	<0.5	<0.5	nd	0.75	1.58	-	-	-	-	2.5	1	-	0.75	LPQL	1.33	<0.5	0.83	<0.5	0.5	1.83	13.3	1.2	11	<10	<50	270	340	610
PBSS10	14-31/01/2009	0.5-1.0	4	<0.1	14	2	14	0.07	5	10	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<10	<50	<100	<100	--
PBSS11	14-31/01/2009	0.0-0.4	19	3	65	386	900	3.49	28	1340	<0.5	0.1	0.14	0.51	0.94	-	-	-	-	1.59	0.54	-	0.58	0.17	0.9	<0.5	0.46	<0.5	0.33	1.41	53	6.9	8	<10	<50	1830	2180	4010
PBSS11	14-31/01/2009	0.5-1.0	36	4	63	283	722	3.44	29	1130	<0.5	0.17	0.69	1.83	2.34	-	-	-	-	3.71	1.11	-	1.97	0.34	4.34	0.2	1	0.2	1.11	5.49	85.8	3.5	25	<10	<50	1480	1340	2820
PBSS12	14-31/01/2009	0.0-0.4	26	7	71	370	1270	13.5	44	1660	0.2	0.14	0.54	1.61	1.59	-	-	-	-	2.54	0.73	-	1.58	0.25	3.69	0.25	0.66	0.15	1.32	3.83	112.7	5.9	19	<10	290	2560	2150	5000
PBDS01	14-31/01/2009	0.0-0.4	14	1	48	233	325	1.6	15	1160	<0.5	<0.5	0.18	0.56	1	-	-	-	-	1.47	0.5	-	0.56	0.15	0.94	<0.5	0.44	<0.5	0.35	1.29	25.3	3.4	7	<10	<50	400	520	920
PBDS02	14-31/01/2009	0.0-0.4	17	1	58	369	504	2.73	21	941	<0.5	<0.5	0.13	0.44	0.67	-	-	-	-	1.09	0.36	-	0.41	0.11	0.75	<0.5	0.31	<0.5	0.27	0.98	35.3	6.4	6	<10	<50	790	1040	1830
PBDS03	14-31/01/2009	0.0-0.4	13	2	44	240	502	5.04	21	909	<0.5	<0.5	0.26	0.84	1.16	-	-	-	-	2.11	0.58	-	1	0.16	1.84	<0.5	0.5	<0.5	0.84	2.26	43.9	3.8	12	<10	<50	750	870	1620
PBDS04	14-31/01/2009	0.0-0.4	12	2	30	221	427	2.23	31	862	0.21	0.24	0.85	2.55	2.61	-	-	-	-	4.24	1.09	-	2.73	0.33	5.58	0.33	1.09	0.24	2.03	5.88	99	3.3	30	<10	<50	990	840	1830
PBDS05	14-31/01/2009	0.0-0.4	2	0	9	50	85	*<0.25	9	177	<0.5	<0.5	1	2.5	2.17	-	-	-	-	3.33	1	-	2.33	<0.5	5.33	<0.5	1	<0.5	3.5	5.33	16.5	0.6	28	<10	<50	120	190	310
PBDS06	14-31/01/2009	0.0-0.4	7	1	31	174	317	1.17	19	751	<0.5	0.26	0.47	1.18	1.15	-	-	-	-	2.06	0.53	-	1.18	0.21	2.38	0.15	0.5	<0.5	1.41	2.44	47.3	3.4	14	<10	<50	1410	1590	3000

Table C: Sediment Analytical Results

TRHs (NEPC 2013)									BTEX						PCBs			Organochlorine Pesticides																								TBT and TOC				
C6-C10 Fraction	>C10-C16 Fraction	>C10-C16 Fraction (Silica Gel Cleanup)	>C16-C34 Fraction	>C16-C34 Fraction (Silica Gel Cleanup)	>C34-C40 Fraction	>C34-C40 Fraction (Silica Gel Cleanup)	C6 - C10 less BTEX (F1)	>C10 - C16 less Naphthalene (F2)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene (Total)	PCBs (Total)	TOC Value	Normalised PCBs (Total)	Aldrin	Dieldrin	DDD	o.p-+p.p DDD	4,4-DDE	DDT	alpha-BHC	beta-BHC	gamma-BHC	delta-BHC	Chlordane	alpha-Chlordane	gamma-Chlordane	Endosulfan alpha	Endosulfan beta	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	Heptachlor	Heptachlor Epoxide	Lindane	Methoxychlor	Toxaphene	Monobutyltin as Sn	Dibutyltin as Sn	Tributyltin as Sn	Total Organic Carbon %	Normalised Tributyltin as Sn
mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ng/g	ng/g	ng/g	%	ng/g
20.00	50.00	50.00	100.00	100.00	100.00	100.00	20.00	50.00	0.10	0.10	0.10	0.20	0.10	0.30	0.10		0.10	0.05	0.05	0.05	0.10	0.05	0.05	0.05	0.05		0.05	0.10			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.10	1.00					
															7[#8]			45										530						100			50			2500	160					
																	0.0340		0.0028		0.0035	0.0014	0.0012						0.0045					0.0027					0.0009							9
																	0.28		0.0070		0.0090	0.0070	0.0050						0.0090					0.0600					0.0014							70
							260[#15]	NL[#16]	3	NL	NL			230																																

-	-	-	-	-	-	-	<25	130	<0.2	<0.5	-	-	<1	<3	0.3	3.9	0.0769231	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	70	<0.2	<0.5	-	-	<1	<3	0.2	3.9	0.0512821	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	87	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-
-	-	-	-	-	-	-	<25	<50	<0.2	<0.5	-	-	<1	<3	<0.1		LOR	-	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	3.9	-

-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	1	11	7.2	1.5
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	<0.5	1	5.9	0.2
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	<0.5	<0.5	5.3	<0.5
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	4	21	6	3.5
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	1	1	2.4	0.5
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	3	30	6.2	4.8
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	2	20	5.5	3.6
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	2	32	5.8	5.5
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	<0.5	1	5.2	0.2
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	<0.5	<0.5	1.6	<0.5
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	<0.5	<0.5	<0.5	<0.5
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	2	19	4.8	4
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	<0.5	<0.5	<0.5	<0.5
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	3	43	5.1	8.4
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	<0.5	<0.5	2.9	<0.5
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	<0.5	<0.5	1.4	<0.5
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	5	6	1.2	5.1
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	<0.5	<0.5	0.7	<0.5
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	1	23	6.9	3.3
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	1	7	3.5	2.1
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	<0.5	<0.5	5.9	<0.5
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	1	14	94	3.4	27.6
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	1	11	6.4	1.7
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	3	24	3.8	6.3
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	1	5	3.3	1.4
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	1	3	0.6	4.3
-	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<1	<0.5	--	<3.0		LOR	<0.001	<0.001	<0.001	-	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	<0.005	-	<0.5	1	3	3.4	0.8

Appendix C – Historical Borelogs

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB BH01

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**17/12/08**
Project:	**Landbased Drilling**	Date Completed:	**17/12/08**
Borehole Location:	**Blackwattle Bay**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Solid Auger**	Driller:	**Macquarie**	Surface RL:	**2 m**
Borehole Diameter:	**100 mm**	Driller Lic No:		Co-ords:	

Borehole Information | **Field Material Description**

1 METHOD	2 SUPPORT	3 WATER	4 WELL CONSTRUCTION	5 RL(m)	5 DEPTH(m)	6 FIELD TEST	7 SAMPLE	8 GRAPHIC LOG	9 USC SYMBOL	10 SOIL/ROCK MATERIAL FIELD DESCRIPTION	11 MOISTURE	12 RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	13 STRUCTURE AND ADDITIONAL OBSERVATIONS
AS					0.05	PID=0.0 ppm	J			Bitumen	M		
										FILL - sandy clay, medium grained, yellow brown, gravels			
						PID=0.0 ppm	J						minor brick fragments
				1	1	PID=0.0 ppm	J						
				0	2	PID=0.0 ppm	J						
		18/12/08		-1	3	PID=0.0 ppm	J				W		as above, but becomes wet
					3.20					SANDSTONE, medium grained, yellow brown			
				-2	4	PID=0.0 ppm	J						
					4.50					END OF BOREHOLE AT 4.50 m			
				-3	5								
				-4	6								

Land based drilling at Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB BH02 (MW02A)

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**18/12/08**
Project:	**Landbased Drilling**	Date Completed:	**18/12/08**
Borehole Location:	**Blackwattle Bay**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Solid Auger**	Driller:	**MacQuarrie**	Surface RL:	**2 m**
Borehole Diameter:	**100 mm**	Driller Lic No:		Co-ords:	

Borehole Information | **Field Material Description**

1 METHOD	2 SUPPORT	3 WATER	4 WELL CONSTRUCTION (TOC 0 m AGL)	5 RL(m)	5 DEPTH(m)	6 FIELD TEST	7 SAMPLE	8 GRAPHIC LOG	9 USC SYMBOL	10 SOIL/ROCK MATERIAL FIELD DESCRIPTION	11 MOISTURE	12 RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	13 STRUCTURE AND ADDITIONAL OBSERVATIONS
AS			Flush Gatic and Lockable Cap		0.05	PID=0.0 ppm	J			Bitumen	M		
										FILL - sandy clay, medium grained, yellow brown, gravels			Dup1, Dup2
						PID=0.0 ppm	J						
				1	1	PID=0.0 ppm	J						
		12/1/09											
				0	2	PID=0.0 ppm	J						
			Bentonite Seal										
					2.50				ML	SILT, grey brown, medium grained	W		
		18/12/08		-1	3	PID=0.0 ppm	J						as above, but becomes wet
					3.50				ML	SILT, marine sediments, grey brown, shells, medium grained			
			50mm uPVC Screen	-2	4	PID=0.0 ppm	J						
				-3	5								
			End Cap	-4	6	PID=0.0 ppm	J						
					6.30					END OF BOREHOLE AT 6.30 m			

Land based drilling at Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB BH03

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**18/12/08**
Project:	**Landbased Drilling**	Date Completed:	**18/12/08**
Borehole Location:	**Blackwattle Bay**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Solid Auger**	Driller:	**MacQuarrie**	Surface RL:	**2 m**
Borehole Diameter:	**100 mm**	Driller Lic No:		Co-ords:	

Borehole Information | **Field Material Description**

1 METHOD	2 SUPPORT	3 WATER	4 WELL CONSTRUCTION	5 RL(m)	5 DEPTH(m)	6 FIELD TEST	7 SAMPLE	8 GRAPHIC LOG	9 USC SYMBOL	10 SOIL/ROCK MATERIAL FIELD DESCRIPTION	11 MOISTURE	12 RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	13 STRUCTURE AND ADDITIONAL OBSERVATIONS
AS					0.05	PID=0.0 ppm	J			Bitumen	M		
										FILL - sandy clay, medium grained, yellow brown, gravels			
						PID=0.0 ppm	J						
				1	1	PID=0.0 ppm	J						Dup3, Dup4
				0	2	PID=0.0 ppm	J						
		18/12/08		-1	3	PID=0.0 ppm	J				W		as above, but becomes wet
				-2	4	PID=0.0 ppm	J						
					4.50				ML	SILT, Marine sediments, grey brown, shells, medium grained			
				-3	5								slight organic odour
				-4	6	PID=0.0 ppm	J						
					6.10					SANDSTONE, medium grained, yellow brown			
					6.20					END OF BOREHOLE AT 6.20 m			

Land based drilling at Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB BH04 (MW03A)

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**17/12/08**
Project:	**Landbased Drilling**	Date Completed:	**17/12/08**
Borehole Location:	**Blackwattle Bay**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Solid Auger**	Driller:	**MacQuarrie**	Surface RL:	**2 m**
Borehole Diameter:	**100 mm**	Driller Lic No:		Co-ords:	

Borehole Information (1–7) | **Field Material Description** (8–13)

1 METHOD	2 SUPPORT	3 WATER	4 WELL CONSTRUCTION (TOC 0 m AGL)	5 RL(m)	5 DEPTH(m)	6 FIELD TEST	7 SAMPLE	8 GRAPHIC LOG	9 USC SYMBOL	10 SOIL/ROCK MATERIAL FIELD DESCRIPTION	11 MOISTURE	12 RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	13 STRUCTURE AND ADDITIONAL OBSERVATIONS
AS			Flush Gatic and Lockable Cap			PID=0.0 ppm	J			Concrete	M		
					0.29	PID=0.0 ppm	J			FILL - sandy clay, medium grained, orange brown, gravels			
				1	1	PID=0.0 ppm	J						
		18/12/09											
			Bentonite Seal	0	2	PID=0.0 ppm	J						
		18/12/08		-1	3	PID=0.0 ppm	J				W		as above, but becomes wet
					3.50				ML	SILT, Marine sediments, grey brown, shells, medium grained			
			50mm uPVC Screen	-2	4	PID=0.0 ppm	J						Slight organic odour
													Not recoverable due to water inflow washing away sample
				-3	5								
			End Cap	-4	6								
					6.30					END OF BOREHOLE AT 6.30 m			

Land based drilling at Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB BH05 (MW04A)

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**17/12/08**
Project:	**Landbased Drilling**	Date Completed:	**17/12/08**
Borehole Location:	**Blackwattle Bay**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Solid Auger**	Driller:	**MacQuarrie**	Surface RL:	**2 m**
Borehole Diameter:	**100 mm**	Driller Lic No:		Co-ords:	

Borehole Information (1–7) | **Field Material Description** (8–13)

1 METHOD	2 SUPPORT	3 WATER	4 WELL CONSTRUCTION (TOC 0 m AGL)	5 RL(m)	5 DEPTH(m)	6 FIELD TEST	7 SAMPLE	8 GRAPHIC LOG	9 USC SYMBOL	10 SOIL/ROCK MATERIAL FIELD DESCRIPTION	11 MOISTURE	12 RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	13 STRUCTURE AND ADDITIONAL OBSERVATIONS
AS			Flush Gatic and Lockable Cap		0.05	PID=0.0 ppm	J			Bitumen	M		
						PID=0.0 ppm	J			FILL - sandy clay, medium grained, brown			
				1	1	PID=0.0 ppm	J						
		12/01/09			1.50					FILL - sandy clay, medium grained, yellow brown			
				0	2	PID=0.0 ppm	J						
			Bentonite Seal										
		18/12/08									W		as above, but becomes wet
				-1	3	PID=0.0 ppm	J						
			50mm uPVC Screen	-2	4	PID=0.0 ppm	J						
				-3	5								
					5.50				ML	SILT, marine sediments, grey brown, shells, medium grained			
			End Cap	-4	6	PID=0.0 ppm	J						slight organic odour
					6.50					END OF BOREHOLE AT 6.50 m			

Land based drilling at Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB HA01

Client:	**Maritime Authority**	Date Commenced:	**12/01/09**
Project:	**Landbased Drilling**	Date Completed:	**12/01/09**
Borehole Location:	**Blackwattle Bay**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Solid Auger**	Driller:	**Macquarrie**	Surface RL:	**2 m**
Borehole Diameter:	**100 mm**	Driller Lic No:		Co-ords:	

Borehole Information | **Field Material Description**

1 METHOD	2 SUPPORT	3 WATER	4 WELL CONSTRUCTION	5 RL(m)	5 DEPTH(m)	6 FIELD TEST	7 SAMPLE	8 GRAPHIC LOG	9 USC SYMBOL	10 SOIL/ROCK MATERIAL FIELD DESCRIPTION	11 MOISTURE	12 RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	13 STRUCTURE AND ADDITIONAL OBSERVATIONS
AS				0.05		PID=0.0 ppm	J			Gravel and wood	D		
						PID=0.0 ppm	J			FILL - sandy clay, medium grained, yellow brown, gravels, wood, concrete, metal, plastic			
				0.40						END OF BOREHOLE AT 0.40 m			
				1	1								
				0	2								
				-1	3								
				-2	4								
				-3	5								
				-4	6								

Land based drilling at Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB HA02

Client:	**Maritime Authority**	Date Commenced:	**12/01/09**
Project:	**Landbased Drilling**	Date Completed:	**12/01/09**
Borehole Location:	**Blackwattle Bay**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Solid Auger**	Driller:	**Macquarie**	Surface RL:	**2 m**
Borehole Diameter:	**100 mm**	Driller Lic No:		Co-ords:	

Borehole Information									Field Material Description					
1	2	3	4		5		6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION		RL(m)	DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
AS						0.05	PID=0.0 ppm	J			Bitumen	D		
						0.30					FILL - sandy clay, medium grained, yellow brown, gravels, wood, concrete, metal, plastic			
											END OF BOREHOLE AT 0.30 m			
					1	1								
					0	2								
					-1	3								
					-2	4								
					-3	5								
					-4	6								

Land based drilling at Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB DSS01

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**3.8m deep, 8:20am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Diver**	Driller:		Surface RL:	**-2.4 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332608 N 6250306**

Borehole Information									Field Material Description				
1	2	3	4		5		6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION		RL(m)	DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
DI							PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour
						0.40					END OF BOREHOLE AT 0.40 m			
					-3									
						1								
					-4									

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB DSS02

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**3.6m deep, 8:10am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Diver**	Driller:		Surface RL:	**-2.3 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332666 N 6250273**

Borehole Information									Field Material Description				
1	2	3	4		5		6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION		RL(m)	DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
DI							PID=0 ppm	J		OL	CLAYEY SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour, some coal granules
						0.40					END OF BOREHOLE AT 0.40 m			
					-3									
						1								
					-4									

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB DSS03

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**2.0m deep, 8:05am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Diver**	Driller:		Surface RL:	**-0.7 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332703 N 6250299**

Borehole Information									Field Material Description				
1	2	3	4		5		6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION		RL(m)	DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
DI							PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour
					-1									
					0.40						END OF BOREHOLE AT 0.40 m			
						1								
					-2									

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB DSS04

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**0.4m deep, 7:58am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Diver**	Driller:		Surface RL:	**0.9 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332750 N 6250337**

Borehole Information									Field Material Description				
1	2	3	4		5		6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION		RL(m)	DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
DI							PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour, some coal granules
						0.40					END OF BOREHOLE AT 0.40 m			
					0									
						1								
					-1									

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB DSS05

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**0.5m deep, 7:50am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Diver**	Driller:		Surface RL:	**0.7 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332773 N 6250376**

Borehole Information								Field Material Description					
1	2	3	4	5		6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m)	DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
DI						PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Dup 201, Dup 202
				0.40						END OF BOREHOLE AT 0.40 m			
				0									
					1								
				-1									

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB DSS06

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**0.7m deep, 7:45am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Diver**	Driller:		Surface RL:	**0.5 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332790 N 6250359**

Borehole Information									Field Material Description					
1	2	3	4		5		6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION		RL(m)	DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
DI							PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour, leaves and twigs
						0.40					END OF BOREHOLE AT 0.40 m			
					0									
						1								
					-1									

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB SS01

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**6.5m deep, 10:08am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Drop Core**	Driller:		Surface RL:	**-4.7 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332626 N 6250256**

Borehole Information | **Field Material Description**

1 METHOD	2 SUPPORT	3 WATER	4 WELL CONSTRUCTION	5 RL(m) / DEPTH(m)	6 FIELD TEST	7 SAMPLE	8 GRAPHIC LOG	9 USC SYMBOL	10 SOIL/ROCK MATERIAL FIELD DESCRIPTION	11 MOISTURE	12 RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	13 STRUCTURE AND ADDITIONAL OBSERVATIONS
PT					PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour
				-5								
				0.50				SC	clayey SAND, medium grained, medium plasticity, sediment, dark grey			
					PID=0 ppm	J						
				1								
					PID=0 ppm	J						
				-6								
				1.80					END OF BOREHOLE AT 1.80 m			

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB SS02

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**7.4m deep, 8:32am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Diver**	Driller:		Surface RL:	**-6 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332569 N 6250327**

Borehole Information								Field Material Description					
1	2	3	4		5		6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION		RL(m)	DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
DI							PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour
					0.40						END OF BOREHOLE AT 0.40 m			
					-7	1								

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB SS03

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**8.5m deep, 10:14am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Drop Core**	Driller:		Surface RL:	**-6.7 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332612 N 6250359**

Borehole Information								Field Material Description					
1	2	3	4	5		6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m)	DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT						PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour
				-7									refusal
					0.80					END OF BOREHOLE AT 0.80 m			
					1								
				-8									

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB SS04

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**7.6m deep, 10:27am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Drop Core**	Driller:		Surface RL:	**-5.7 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332642 N 6250331**

Borehole Information | **Field Material Description**

1 METHOD	2 SUPPORT	3 WATER	4 WELL CONSTRUCTION	5 RL(m) / DEPTH(m)	6 FIELD TEST	7 SAMPLE	8 GRAPHIC LOG	9 USC SYMBOL	10 SOIL/ROCK MATERIAL FIELD DESCRIPTION	11 MOISTURE	12 RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	13 STRUCTURE AND ADDITIONAL OBSERVATIONS
PT					PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour
				-6								refusal
				0.80					END OF BOREHOLE AT 0.80 m			
				1								
				-7								

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB SS05

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**7.2m deep, 10:35am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Drop Core**	Driller:		Surface RL:	**-5.3 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332658 N 6250315**

Borehole Information | **Field Material Description**

1 METHOD	2 SUPPORT	3 WATER	4 WELL CONSTRUCTION	5 RL(m) / DEPTH(m)	6 FIELD TEST	7 SAMPLE	8 GRAPHIC LOG	9 USC SYMBOL	10 SOIL/ROCK MATERIAL FIELD DESCRIPTION	11 MOISTURE	12 RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	13 STRUCTURE AND ADDITIONAL OBSERVATIONS
PT					PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour
				0.50	PID=0 ppm	J		SC	clayey SAND, medium grained, medium plasticity, sediment, dark grey			
				-6								
				1.00 -1	PID=0 ppm	J		CH	CLAY, medium to high plasticity, red brown mottled			
				1.50					END OF BOREHOLE AT 1.50 m			
				-7								

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB SS06

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**8.2m deep, 10:20am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Drop Core**	Driller:		Surface RL:	**-6.4 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332664 N 6250349**

Borehole Information								Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT					PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour
				0.50	PID=0 ppm	J		SC	clayey SAND, medium grained, medium plasticity, sediment, dark grey			
				-7								
				1.00 1					END OF BOREHOLE AT 1.00 m			
				-8								

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB SS07

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**7.9m deep, 10:42am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Drop Core**	Driller:		Surface RL:	**-6.1 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332639 N 6250370**

Borehole Information | **Field Material Description**

1 METHOD	2 SUPPORT	3 WATER	4 WELL CONSTRUCTION	5 RL(m) / DEPTH(m)	6 FIELD TEST	7 SAMPLE	8 GRAPHIC LOG	9 USC SYMBOL	10 SOIL/ROCK MATERIAL FIELD DESCRIPTION	11 MOISTURE	12 RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	13 STRUCTURE AND ADDITIONAL OBSERVATIONS
PT					PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour, shells
				0.50	PID=0 ppm	J		CH	CLAY, medium plasticity, red brown mottled			Dup 207
				-7								
				1.00 1					END OF BOREHOLE AT 1.00 m			
				-8								

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB SS08

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**7.2m deep, 10:50am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Drop Core**	Driller:		Surface RL:	**-5.4 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332666 N 6250400**

Borehole Information								Field Material Description					
1	2	3	4	5		6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m)	DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT						PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Dup 203, Dup 204
													refusal
					0.50					END OF BOREHOLE AT 0.50 m			
				-6									
					1								
				-7									

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB SS09

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**6.9m deep, 11:15am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Drop Core**	Driller:		Surface RL:	**-5.2 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332691 N 6250374**

Borehole Information								Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT					PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour
				0.50	PID=0 ppm	J		CH	CLAY, medium plasticity, red brown mottled			
				-6								
				1.00 1					END OF BOREHOLE AT 1.00 m			
				-7								

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB SS10

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**6.9m deep, 10:55am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Drop Core**	Driller:		Surface RL:	**-5.1 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332690 N 6250342**

Borehole Information								Field Material Description					
1	2	3	4	5		6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m)	DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT						PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour
					0.50	PID=0 ppm	J		CH	CLAY, medium plasticity, red brown mottled			
				-6									
					1.00 1					END OF BOREHOLE AT 1.00 m			
				-7									

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB SS11

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**6.3m deep, 11:00am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Drop Core**	Driller:		Surface RL:	**-4.5 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332729 N 6250362**

Borehole Information								Field Material Description					
1	2	3	4		5		6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION		RL(m)	DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT							PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour
					-5	0.50	PID=0 ppm	J		SC	clayey SAND, medium grained, medium plasticity, sediment, dark grey			
						1.00 1					END OF BOREHOLE AT 1.00 m			
					-6									

Samples taken from Sediment in Blackwattle Bay

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BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

PB SS12

SHEET 1 OF 1

Client:	**Maritime Authority**	Date Commenced:	**14/01/09**
Project:	**Sediment Sampling**	Date Completed:	**14/01/09**
Borehole Location:	**4.0m deep, 11:09am**	Recorded By:	**DH**
Project Number:	**2116954A**	Log Checked By:	**MW**

Drill Model/Mounting:	**Drop Core**	Driller:		Surface RL:	**-2.3 m**
Borehole Diameter:	**0.1 mm**	Driller Lic No:		Co-ords:	**E 332758 N 6250386**

Borehole Information								Field Material Description					
1	2	3	4	5		6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m)	DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT						PID=0 ppm	J		OL	clayey SILT, medium plasticity, sediment, dark grey	W		Sulfurous odour, gravels on bottom; refusal
					0.50					END OF BOREHOLE AT 0.50 m			
				-3									
					1								
				-4									

Samples taken from Sediment in Blackwattle Bay

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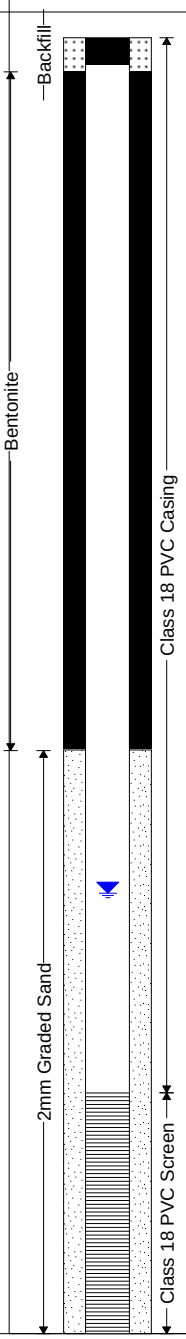
JBS&G	**Well No: HHBH01**	**Project No:** 50460 **Client:** UrbanGrowth NSW **Project Name:** Bays Precinct Investigation **Site Address:** Hymix Plant, Bank St, Pyrmont, NSW

Date: 14/08/2015	**Eastings (MGA):** -	**Water Level Initial (mbgs):** 3.0
Contractor: Rockwell	**Northings (MGA):** -	**Water Level Static (mbgs):** 3.0
Drill Rig: Geoprobe	**Reference Level:** Ground Level	**Casing Type/Surface Finish:** Gatic
Method: SFA	**Elevation: Surface (m)** 0 **TOC (m):** 0	**Screen Diameter (mm):** 50 **Screen Length (m):** 3.0
Total Hole Depth (mbgs): 7.5	**Bore Diameter (mm):** 125	**Casing Diameter (mm):** 50 **Casing Length (m):** 3.7

SUBSURFACE PROFILE			SAMPLE			
Depth (m)	**Graphic Log**	**Lithologic Description**	**Sample ID**	**PID (ppm)**	**Sample Type**	**Comments**
		Ground Surface				
0.0		**Concrete**				
		Fill Gravelly sand, brown, heterogeneous, damp, medium density, fine-coarse grained, with sandstone, concrete and igneous gravels.	0.12-0.2	0	U	No odour, staining or ACM observed.
		Fill Gravelly clayey sand, black with brown clays, heterogeneous, damp, medium density, fine grained, with inclusions of sandstone and concrete gravels.	0.5-0.6	0	U	No odour, staining or ACM observed.
1.0						
		Fill As above, but saturated.				
2.0			2.0-2.1	0	U	No odour, staining or ACM observed.
3.0			3.0-3.1	0	U	No odour, staining or ACM observed. QC01/QC01A collected. Groundwater encountered.
		Silty Clay Silty clay, brown-black, homogeneous, moist, high plasticity, stiff with inclusions of organic matter.				
4.0			4.0-4.1	0	U	No staining or ACM observed. Organic odour observed.

Well Construction



Method	*Sample Type*	*Reference Level*	*Casing Type/Surface Finish*	*Log Details*
HA - Hand Auger	*U - Undisturbed tube sample*	*AHD - Australian Height Datum*	*PVC 18 - Class 18 PVC*	*Logged By:* KS
SFA - Solid Flight Auger	*D - Disturbed sample*	*BGS - Below Ground Surface*	*MT - Monument*	*Project Manager:* JR
HFA - Hollow Flight Auger	*CS - Core sample*	*TOC - Top of Casing*	*RB - Roadbox*	
PT - Push Tube			*SP - Stickup/Standpipe*	
AH - Air Hammer				

NOTE: This bore log is for environmental assessment purposes only and is not intended to provide geotechnical information

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 8

EASTING: 332532
NORTHING: 6250240

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -4.50 m
Date: 29/5/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						-5	1			-				
	■			■	N=0 0,0,0	-6	2		CH	SILTY CLAY: high plasticity, dark grey/black, trace of shell fragments.	MC>PL	VS	<10 <10	SPT SUNK 450mm UNDER WEIGHT OF HAMMER ALONE SLIGHT HYDROCARBON ODOUR
	■			■	N = 12 3,5,7	-7	3			SILTY CLAY: high plasticity, light grey.		VSt	310 320 340	
		■			N = 8 3,4,4	-8	4							NO RECOVERY IN SPT
				■	N = 7 3,3,4	-9	5			as above, but grey.		St - VSt	180 240 220	
						-10	6							
						-11								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No.
8
2 / 3

EASTING: 332532
NORTHING: 6250240

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -4.50 m
Date: 29/5/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									CH	SILTY CLAY: high plasticity, grey.	MC>PL	St - VSt		
						-12								
				■	N = 19 10,12,7		8		SC	CLAYEY SAND: fine to coarse grained, grey.	W	MD		
						-13								
							9							
				■	N = 28 6,14,14	-14								
							10							
						-15								
					N=SPT 11/ 100mm REFUSAL		11							NO RECOVERY IN SPT BANDED RESISTANCE ON CASING ADVANCER
						-16								
							12			SANDSTONE: fine to coarse grained, light grey.	(DW)	(M)		RESISTANCE ON CASING ADVANCER
						-17				REFER TO CORED BOREHOLE LOG				
							13							
						-18								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

CORED BOREHOLE LOG

Borehole No. 8

3 / 3

EASTING: 332532
NORTHING: 6250240

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -4.50 m

Date: 29/5/17 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
					START CORING AT 12.47m					
		-17	13		SANDSTONE: fine to coarse grained, light grey, bedded at 0-10°.	SW	M			(12.58m) XWS, 0°, 1 mm.t
		-18	14		as above, but light grey mottled red and yellow brown, with quartz inclusions.		M - H L			(13.88m) XWS, 0°, 20 mm.t (14.02m) XWS, 0°, 20 mm.t (14.20m) XWS, 0°, 10 mm.t (14.33m) XWS, 0°, 10 mm.t (14.38m) XWS, 0°, 5 mm.t
		-19	15		as above, but light grey.	FR	M - H			(15.38m) XWS, 0°, 3 mm.t
		-20	16		END OF BOREHOLE AT 15.50 m					
		-21	17							
		-22	18							
		-23								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 9

EASTING: 332545
NORTHING: 6250192

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -2.08 m

Date: 2/6/17 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
	■			■						FILL: Silty sand, fine to medium grained, dark grey/black, with shell fragments, trace of fine grained river gravel.	W			SLIGHT ORGANIC ODOUR
					N=0 0,0,0	-3	1							SPT SUNK 450mm UNDER WEIGHT OF HAMMER ALONE NO RECOVERY IN SPT
						-4	2							
	■			■	N=0 0,0,0				CH	SILTY CLAY: high plasticity, dark grey/black, trace of fine to medium grained sand.	MC>PL	VS	<20 <20	SPT SUNK 450mm UNDER WEIGHT OF HAMMER ALONE
						-5	3							SLIGHT HYDROCARBON ODOUR
	■			■	N = 3 0,0,3	-6	4		CL	as above, but medium plasticity, light grey.		St	120 120 140	SPT SUNK 300mm UNDER WEIGHT OF HAMMER ALONE
														NO RECOVERY IN U50
						-7	5							
				■	N = 6 3,2,4				CH	as above, but with fine to medium grained sand.	MC~PL	VSt	220 240 250	
														NO RECOVERY IN U50
						-8	6							
				■	N = 6 3,2,4	-9				SILTY CLAY: high plasticity, light grey mottled red and yellow brown.			210 210 250	

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No.
9
2 / 3

EASTING: 332545
NORTHING: 6250192

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -2.08 m
Date: 2/6/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									CH	SILTY CLAY: high plasticity, light grey mottled red and yellow brown. *(continued)*	MC~PL	VSt		
						-10	8							
				■	N = 6 4,4,2				SC	CLAYEY SAND: fine to coarse grained, light grey.	W	L		
						-11	9							
										SANDSTONE: fine to coarse grained, light grey.	SW	(M)		RESISTANCE ON CASING ADVANCER
										REFER TO CORED BOREHOLE LOG				
						-12	10							
						-13	11							
						-14	12							
						-15	13							
						-16								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

CORED BOREHOLE LOG

Borehole No. 9

EASTING: 332545
NORTHING: 6250192

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -2.08 m

Date: 2/6/17 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
					START CORING AT 9.38m					
		-12	10		SANDSTONE: fine to coarse grained, light grey, with dark grey laminae, bedded at 5-10°, with quartz inclusions.	FR	M			(10.16m) XWS, 5°, 60 mm.t (10.31m) XWS, 5°, 10 mm.t (10.40m) XWS, 10°, 50 mm.t (10.46m) XWS, 5°, 15 mm.t
		-13	11		CORE LOSS 0.96m					
		-14	12		SANDSTONE: fine to coarse grained, light grey, with dark grey laminae, bedded at 5-10°.	FR	M			(12.06m) XWS, 5°, 5 mm.t
		-15	13		as above, but light grey mottled red and yellow brown.					(13.28m) XWS, 0°, 3 mm.t (13.36m) XWS, 0°, 5 mm.t (13.51m) XWS, 0°, 25 mm.t
		-16	14		END OF BOREHOLE AT 13.79 m					
		-17	15							
		-18								

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BOREHOLE LOG

Borehole No. 10

EASTING: 332631
NORTHING: 6250245

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -3.65 m

Date: 1/6/17 TO 2/6/17 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
										-				NO RECOVERY IN U50
						-4				FILL: Silty clay, high plasticity, dark grey/black, with fine to coarse grained sand, interbedded with sandy gravel, fine to coarse grained, dark grey coal, trace of plastic fragments.	MC>PL / W	VS / VL		
							1							
						-5								
	■			■	N = 2 0,1,1		2							SPT SUNK 190mm UNDER WEIGHT OF HAMMER
						-6								
														RESISTANCE ON CASING ADVANCER ON OBSTRUCTION IN FILL
	■				N = 1 1,1,0		3							NO RECOVERY IN SPT
						-7								
							4							
						-8								
	■			■	N = 9 3,4,5				CH	SILTY CLAY: high plasticity, light grey mottled red and yellow brown.	MC>PL	VSt - H	420 380 500	
		■					5							
						-9								
				■	N = 8 3,3,5		6					VSt	350 270 320	
						-10								

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BOREHOLE LOG

Borehole No.
10
2 / 3

EASTING: 332631
NORTHING: 6250245

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -3.65 m
Date: 1/6/17 TO 2/6/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									CH	SILTY CLAY: high plasticity, light grey mottled red and yellow brown. *(continued)*	MC>PL	VSt		
					N = 8 2,3,5	-11				as above, but grey.				
							8							
						-12								
					N = 14 4,6,8		9			SILTY CLAY: high plasticity, grey, with fine to medium grained sand.			320 350 330	
						-13								
					N = 14 4,7,7		10							NO RECOVERY IN SPT
						-14								
							11			SANDSTONE: fine to medium grained, yellow brown and light grey.	DW	(L - M)		RESISTANCE OF CASING ADVANCER
						-15				REFER TO CORED BOREHOLE LOG				
							12							
						-16								
							13							
						-17								

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CORED BOREHOLE LOG

Borehole No. 10
3 / 3

EASTING: 332631
NORTHING: 6250245

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Date: 1/6/17 TO 2/6/17
Plant Type: JK305
Core Size: NMLC
Inclination: VERTICAL
Bearing: N/A
R.L. Surface: -3.65 m
Datum: AHD
Logged/Checked By: M.S./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
					START CORING AT 11.37m					
		-15			SANDSTONE: fine to medium grained, yellow brown mottled red brown and light grey, bedded at 0-10°.	DW	VL			(11.47m) Be, 0°, P, R, IS
							L			
			12							
		-16								
										(12.73m) XWS, 0°, 5 mm.t
							M			
			13							
		-17								
										(13.57m) XWS, 0°, 130 mm.t
					as above, but light grey mottled red and yellow brown.		VL			
							M			
			14		as above, but yellow brown mottled light grey.	SW				
		-18								
					END OF BOREHOLE AT 14.44 m					
			15							
		-19								
			16							
		-20								
			17							
		-21								

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BOREHOLE LOG

Borehole No. 11

EASTING: 332581
NORTHING: 6250274

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Method: CASING ADVANCER
R.L. Surface: -7.02 m
Date: 31/5/17 TO 1/6/17
Datum: AHD
Plant Type: JK305
Logged/Checked By: M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
										-				
									CH	SILTY CLAY: high plasticity, dark grey.				NO RECOVERY IN U50
						-8	1							
										SILTY CLAY: high plasticity, light grey mottled red and yellow brown.	MC>PL	VSt - H		
	■			■	N = 9 3,4,5								380 420 450	
						-9	2							NO RECOVERY IN U50
						-10	3							
				■	N = 8 3,3,5								360 420 450	
						-11	4							
		■							SC	CLAYEY SAND: fine to medium grained, light grey.	W		410 450 440	
						-12	5							
						-13	6		CL-CH	SANDY CLAY: medium to high plasticity, grey, with bands of clayey sand.	MC~PL	St		
				■	N = 11 3,4,7								150 160	

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BOREHOLE LOG

Borehole No.
11
2 / 3

EASTING: 332581
NORTHING: 6250274

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -7.02 m
Date: 31/5/17 TO 1/6/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									CL-CH	SANDY CLAY: medium to high plasticity, grey, with bands of clayey sand. *(continued)*	MC~PL	St		NO RECOVERY IN U50
				■	N = 32 8,13,19	-15	8		SP	SAND: medium to coarse grained, light grey, with silt and clay.	W	D		
						-16	9			SANDSTONE: fine to coarse grained, light grey and yellow brown.	XW - DW	(EL - M)		BANDED RESISTANCE ON CASING ASVANCER
										REFER TO CORED BOREHOLE LOG				
						-17	10							
						-18	11							
						-19	12							
						-20	13							

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CORED BOREHOLE LOG

Borehole No.
11
3 / 3

EASTING: 332581
NORTHING: 6250274

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Date: 31/5/17 TO 1/6/17
Plant Type: JK305

Core Size: NMLC
Inclination: VERTICAL
Bearing: N/A

R.L. Surface: -7.02 m
Datum: AHD
Logged/Checked By: M.S./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		-16	9		START CORING AT 9.14m					
		-17	10		SANDSTONE: fine to coarse grained, light grey and yellow brown mottled red brown, bedded at 0-10°, with quartz inclusions.	SW	L - M			
		-18	11		SANDSTONE: fine to coarse grained, light grey, with dark grey laminae, bedded at 0-5°.	FR	M			(10.90m) XWS, 0°, 5 mm.t (11.07m) J, 80°, P, R, IS (11.26m) XWS, 0°, 10 mm.t
		-19	12							
		-20	13		END OF BOREHOLE AT 12.13 m					
		-21	14							

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BOREHOLE LOG

Borehole No.
12
1 / 4

EASTING: 332658
NORTHING: 6250307

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Method: CASING ADVANCER
R.L. Surface: -6.39 m
Date: 30/5/17 TO 31/5/17
Datum: AHD
Plant Type: JK305
Logged/Checked By: M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
										-				
									CH	SILTY CLAY: high plasticity, dark grey.	MC>PL	(VS)		NO RECOVERY IN U50
						-7	1							
						-8								
					N=0 0,0,0		2					(VS)		SPT SUNK 450mm UNDER WEIGHT OF HAMMER
														NO RECOVERY IN SPT
						-9								
							3			SILTY CLAY: high plasticity, grey mottled red and yellow brown.				
						-10								
	■			■	N = 7 2,3,4		4					VSt	310 250 240	
						-11								
							5							
						-12								
				■	N = 15 5,6,9		6			as above, but with fine to medium grained sand.			250 270 320	
						-13								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 12

EASTING: 332658
NORTHING: 6250307

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -6.39 m

Date: 30/5/17 TO 31/5/17 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
				■	N = 7 2,3,4				CH	as above, but with fine to medium grained sand. *(continued)*	MC>PL	VSt	240 250 270	
						-14	8		CH / SC	INTERBEDDED SANDY CLAY: high plasticity, dark grey, fine to coarse grained sand and CLAYEY SAND: fine to coarse grained, dark grey.	MC>PL / W	(St / MD)		
						-15								
	■			■	N = 18 2,5,13		9					St / MD	150 120	
						-16	10							
	■			■	N=0 0,0,0	-17	11		CH	SILTY CLAY: high plasticity, dark grey.	MC>PL	S	90 70 90	SPT SUNK 450mm UNDER WEIGHT OF HAMMER
									SP	SAND: medium to coarse grained, light grey and grey, trace of possible boulders.	W	(L - MD)		BANDED RESISTANCE ON CASING ADVANCER
						-18	12							
				■	N = 19 2,8,11	-19	13					MD		
						-20								

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BOREHOLE LOG

Borehole No.
12
3 / 4

EASTING: 332658
NORTHING: 6250307

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -6.39 m
Date: 30/5/17 TO 31/5/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						-21				SANDSTONE: fine to coarse grained, light grey, brown and red brown.	(XW - DW)	(EL - M)		BANDED RESISTANCE ON CASING ADVANCER
										REFER TO CORED BOREHOLE LOG				
						-22	15							
						-23	16							
						-24	17							
						-25	18							
						-26	19							
						-27	20							

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CORED BOREHOLE LOG

Borehole No. 12
4 / 4

EASTING: 332658
NORTHING: 6250307

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -6.39 m
Date: 30/5/17 TO 31/5/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS – DESCRIPTION (Specific / General)
					START CORING AT 14.65m					
		-21			CORE LOSS 0.40m					
			15		SANDSTONE: fine to coarse grained, light grey and yellow brown, with quartz inclusions.	DW	M - H			(15.05m) J, 75°, Un, R; (15.12m) XWS, 0°, 15 mm.t
		-22			as above, but light grey, with dark grey laminae, bedded at 0-5°.	SW				
			16							(16.19m) J, 80°, P, R
		-23								
			17							(16.77m) J, 80°, Un, R; (16.98m) XWS, 0°, 60 mm.t; (17.14m) XWS, 0°, 30 mm.t
							H			(17.42m) XWS, 0°, 10 mm.t
		-24				FR				
			18							
		-25								(18.80m) XWS, 0°, 2 mm.t
			19							
		-26								
			20							
		-27			END OF BOREHOLE AT 20.54 m					

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BOREHOLE LOG

Borehole No. 13

EASTING: 332635
NORTHING: 6250360

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -7.29 m

Date: 30/5/17 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
										-				
	■					-8	1		CH	SILTY CLAY: high plasticity, dark grey, trace of fine to medium grained sand.	MC>PL	(VS)		SLIGHT HYDROCARBON ODOUR
					N = 6 2,2,4	-9	2			as above, but grey mottled red brown and yellow.		(St - VSt)		NO RECOVERY IN SPT
					N = 6 3,3,3	-10	3							NO RECOVERY IN SPT
	■	■				-11	4					VSt	220 250	
				■	N = 6 2,2,4	-12	5			as above, but grey.			250 270 330	
				■	N = 6 2,2,4	-13	6			SILTY CLAY: high plasticity, grey, with sandy clay bands.			250 300 310	
						-14								

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BOREHOLE LOG

Borehole No. 13
2 / 3

EASTING: 332635
NORTHING: 6250360

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -7.29 m
Date: 30/5/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									CH	SILTY CLAY: high plasticity, grey, with sandy clay bands. *(continued)*	MC>PL	VSt		
	■			■	N = 7 3,3,4								220 250 240	
						-15	8							
				■	N = 30 9,15,15				SC	CLAYEY SAND: fine to coarse grained, grey.	W	MD		
						-16	9							
				■	N = 24 12,14,10	-17	10							
						-18								
				■	N = 3 3,2,1		11		CH	SANDY CLAY: high plasticity, grey, with clayey sand bands.	MC>PL	VSt	250 220	
						-19	12							
				■	N > 14 4,14/ 150mm REFUSAL	-20	13		SC	CLAYEY SAND: medium to coarse grained, grey and yellow brown, with bands of XW sandstone.	W			
						-21								

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CORED BOREHOLE LOG

Borehole No. 13
3 / 3

EASTING: 332635
NORTHING: 6250360

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -7.29 m
Date: 30/5/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		-21			START CORING AT 13.96m					
			14		SANDSTONE: fine to medium grained, light grey and yellow brown.	SW	H			(14.14m) Be, 0°, P, R (14.27m) J, 0°, P, R
					CORE LOSS 0.10m					
		-22			SANDSTONE: fine to medium grained, light grey and yellow brown.	DW	M			(14.59m) XWS, 0°, 5 mm.t (14.66m) XWS, 0°, 40 mm.t (14.72m) J, 80°, P, R (14.80m) XWS, 0°, 80 mm.t (14.88m) J, 80°, P, R
			15		SANDSTONE: fine to coarse grained, light grey, with quartz inclusions.	FR	M - H			(15.38m) XWS, 0°, 30 mm.t (15.60m) J, 80°, P, HEALED
		-23								
			16							
		-24								
			17							
		-25								
			18		END OF BOREHOLE AT 18.00 m					
		-26								
			19							
		-27								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No.
14
1 / 3

EASTING: 332731
NORTHING: 6250333

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Method: CASING ADVANCER
R.L. Surface: -2.32 m
Date: 5/6/17
Datum: AHD
Plant Type: JK305
Logged/Checked By: M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
										-				
	■			■		-3	1		-	FILL: Silty clayey sand, fine to medium grained, dark grey, with coal fragments.	W			SLIGHT SULFUR/HYDROCARBON ODOUR
	■			■	N=0 0,0,0	-4	2		CH	SILTY CLAY: high plasticity, black, trace of coal fragments.	MC>PL	VS	<20 <20	POSSIBLY FILL
						-5	3							SPT SUNK 450mm UNDER WEIGHT OF HAMMER
						-6	4							SLIGHT HYDROCARBON ODOUR
	■			■										
	■			■	N = 11 4,7,4	-7	5		CL	SANDY CLAY: medium plasticity, light grey, medium to coarse grained sand, with bands of clayey sand.		St - VSt	170 220 270	SPT SUNK 300mm UNDER WEIGHT OF HAMMER ALONE
		■												
	■			■	N = 7 3,3,4	-8	6		SC	CLAYEY SAND: fine to coarse grained, light grey.	W	L	180 220 250	
						-9								

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BOREHOLE LOG

Borehole No.
14
2 / 3

EASTING: 332731
NORTHING: 6250333

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -2.32 m
Date: 5/6/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
										SANDSTONE: fine to coarse grained, light grey.	(SW)	(M)		RESISTANCE ON CASING ADVANCER
						-10								
							8			REFER TO CORED BOREHOLE LOG				
						-11								
							9							
						-12								
							10							
						-13								
							11							
						-14								
							12							
						-15								
							13							
						-16								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

CORED BOREHOLE LOG

Borehole No.
14
3 / 3

EASTING: 332731
NORTHING: 6250333

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -2.32 m
Date: 5/6/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		-10			START CORING AT 7.73m					
			8		CORE LOSS 0.50m					
		-11	9		SANDSTONE: fine to coarse grained, light grey, with dark grey laminae, bedded at 0°. as above, but light grey mottled red and yellow brown.	SW	H			(8.23m) J, 80° (8.47m) J, 80°, P, R (8.63m) J, 80°, P, R (8.80m) J, 90°, P, R (9.10m) Be, 0°, P, R (9.13m) Be, 0°, P, R (9.16m) J, 90°, P, R (9.24m) XWS, 5°, 15 mm.t
		-12	10							(10.02m) J, 85°, P, R (10.17m) J, 80°, Un, R (10.27m) J, 90°, P, R (10.38m) J, 85°, P, R (10.45m) XWS, 60°, 20 mm.t
		-13	11		SANDSTONE: fine to medium grained, light grey mottled red and yellow brown, bedded at 5-30°, with frequent healed and altered joints up to 90°, occasional vesciles.	DW	H - VH			(10.83m) J, 60°, P, R (10.87m) J, 85°, P, R (11.11m) XWS, 0°, 2 mm.t (11.24m) J, 85°, P, R (11.33m) J, 70°, P, R (11.38m) J, 80°, P, HEALED (11.56m) XWS, 20°, 20 mm.t (11.60m) J, 80°, P, R (11.71m) J, 85°, P, R (11.75m) XWS, 0°, 15 mm.t (11.80m) J, 70°, P, R
		-14	12							(12.04m) J, 80°, P, R
		-15	13							(12.62m) J, 90°, P, R (12.63m) J, 85°, P, R (12.66m) J, 80°, P, R (12.81m) XWS, 0°, 20 mm.t (13.06m) Be, 30°, P, R (13.14m) J, 90°, P, R (13.22m) J, 80°, Un, R
		-16			END OF BOREHOLE AT 13.40 m					

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 15

EASTING: 332748
NORTHING: 6250362

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -3.79 m

Date: 14/2/17 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						-4				FILL: Silty clay, high plasticity, black and dark grey, trace of fine to medium grained sand and coal fragments.	MC>PL	(VS)		NO RECOVERY IN U50
					N=0 0,0,0									SPT SANK 450mm UNDER WEIGHT OF HAMMER ALONE
						-5	1							
					N=0 0,0,0	-6	2							SPT SANK 450mm UNDER WEIGHT OF HAMMER ALONE
						-7	3							
					N=0 0,0,0									SPT SANK 450mm UNDER WEIGHT OF HAMMER ALONE
						-8	4							
	■			■	N = 13 5,5,8	-9	5		SC	CLAYEY SAND: fine to medium grained, light grey, trace of fine to coarse grained gravel and shell fragments.	W	MD		
						-10	6			REFER TO CORED BOREHOLE LOG				

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

CORED BOREHOLE LOG

Borehole No. 15
2 / 3

EASTING: 332748
NORTHING: 6250362

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -3.79 m
Date: 14/2/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS – DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		-9			START CORING AT 5.49m					
					SANDSTONE: fine to medium grained, light grey, yellow and red brown.	DW	M			(5.51m) Be, 0°, P, R (5.53m) J, 75°, Un, R
		-10	6		CORE LOSS 1.34m					
		-11	7		SANDSTONE: fine to medium grained, light grey mottled yellow brown, with frequent healed and altered joints up to 90°.	DW	H - VH			(7.02m) FRAGMENTED ZONE, 0°, 560 mm.t
					CORE LOSS 0.20m					
		-12	8		SANDSTONE: fine to medium grained, light grey mottled yellow brown, bedded at 10-30°, with frequent healed and altered joints up to 90°, occasional vesciles.	DW	H			(7.78m) FRAGMENTED ZONE, 0°, 770 mm.t (8.55m) J, 90°, P, R (8.69m) Be, 0°, P, R (8.72m) J, 75°, P, R (8.88m) J, 45°, P, R
		-13	9							(9.05m) J, 60°, P, R (9.10m) J, 90°, P, R (9.26m) XWS, 0°, 50 mm.t (9.31m) J, 90°, Un, R (9.58m) J, 80°, P, R (9.76m) Be, 30°, P, R (9.82m) J, 40°, P, R
		-14	10							(9.99m) XWS, 0°, 25 mm.t, P (10.02m) J, 90°, Un, R (10.35m) XWS, 15°, 15 mm.t, P (10.41m) J, 80°, P, R (10.43m) J, 50°, P, R (10.55m) J, 50°, P, R (10.75m) J, 65°, P, R (10.90m) J, 70°, P, R
		-15	11		CORE LOSS 0.30m					
					SANDSTONE: fine to medium grained, light grey mottled red and yellow brown, bedded at 10-30°, with frequent healed and altered joints up to 90°, occasional vesciles.	DW	H - VH			(11.35m) J, 75°, P, R (11.45m) J, 30°, P, R (11.54m) J, 60°, P, R (11.74m) J, 50°, P, R (11.83m) J, 55°, P, R (11.87m) J, 75°, P, R

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CORED BOREHOLE LOG

Borehole No.
15
3 / 3

EASTING: 332748
NORTHING: 6250362

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Date: 14/2/17
Plant Type: JK305

Core Size: NMLC
Inclination: VERTICAL
Bearing: N/A

R.L. Surface: -3.79 m
Datum: AHD
Logged/Checked By: M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS – DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		-16	13		SANDSTONE: fine to medium grained, light grey mottled red and yellow brown, bedded at 10-30°, with frequent healed and altered joints up to 90°, occasional vesciles.	DW	H - VH			(11.97m) J, 40°, Un, R (12.02m) J, 30°, P, R (12.03m) J, 60°, P, R (12.11m) J, 50°, P, R (12.20m) Be, 20°, P, R (12.23m) Be, 20°, P, R (12.30m) Be, 20°, P, R (12.47m) J, 55°, P, R (12.52m) J, 75°, P, R (12.53m) J, 75°, P, R (12.60m) J, 85°, P, R (12.79m) J, 80°, P, R
		-17			as above, but light grey and yellow brown.					(13.31m) J, 90°, P, R (13.44m) J, 90°, Un, R (13.66m) XWS, 20°, 3 mm.t (13.72m) J, 60°, P, R (13.84m) J, 60°, P, R (13.90m) J, 50°, P, R
		-18	14		SANDSTONE: fine grained, light yellow brown, with indistinct bedding at 10-30°.					(14.05m) XWS, 0°, 5 mm.t (14.07m) J, 60°, P, R (14.26m) J, 70°, P, R (14.32m) J, 70°, P, R (14.50m) J, 50°, P, R (14.68m) J, 90°, P, R (14.70m) J, 50°, P, R (14.80m) J, 50°, P, R (14.93m) J, 50°, P, R (15.01m) J, 50°, P, R (15.17m) J, 75°, Un, R (15.31m) J, 65°, P, R (15.39m) J, 85°, Un, R (15.60m) J, 80°, P, R
		-19	15							
		-20	16		DOLERITE: fine grained, green grey.	FR	H			(16.30m) J, 75°, Un, R (16.36m) J, 50°, P, R (16.45m) J, 60°, P, R (16.54m) J, 60°, P, R
					CORE LOSS 0.44m					
		-21	17		DOLERITE: fine grained, green grey.	FR	H - VH			~~(17.08m) CS, 0°~~ (17.12m) J, 75°, P, R (17.24m) J, 70°, P, R (17.28m) J, 70°, P, R
					as above, but grey.					(17.44m) J, 50°, P, R (17.49m) FRAGMENTED ZONE, 0°, 460 mm.t
		-22	18		END OF BOREHOLE AT 17.90 m					

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BOREHOLE LOG

Borehole No. 16

EASTING: 332508
NORTHING: 6250253

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -5.12 m
Date: 6/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									-	-				
	■			■	N = 8 3,3,5	-6	1		CL	SILTY CLAY: medium plasticity, light grey, trace of fine grained sand.	MC>PL	St	180 190 190	
		■				-7	2							
				■	N = 9 4,4,5	-8	3		CH	SANDY CLAY: high plasticity, light grey, fine to medium grained sand.	MC>PL	VSt	220 220 240	
	■			■	N = 11 5,5,6	-9	4			SILTY CLAY: high plasticity, grey mottled red and yellow brown.			240 250 250	
						-10	5							
				■	N = 7 3,3,4					as above, but grey.			240 250 220	
						-11	6							
						-12								

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BOREHOLE LOG

Borehole No. 16

EASTING: 332508
NORTHING: 6250253

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -5.12 m
Date: 6/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
					N = 26 9,16,10				CH	SANDY CLAY: high plasticity, grey.	MC>PL	St	140 150 140	
									SC	CLAYEY SAND: fine to medium grained, grey, with sandy clay bands.	W	MD		
						-13	8							
					N = 22 9,11,11					as above, but grey mottled yellow brown.				
						-14	9							
												L		
					N = 7 5,3,4	-15	10							
						-16	11							
					N = 9 2,5,4									
						-17	12							
						-18	13					D		
					N = 42 7,21,21									
										SANDSTONE: fine to medium grained, light grey.	DW	(M)		RESISTANCE ON CASING ADVANCER
						-19								

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BOREHOLE LOG

Borehole No.
16
3 / 4

EASTING: 332508
NORTHING: 6250253

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -5.12 m
Date: 6/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
										SANDSTONE: fine to medium grained, light grey.	DW	(M)		
										REFER TO CORED BOREHOLE LOG				
						-20	15							
						-21	16							
						-22	17							
						-23	18							
						-24	19							
						-25	20							
						-26								

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CORED BOREHOLE LOG

Borehole No. 16
4 / 4

EASTING: 332508
NORTHING: 6250253

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -5.12 m
Date: 6/2/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT SPACING (mm)	DEFECT DETAILS – DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
					START CORING AT 14.13m					
					SANDSTONE: fine to medium grained, light grey.	SW	L			(14.33m) Be, 0°, P, R, IS (14.41m) J, 40°, P, R (14.48m) Be, 0°, P, R, IS (14.52m) Be, 0°, P, R, IS (14.58m) Be, 0°, P, R, IS (14.71m) Be, 0°, P, R (14.79m) Be, 0°, P, R (14.86m) J, 45°, P, R
							M			
		-20	15		as above, but with dark grey lenses bedded at 0-5°.					(15.07m) J, 60°, P, R (15.40m) J, 90°, Un, R
										(15.78m) Be, 0°, P, R
		-21	16				H			
										(16.30m) J, 85°, Un, R (16.60m) HEALED J, 75°, P R
		-22	17							
										(17.17m) XWS, 0°, 5 mm.t (17.30m) J, 30°, P, R
		-23	18							(17.87m) J, 20°, P, R (18.00m) Cr, 0°, 20 mm.t
					as above, but with dark grey laminae, bedded at 0-10°.					
		-24	19							(19.14m) J, 65°, P, R (19.29m) J, 45°, S (19.40m) XWS, 0°, 10 mm.t
					as above, but light grey mottled dark grey.					
		-25	20		END OF BOREHOLE AT 19.81 m					
		-26								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 17

EASTING: 332484
NORTHING: 6250286

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -4.11 m

Date: 7/2/17 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
										-				
					N=0 0,0,0	-5	1		CH	SILTY CLAY: high plasticity, dark grey and black, interbedded with fine to medium grained, yellow brown clayey sand.	MC>PL	VS		ORGANIC ODOUR SPT SANK 450mm UNDER WEIGHT OF HAMMER ALONE
	■					-6	2		CL	SANDY CLAY: medium plasticity, light grey mottled yellow brown.		VSt		
	■			■	N = 16 4,5,11								220 240 260	
						-7	3							
						-8	4		SC	CLAYEY SAND: fine to medium grained, light grey mottled yellow brown.	W	L		
				■	N = 3 2,1,2									
						-9	5							
	■			■	N = 4 2,1,3	-10	6		CH	SANDY CLAY: high plasticity, light grey mottled red and yellow, trace of fine grained river gravel and shells.	MC>PL	St	140 150 150	
						-11				SANDSTONE: fine to medium grained, light grey.	XW	(EL)		RESISTANCE OF CASING ADVANCER

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BOREHOLE LOG

Borehole No.
17
2 / 4

EASTING: 332484
NORTHING: 6250286

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -4.11 m
Date: 7/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
				■	N=SPT 15/ 150mm REFUSAL					SANDSTONE: fine to medium grained, light grey.	XW	EL		
										REFER TO CORED BOREHOLE LOG				
						-12	8							
						-13	9							
						-14	10							
						-15	11							
						-16	12							
						-17	13							
						-18								

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CORED BOREHOLE LOG

Borehole No. 17
3 / 4

EASTING: 332484
NORTHING: 6250286

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -4.11 m
Date: 7/2/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS – DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
					START CORING AT 7.21m					
					SANDSTONE: fine to medium grained, light grey.	DW	L			
					CORE LOSS 0.15m					
					SANDSTONE: fine to medium grained, light grey.	DW	VL			(7.52m) J, 60°, P, R (7.57m) Be, 0°, P, R (7.81m) Be, 0°, P, R (7.85m) J, 90°, Un, R (7.90m) J, 35°, P, R
		-12	8				M			
					as above, but yellow brown, red brown and light grey.					(8.40m) Be, 15°, P, R (8.77m) Be, 10°, P, R (8.91m) J, 40°, P, R (9.04m) J, 60°, P, R
		-13	9							
					CORE LOSS 0.76m					
		-14	10		SANDSTONE: fine to medium grained, yellow brown, red brown and light grey.	DW	M			(9.90m) Be, 15°, P, R (10.20m) Be, 10°, P, R (10.33m) J, 35°, P, R, IS (10.52m) J, 5°, P, R, IS (10.61m) J, 50°, P, R (10.71m) J, 25°, P, R, IS (10.77m) J, 70°, P, R, IS (10.85m) Be, 10°, P, R, IS (10.90m) J, 45°, P, R, IS
		-15	11							(11.30m) J, 90°, Un, R, IS (11.65m) Be, 10°, Un, R, IS
		-16	12							(12.13m) CS, 0°, 30 mm t
					CORE LOSS 0.84m					
		-17	13		SILTY CLAY: high plasticity, dark grey, with XW shale bands.	RS	EL			(13.00m) HP; 420,470,>600
					SHALE: grey.	XW	EL			
		-18								

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CORED BOREHOLE LOG

Borehole No. 17
4 / 4

EASTING: 332484
NORTHING: 6250286

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Date: 7/2/17
Plant Type: JK305

Core Size: NMLC
Inclination: VERTICAL
Bearing: N/A

R.L. Surface: -4.11 m
Datum: AHD
Logged/Checked By: M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
					SANDSTONE: fine to medium grained, yellow brown, red brown and light grey.	DW	M			(14.16m) XWS, 0°, 10 mm.t (14.43m) J, 70°, P, R
		-19	15		as above, but yellow brown, red brown and light grey.					(15.05m) J, 55°, P, R (15.51m) J, 40°, P, R (15.80m) J, 25°, P, R
		-20	16							(15.97m) J, 80°, Un, R (16.08m) XWS, 0°, 5 mm.t (16.39m) Be, 0°, P, R, IS (16.75m) J, 70°, P, R
		-21	17							(16.86m) J, 45°, P, R, IS (17.07m) Be, 0°, P, R, IS (17.21m) J, 90°, P, R
					END OF BOREHOLE AT 17.27 m					
		-22	18							
		-23	19							
		-24	20							
		-25								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No.
18
1 / 3

EASTING: 332552
NORTHING: 6250324

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Method: CASING ADVANCER
R.L. Surface: -7.86 m
Date: 8/2/17
Datum: AHD
Plant Type: JK305
Logged/Checked By: M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						-8				-				
	■			■	N = 9 3,4,5				CH	SILTY CLAY: high plasticity, light grey mottled red and yellow brown, trace of fine grained sand.	MC>PL	VSt	210 220 240	
						-9	1							
						-10	2							
				■	N = 6 2,2,4					SILTY CLAY: high plasticity, grey mottled red and yellow brown.			220 210 250 270 280	
						-11	3							
				■	N = 8 2,4,4					as above, but trace of fine to medium grained sand.			270 270 280	
		■				-12	4							
						-13	5							
				■	N = 7 3,3,4					as above, but with bands of sandy clay.			310 320 290	
						-14	6							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 18
2 / 3

EASTING: 332552
NORTHING: 6250324

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -7.86 m
Date: 8/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
					N = 10 3,4,6	-15			CH	SANDY CLAY: high plasticity, grey, fine to medium grained sand.	MC>PL	St - VSt	180 200 210	
						-16	8							
					N = 8 3,3,5				SC	CLAYEY SAND: fine to medium grained, light grey mottled yellow brown.	W	L		
						-17	9							
							10							
					N = 15 3,3,12	-18			CH	INTERBEDDED: SANDY CLAY: high plasticity, grey. CLAYEY SAND: fine to medium grained, light grey.	MC>PL / W	St / L	180 190 180	
						-19	11							
					N = 7 3,3,4	-20	12						150 160 180	
						-21	13							
										REFER TO CORED BOREHOLE LOG				

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CORED BOREHOLE LOG

Borehole No. 18

EASTING: 332552
NORTHING: 6250324

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -7.86 m

Date: 8/2/17 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		-21			START CORING AT 13.59m					
		-22	14		SANDSTONE: fine to medium grained, light grey, with dark grey laminae, bedded at 0-10°.	SW	M			(13.70m) J, 30°, P, R (13.83m) J, 35°, P, R (13.95m) XWS, 0°, 50 mm.t
							VL			(14.11m) XWS, 0°, 15 mm.t
					CORE LOSS 1.85m					
		-23	15							
		-24	16		SANDSTONE: fine to coarse grained, light grey and brown, with dark grey laminae, bedded at 0-20°.	XW	EL			(16.25m) J, 45°, P, R (16.30m) J, 45°, P, R (16.37m) J, 50°, P, R
						SW	H			(16.46m) XWS, 0°, 20 mm.t (16.69m) J, 30°, P, R (16.72m) J, 40°, P, R (16.78m) J, 45°, P, R (16.85m) J, 30°, P, R (16.93m) J, 65°, P, R (16.95m) J, 80°, Un, R
		-25	17		as above, but light grey, with dark grey laminae.	FR				(17.16m) J, 85°, Un, R (17.60m) HEALED J, 80°, Un
		-26	18							(18.37m) Be, 5°, P, R (18.55m) Be, 5°, P, R
		-27	19		as above, but fine grained.					(19.03m) J, 60°, P, R (19.20m) J, 60°, P, R
					as above, but fine to medium grained.					(19.39m) XWS, 5°, 5 mm.t
					END OF BOREHOLE AT 19.61 m					

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No.
19
1 / 3

EASTING: 332517
NORTHING: 6250358

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Method: CASING ADVANCER
R.L. Surface: -7.50 m
Date: 8/2/17
Datum: AHD
Plant Type: JK305
Logged/Checked By: M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						-8				-				
	■			■	N = 8 2,3,5		1		CH	SILTY CLAY: high plasticity, light grey mottled yellow brown.	MC>PL	VSt	210 240 210	
						-9	2							
	■			■	N = 8 3,3,5	-10							340 320 360	
		■					3							
						-11								
							4							
				■	N = 5 2,2,3	-12				as above, but grey mottled red and yellow brown.			240 250 280	
							5							
						-13								
				■	N = 7 2,3,4		6			as above, but grey, trace of fine grained sand.			240 260 260	
						-14								

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BOREHOLE LOG

Borehole No. 19
2 / 3

EASTING: 332517
NORTHING: 6250358

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -7.50 m
Date: 8/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									CH	as above, but grey, trace of fine grained sand. *(continued)*	MC>PL	VSt		
						-15			SC	CLAYEY SAND: fine to medium grained, light grey.	W	D		
	■			■	N = 40 14,22,18		8							
						-16						MD		
							9							
				■	N = 11 8,6,5	-17								
										SANDSTONE: fine to medium grained, light grey.	DW	(M)		RESISTANCE ON CASING ADVANCER
							10			REFER TO CORED BOREHOLE LOG				
						-18								
							11							
						-19								
							12							
						-20								
							13							
						-21								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

CORED BOREHOLE LOG

Borehole No.
19
3 / 3

EASTING: 332517
NORTHING: 6250358

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Date: 8/2/17
Plant Type: JK305

Core Size: NMLC
Inclination: VERTICAL
Bearing: N/A

R.L. Surface: -7.50 m
Datum: AHD
Logged/Checked By: M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		-17			START CORING AT 9.86m					
			10		SANDSTONE: fine to coarse grained, brown, bedded at 0-10°, with fine to medium grained quartz inclusions.	SW	M			(9.92m) J, 45°, P, R (10.07m) Be, 0°, P, R
		-18			as above, but yellow and red brown.					(10.66m) Be, 10°, P, R
			11							(11.19m) Be, 10°, P, R (11.30m) J, 25°, P, R
		-19								
			12							
		-20								(12.63m) XWS, 0°, 3 mm.t (12.69m) J, 80°, Un, R
							H			
			13		END OF BOREHOLE AT 12.98 m					
		-21								
			14							
		-22								
			15							
		-23								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 20

EASTING: 332575
NORTHING: 6250385

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -7.93 m

Date: 9/2/17 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						-8			CH	SILTY CLAY: high plasticity, dark grey.	MC>PL	(S)		ORGANIC ODOUR
									SC	CLAYEY SAND: fine to medium grained, grey.	W	VL		
						-9	1							
					N=0 0,0,0									
						-10	2							
					N=0 0,0,0									SPT SUNK 450mm UNDER WEIGHT OF HAMMER ALONE
						-11	3							
						-12	4							
					N = 9 3,3,6				CH	SILTY CLAY: high plasticity, grey mottled red and yellow brown, trace of fine to medium grained sand.	MC>PL	VSt	350 370 360	
						-13	5							
					N = 8 3,3,5					as above, but grey.			260 270 280	
						-14	6							
					N = 7 3,3,4								240 250 260	

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 20

EASTING: 332575
NORTHING: 6250385

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -7.93 m
Date: 9/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						-15			CH	SILTY CLAY: high plasticity, grey mottled yellow brown, trace of fine to medium grained sand.	MC>PL	VSt		
												St		
						-16	8							
				■	N = 3 0,0,3					SILTY CLAY: high plasticity, dark grey, with fine to medium grained sand.			150 160 150	
						-17	9							
				■	N = 5 0,2,3					as above, but without fine to medium grained sand.			120 110 140	
						-18	10							
						-19	11							
				■	N = 6 3,3,3					as above, but dark grey mottled yellow brown, trace of fine to medium grained sand.			140 120 120	
				■						SANDY CLAY: high plasticity, yellow brown and grey.				
						-20	12							
						-21	13							
										REFER TO CORED BOREHOLE LOG				

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

CORED BOREHOLE LOG

Borehole No.
20
3 / 3

EASTING: 332575
NORTHING: 6250385

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Date: 9/2/17
Plant Type: JK305

Core Size: NMLC
Inclination: VERTICAL
Bearing: N/A

R.L. Surface: -7.93 m
Datum: AHD
Logged/Checked By: M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		-21			START CORING AT 13.59m					
		-22	14		SANDSTONE: fine to coarse grained, light grey and yellow brown, with dark grey laminae and fine to medium grained quartz inclusions, bedded at 5-20°.	FR	M			(14.44m) Be, 5°, P, R (14.68m) Be, 0°, P, R
		-23	15		as above, but with dark grey mudstone lenses and bedded at 0-5°.		H			(14.95m) Be, 0°, P, R (15.03m) J, 30°, P, R (15.58m) Be, 0°, Un, R
		-24	16							(16.36m) Be, 0°, Un, R
		-25	17		END OF BOREHOLE AT 16.68 m					
		-26	18							
		-27	19							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 21

EASTING: 332665
NORTHING: 6250385

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -6.14 m

Date: 13/2/17 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									CH	SILTY CLAY: high plasticity, dark grey, with fine to medium grained sand.	MC>PL	(VS)		ORGANIC ODOUR
										SILTY CLAY: high plasticity, dark brown and dark grey.		(S - F)		
						-7	1							
				■	N=0 0,0,0							S - F	50 60 60	SPT SUNK 450mm UNDER WEIGHT OF HAMMER ALONE
			■			-8	2			as above, but light grey mottled yellow brown.		VSt		
				■	N = 7 3,3,4	-9	3						220 320 340	
						-10	4							
					N = 7 7,4,3									
						-11	5							NO SAMPLE IN SPT
				■	N = 13 4,5,8	-12	6		SP	SAND: fine to medium grained, grey, with clay and silt fines and sandy clay/clayey sand bands.	W	MD		
						-13								

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BOREHOLE LOG

Borehole No.
21
2 / 3

EASTING: 332665
NORTHING: 6250385

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -6.14 m
Date: 13/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									SP	SAND: fine to medium grained, grey, with clay and silt fines and sandy clay/clayey sand bands.	W	MD		
				■	N = 15 3,6,9									
						-14	8							
				■	N = 14 6,10,4	-15	9							
						-16	10							
				■	N = 13 7,6,7									
						-17	11							
						-18								
							12			REFER TO CORED BOREHOLE LOG				
						-19	13							
						-20								

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CORED BOREHOLE LOG

Borehole No. 21
3 / 3

EASTING: 332665
NORTHING: 6250385

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -6.14 m
Date: 13/2/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS – DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		-18			START CORING AT 11.96m					
			12		CORE LOSS 0.55m					
		-19			SANDSTONE: fine to medium grained, light grey, with dark grey laminae, bedded at 0-20°.	SW	M			
			13				H			(13.00m) J, 80°, Un, R, IS (13.26m) Be, 0°, P, R (13.57m) Be, 10°, P, R (13.75m) J, 50°, P, R
		-20								
			14		as above, but light grey, with dark grey mudstone lenses.	FR				
		-21					M			(14.66m) Be, 0°, P, R (14.85m) XWS, 0°, 5 mm.t
			15		END OF BOREHOLE AT 15.04 m					
		-22								
			16							
		-23								
			17							
		-24								

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BOREHOLE LOG

Borehole No. 22

EASTING: 332636
NORTHING: 6250427

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -6.42 m

Date: 10/2/17 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									CH	SILTY CLAY: high plasticity, dark grey.	MC>PL	(VS)		
									CL-CH	SANDY CLAY: medium to high plasticity, light grey mottled red and yellow brown.		(F - St)		ORGANIC ODOUR
						-7	1							
					N = 7 4,4,3	-8			SC	CLAYEY SAND: fine to medium grained, yellow brown and light grey mottled red brown.	W	L		
							2							
						-9								
							3							
										as above, but light grey.				
					N = 5 3,2,3				CH	SILTY CLAY: high plasticity, dark grey, trace of fine to medium grained sand.	MC>PL	VSt - H	360 390 420	
						-10								
							4							
						-11								
					N = 10 7,9,1		5					F - St		NO RECOVERY IN SPT
						-12								
							6							
					N=0 0,0,0	-13				as above, but grey.			90 100 110	SPT SANK 450mm UNDER WEIGHT OF HAMMER ALONE

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BOREHOLE LOG

Borehole No.
22
2 / 3

EASTING: 332636
NORTHING: 6250427

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -6.42 m
Date: 10/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									CH	SILTY CLAY: high plasticity, grey.	MC>PL	F - St		
						-14								
				■	N = 16 9,9,7		8		SC	CLAYEY SAND: fine to medium grained, light grey.	W	MD		
						-15								
							9							
				■	N=SPT 6/ 100mm REFUSAL					SANDSTONE: fine to medium grained, light grey.	XW	EL		
						-16				REFER TO CORED BOREHOLE LOG				
							10							
						-17								
							11							
						-18								
							12							
						-19								
							13							
						-20								

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CORED BOREHOLE LOG

Borehole No. 22
3 / 3

EASTING: 332636
NORTHING: 6250427

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -6.42 m
Date: 10/2/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS – DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
					START CORING AT 9.40m					
		-16	10		SANDSTONE: fine to coarse grained, red brown and light grey mottled yellow brown, bedded at 0-20°.	DW	M			
		-17								(10.55m) XWS, 5°, 40 mm.t (10.67m) XWS, 20°, 20 mm.t
			11		CORE LOSS 0.56m					
		-18			SHALE: grey, interbedded with fine to medium grained, light grey sandstone.	XW	EL			
			12		SANDSTONE: fine grained, light grey mottled red brown, with grey shale lenses.	DW	M			(11.75m) J, 90°, Un, R (11.80m) XWS, 4°, 70 mm.t (12.04m) J, 45°, P, R (12.07m) XWS, 0°, 80 mm.t (12.16m) Be, 5°, P, R (12.31m) CS, 0°, 30 mm.t (12.41m) XWS, 0°, 30 mm.t (12.47m) XWS, 5°, 30 mm.t
		-19			SANDSTONE: fine to coarse grained, light grey and yellow brown, bedded at 0-15°.	SW	H			
		-20	13							
			14							(13.89m) Be, 15°, Un, R
							M			(14.13m) J, 75°, P, R (14.21m) J, 80°, Un, R (14.30m) J, 65°, Un, R
		-21			as above, but light grey, with dark grey laminae.	FR				(14.47m) J, 65°, P, R (14.52m) CS, 5°, 3 mm.t
			15							(15.05m) XWS, 5°, 3 mm.t
		-22			END OF BOREHOLE AT 15.23 m					

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BOREHOLE LOG

Borehole No. 23

EASTING: 332671
NORTHING: 6250417

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -5.94 m
Date: 13/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						-6			SC	CLAYEY SAND: fine to medium grained, grey and dark grey.	W			
									CL-CH	SILTY CLAY: medium to high plasticity, dark grey, trace of fine to medium grained sand and organic.	MC>PL	(S - F)		ORGANIC ODOUR
						-7	1							
					N=0 0,0,0							F - St	90 100 110	SPT SANK UNDER WEIGHT OF HAMMER ALONE
						-8	2							
					N = 3 0,0,3	-9	3							
									SC	CLAYEY SAND: fine to medium grained, grey.	W	L		
						-10	4							
					N = 5 3,3,2									NO RECOVERY IN SPT
						-11	5							
					N = 5 0,2,3	-12	6		CH	SANDY CLAY: high plasticity, grey.	MC>PL	F - St	90 110 150	

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No.
23
2 / 3

EASTING: 332671
NORTHING: 6250417

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -5.94 m
Date: 13/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
					N = 23 9,13,10	-13			SC	CLAYEY SAND: fine to medium grained, grey.	W	MD		NO RECOVERY IN SPT
						-14	8							
				■	N = 10 15,5,5					as above, but light grey, yellow and red brown.				
						-15	9							
				■	N = 28 9,14,14					SANDSTONE: fine to medium grained, light grey, yellow brown and brown.	XW	EL		
						-16	10			REFER TO CORED BOREHOLE LOG				
						-17	11							
						-18	12							
						-19	13							

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CORED BOREHOLE LOG

Borehole No.
23
3 / 3

EASTING: 332671
NORTHING: 6250417

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Date: 13/2/17
Plant Type: JK305

Core Size: NMLC
Inclination: VERTICAL
Bearing: N/A

R.L. Surface: -5.94 m
Datum: AHD
Logged/Checked By: M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		-15								
			10		START CORING AT 10.01m					
		-16			SANDSTONE: fine to medium grained, brown and light grey.	SW	M			
		-17	11		as above, but light brown.					(11.67m) J, 90°, P, R, IS
		-18	12				H			(12.03m) XWS, 0°, 30 mm.t (12.61m) XWS, 0°, 10 mm.t
					as above, but light grey, with dark grey lenses.					(12.77m) Be, 0°, P, S
		-19	13							
					END OF BOREHOLE AT 13.11 m					
		-20	14							
		-21	15							

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BOREHOLE LOG

Borehole No.
24
1 / 2

EASTING: 332677
NORTHING: 6250483

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -5.04 m
Date: 15/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
	■								CH	SILTY CLAY: high plasticity, dark grey and black, trace of fine to medium grained sand.	MC>PL	VS		ORGANIC ODOUR
	■			■	N = 2 2,1,1	-6	1		SC	CLAYEY SAND: fine to medium grained, light grey mottled dark grey and yellow brown.	W	VL		
						-7	2							
				■	N = 5 2,2,3							L		
						-8	3							
				■	N = 5 2,2,3	-9	4		CH	SANDY CLAY: high plasticity, light grey and yellow brown, trace of fine to medium grained quartz gravel.	MC>PL	St - VSt	170 210 240	RESIDUAL
						-10	5			SANDSTONE: fine to medium grained, red brown.	XW	(EL)		RESISTANCE OF CASING ADVANCER
										REFER TO CORED BOREHOLE LOG				
						-11	6							
						-12								

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CORED BOREHOLE LOG

Borehole No.
24
2 / 2

EASTING: 332677
NORTHING: 6250483

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Date: 15/2/17
Plant Type: JK305

Core Size: NMLC
Inclination: VERTICAL
Bearing: N/A

R.L. Surface: -5.04 m
Datum: AHD
Logged/Checked By: M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
					START CORING AT 5.00m					
		-10	5		CORE LOSS 0.71m					
		-11	6		SANDSTONE: fine to medium grained, dark red brown.	DW	L			(5.94m) XWS, 0°, 5 mm.t (6.06m) Be, 0°, P, R (6.16m) CS, 0°, 3 mm.t (6.29m) Be, 0°, P, R
					as above, but light grey, red and yellow brown, bedded at 0-40°.	SW	M			(6.64m) XWS, 20 mm.t
		-12	7		as above, but light brown, with minor dark grey lenses.					
		-13	8							
					END OF BOREHOLE AT 8.06 m					
		-14	9							
		-15	10							
		-16								

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BOREHOLE LOG

Borehole No. 25
1 / 3

EASTING: 332641
NORTHING: 6250575

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -2.73 m
Date: 15/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						-3			SC	CLAYEY SAND: fine to medium grained, dark grey, trace of shell fragments.	W	(VL)		ORGANIC/SULFUR ODOUR
							1							
						-4								
					N=0 0,0,0									
							2			CLAYEY SAND: fine to medium grained, light grey mottled yellow brown.				
						-5								
							3			SANDSTONE: fine to medium grained.	DW	(L)		RESISTANCE ON CASING ADVANCER
						-6				REFER TO CORED BOREHOLE LOG				
							4							
						-7								
							5							
						-8								
							6							
						-9								

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CORED BOREHOLE LOG

Borehole No. 25
2 / 3

EASTING: 332641
NORTHING: 6250575

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -2.73 m
Date: 15/2/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS – DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		-5								
			3		START CORING AT 3.01m					
		-6			SANDSTONE: fine to medium grained, light grey mottled yellow brown.	SW	M			(3.03m) J, 70°, P, R; (3.25m) Be, 0°, P, R
					as above, but light grey, yellow brown and brown, with quartz inclusions.	DW				(3.33m) J, 70°, P, R; (3.37m) HEALED, J, 85°, Un, R
					CORE LOSS 2.04m					
			4							
		-7								
			5							
		-8								
					SANDSTONE: fine to medium grained, light grey.	SW	VL			(5.58m) J, 60°, Un, R; (5.73m) XWS, 0°, 40 mm.t
			6		as above, but light grey, with dark grey laminae and red brown bands, bedded at 0-10°, and quartz inclusions.		L - M			(6.10m) J, 70°, P, R; (6.26m) Be, 5°, P, R
		-9								
					as above, but light grey, with dark grey laminae.					(6.69m) Be, 0°, Un, R
			7							
		-10								
										(7.49m) J, 80°, P, R
					as above, but light grey, with dark grey laminae and bands of yellow and red brown iron staining.					(7.65m) J, 80°, P, R; (7.76m) XWS, 0°, 10 mm.t; (7.86m) XWS, 0°, 30 mm.t
			8							(8.00m) J, 75°, P, R
		-11								(8.20m) J, 80°, P, R
										(8.67m) J, 65°, P, R; (8.73m) XWS, 0°, 15 mm.t; (8.75m) J, 80°, P, R; (8.92m) J, 80°, P, R

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CORED BOREHOLE LOG

Borehole No. 25
3 / 3

EASTING: 332641
NORTHING: 6250575

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Date: 15/2/17
Plant Type: JK305
Core Size: NMLC
Inclination: VERTICAL
Bearing: N/A
R.L. Surface: -2.73 m
Datum: AHD
Logged/Checked By: M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		-12			SANDSTONE: fine to medium grained, light grey, with dark grey laminae at about 15°, bands of yellow and red brown staining.	SW	M			(9.64m) XWS, 20°, 5 mm.t
			10							
		-13			as above, but light grey with dark grey lenses.		H			
					END OF BOREHOLE AT 10.31 m					
			11							
		-14								
			12							
		-15								
			13							
		-16								
			14							
		-17								
			15							
		-18								

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BOREHOLE LOG

Borehole No. 26

EASTING: 332499
NORTHING: 6250667

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -4.57 m

Date: 16/2/17 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									CL	SILTY SANDY CLAY: high plasticity, dark grey, black and grey, trace of ash.	MC>PL	(VS)		ORGANIC/SULFUR ODOUR
						-5								
	■				N = 2 4,1,1		1							
						-6								
	■			■	N = 5 2,2,3		2		CH	SANDY CLAY: high plasticity, light grey mottled red ad yellow brown, with bands of clayey sand.		VSt	260 320 340	
						-7								
							3							
				■	N = 3 2,1,2	-8			SC	CLAYEY SAND: fine to medium grained, light grey mottled red and yellow brown.	W	L		
							4							
						-9								
				■	N = 4 1,2,2		5							
						-10								
							6							
				■	N = 8 1,2,6	-11								

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No.
26
2 / 3

EASTING: 332499
NORTHING: 6250667

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -4.57 m
Date: 16/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									SC	CLAYEY SAND: fine to medium grained, light grey mottled red and yellow brown. *(continued)*	W	L		
						-12								
				■	N = 10 4,5,5		8			as above, but light brown and red brown.		MD		
						-13								
							9							
				■	N=SPT 3/ 80mm REFUSAL									
						-14				REFER TO CORED BOREHOLE LOG				
							10							
						-15								
							11							
						-16								
							12							
						-17								
							13							
						-18								

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CORED BOREHOLE LOG

Borehole No. 26
3 / 3

EASTING: 332499
NORTHING: 6250667

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -4.57 m
Date: 16/2/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS – DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		-13	9		START CORING AT 9.20m					
		-14			SANDSTONE: fine to medium grained, yellow brown mottled red brown and light grey.	DW	M			(9.30m) Be, 5°, P, R (9.49m) CS, 5°, 30 mm.t
					CORE LOSS 0.37m					
			10		SANDSTONE: fine to medium grained, yellow brown, with fine to medium grained quartz inclusions.	DW	L			(9.95m) J, 90°, P, R
						SW	M			(10.12m) XWS, 5°, 5 mm.t (10.13m) J, 90°, Un, R
		-15			as above, but light grey, with dark grey shale lenses.					
			11							
		-16								
							H			
			12							
		-17			Shale band 0.12mt.		M			(12.20m) CS, 0°, 5 mm.t (12.30m) XWS, 0°, 30 mm.t
					END OF BOREHOLE AT 12.50 m					
			13							
		-18								
			14							
		-19								

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BOREHOLE LOG

Borehole No. 27
1 / 2

EASTING: 332415
NORTHING: 6250682

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -5.35 m
Date: 16/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
	■					-6	1		CH	SILTY CLAY: high plasticity, dark grey, with fine grained sand, trace of shell fragments.	MC>PL	(VS)		
	■			■	N = 2 0,0,2	-7	2		SC	CLAYEY SAND: fine to medium grained, yellow brown mottled brown.	W	VL		
				■	N = 11 3,5,6	-8	3			as above, but light grey mottled red and yellow brown, trace of shell fragments.		MD		
				■	N = 10 3,4,6	-9	4							
						-10	5							
						-11	6			REFER TO CORED BOREHOLE LOG				
						-12								

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CORED BOREHOLE LOG

Borehole No.
27
2 / 2

EASTING: 332415
NORTHING: 6250682

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S
Date: 16/2/17
Plant Type: JK305

Core Size: NMLC
Inclination: VERTICAL
Bearing: N/A

R.L. Surface: -5.35 m
Datum: AHD
Logged/Checked By: M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
					START CORING AT 5.38m					
		-11	6		SANDSTONE: fine to medium grained, brown, red brown and light brown, bedded at 0-30°.	SW	M			(6.10m) Be, 20°, P, R
		-12	7							(7.29m) J, 35°, Un, R
		-13	8				M - H			
		-14	9		END OF BOREHOLE AT 8.48 m					
		-15	10							
		-16	11							
		-17								

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BOREHOLE LOG

Borehole No. 28

EASTING: 332311
NORTHING: 6250870

Client: URBANGROWTH NSW

Project: THE BAYS MARKET DISTRICT

Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -4.92 m

Date: 17/2/17 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						-5				FILL: Gravel, fine to coarse grained coal, dark grey, trace of sand and shell fragments.	W			
					N = 1 1,1,0		1							
						-6								
							2		CL-CH	SILTY CLAY: medium to high plasticity, dark grey, trace of shell fragments.	MC>PL	VS	10 20 30	SPT SANK 450mm UNDER WEIGHT OF HAMMER ALONE
					N=0 0,0,0	-7								
						-8	3							
									CH	as above, but grey, trace of fine to medium grained sand.		VS - S	20 40 30	SPT SANK 450mm UNDER WEIGHT OF HAMMER ALONE
					N=0 0,0,0	-9	4							
					N = 5 2,2,3	-10	5		SC	as above, but with fine to medium grained sand. CLAYEY SAND: fine to medium grained, grey brown and yellow brown.	W	L		
						-11	6							
					N = 6 2,2,4					as above, but brown.				

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BOREHOLE LOG

Borehole No. 28
2 / 3

EASTING: 332311
NORTHING: 6250870

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S **Method:** CASING ADVANCER **R.L. Surface:** -4.92 m
Date: 17/2/17 **Datum:** AHD
Plant Type: JK305 **Logged/Checked By:** M.S./O.F./P.S.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
				■		-12			SC	CLAYEY SAND: fine to medium grained, brown.	W	L		
				■	N=SPT 9/ 60mm REFUSAL	-13	8			REFER TO CORED BOREHOLE LOG				
						-14	9							
						-15	10							
						-16	11							
						-17	12							
						-18	13							

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CORED BOREHOLE LOG

Borehole No.
28
3 / 3

EASTING: 332311
NORTHING: 6250870

Client: URBANGROWTH NSW
Project: THE BAYS MARKET DISTRICT
Location: BLACKWATTLE BAY, PYRMONT, NSW

Job No.: 29245S | **Core Size:** NMLC | **R.L. Surface:** -4.92 m
Date: 17/2/17 | **Inclination:** VERTICAL | **Datum:** AHD
Plant Type: JK305 | **Bearing:** N/A | **Logged/Checked By:** M.S./O.F./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT SPACING (mm) (500, 300, 100, 50, 30, 10)	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		-12								
			8		START CORING AT 8.01m					
		-13			SANDSTONE: fine to medium grained, yellow brown and light brown.	DW	VL			(8.01m) J, 60°, P, R (8.06m) J, 60°, P, R (8.12m) J, 50°, P, R (8.16m) J, 50°, P, R
					as above, but light grey, red and yellow brown.					(8.57m) J, 45°, Un, R (8.58m) J, 70°, P, R (8.67m) J, 60°, P, R
					CORE LOSS 0.78m					
		-14	9							
					SANDSTONE: fine to medium grained, brown.	XW	EL			
		-15	10		as above, but light grey red brown, bedded at 0-40°.					(10.20m) J, 50°, P, R
						SW	M			(10.93m) Be, 0°, P, R
		-16	11							
					as above, but light grey, with dark laminae and lenses, bedded at 0-20°.	FR	H			
		-17	12							
			13							
		-18			END OF BOREHOLE AT 13.02 m					

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Appendix D – Historical Aerial Photographs of Blackwattle Bay

Source: Base Image - © Department of Lands

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0 60 120 240 m

Scale:1:5,500

Datum: GDA 1994 MGA Zone 56 - AHD

A4			
A	Original Issue - R01	LL	12-06-2014
Rev	Description	Drn.	Date:

Legend:

Precinct Boundary

JBS&G **Figure: Blackwattle Bay - 1930**

Client: UrbanGrowth NSW

Project: Bay Precinct NSW - PSI

Job No: 43503 File Name: 43503_1930

Source: Base Image - © Department of Lands

© 2014 JBS&G

0 60 120 240 m

Scale:1:5,500

Datum: GDA 1994 MGA Zone 56 - AHD

A4			
A	Original Issue - R01	LL	12-06-2014
Rev	Description	Drn.	Date:

Legend:

Precinct Boundary

JBS&G **Figure: Blackwattle Bay - 1943**

Client: UrbanGrowth NSW

Project: Bay Precinct NSW - PSI

Job No: 43503 File Name: 43503_1943

Source: Base Image - © Department of Lands

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0 60 120 240 m

Scale:1:5,500

Datum: GDA 1994 MGA Zone 56 - AHD

A4			
A	Original Issue - R01	LL	12-06-2014
Rev	Description	Drn.	Date:

Legend:

Precinct Boundary

JBS&G **Figure: Blackwattle Bay - 1961**

Client: UrbanGrowth NSW

Project: Bay Precinct NSW - PSI

Job No: 43503 File Name: 43503_1961

Source: Base Image - © Department of Lands

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0 60 120 240 m

Scale:1:5,500

Datum: GDA 1994 MGA Zone 56 - AHD

A4			
A	Original Issue - R01	LL	12-06-2014
Rev	Description	Drn.	Date:

Legend:

Precinct Boundary

JBS&G **Figure: Blackwattle Bay - 1970**

Client: UrbanGrowth NSW

Project: Bay Precinct NSW - PSI

Job No: 43503 File Name: 43503_1970

Source: Base Image - © Department of Lands

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0 60 120 240 m

Scale:1:5,500

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date:
A4			
A	Original Issue - R01	LL	12-06-2014

Legend:

Precinct Boundary

JBS&G **Figure: Blackwattle Bay - 1982**

Client: UrbanGrowth NSW

Project: Bay Precinct NSW - PSI

Job No: 43503 File Name: 43503_1982

Source: Base Image - © Department of Lands

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0 60 120 240 m

Scale:1:5,500

Datum: GDA 1994 MGA Zone 56 - AHD

A4			
A	Original Issue - R01	LL	12-06-2014
Rev	Description	Drn.	Date:

Legend:

Precinct Boundary

JBS&G **Figure: Blackwattle Bay - 1991**

Client: UrbanGrowth NSW

Project: Bay Precinct NSW - PSI

Job No: 43503 File Name: 43503_1991

Source: Base Image - © Department of Lands

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0 60 120 240 m

Scale:1:5,500

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date:
A4			
A	Original Issue - R01	LL	12-06-2014

Legend:

Precinct Boundary

JBS&G **Figure: Blackwattle Bay - 1998**

Client: UrbanGrowth NSW

Project: Bay Precinct NSW - PSI

Job No: 43503 File Name: 43503_1998

Source: Base Image - © Department of Lands

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0 60 120 240 m

Scale:1:5,500

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date:
A4			
A	Original Issue - R01	LL	12-06-2014

Legend:

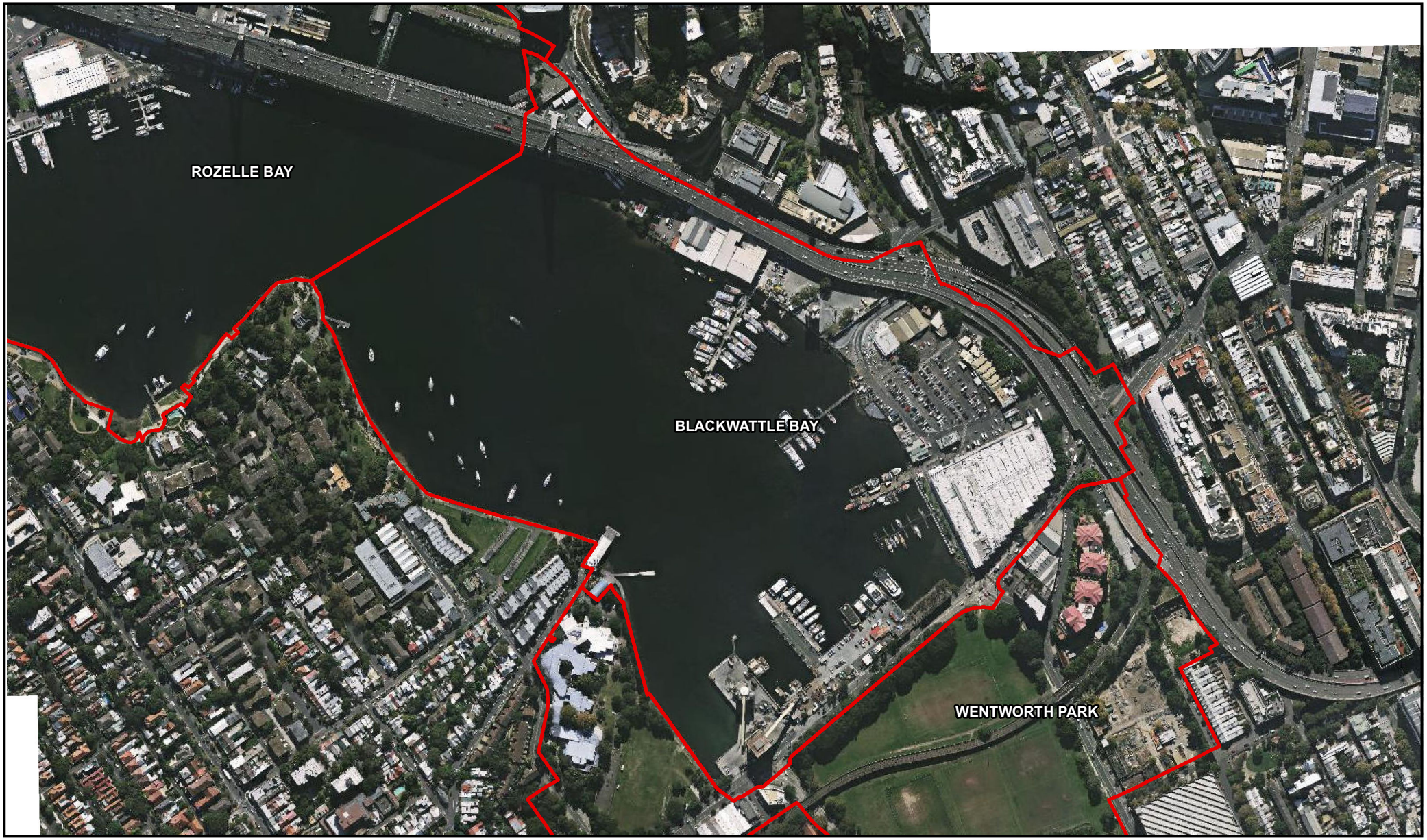
Precinct Boundary

JBS&G **Figure: Blackwattle Bay - 2005**

Client: UrbanGrowth NSW

Project: Bay Precinct NSW - PSI

Job No: 43503 File Name: 43503_2005



Source: Base Image - © SIX Maps www.maps.six.nsw.gov.au, imagery date 11/01/2012, accessed 11/06/2014

© 2014 JBS&G

0 60 120 240 m

Scale:1:5,500

Datum: GDA 1994 MGA Zone 56 - AHD

A4			
A	Original Issue - R01	LL	11-06-2014
Rev	Description	Drn.	Date:

Legend:

Precinct Boundary

JBS&G **Figure: Blackwattle Bay - 2012**

Client: UrbanGrowth NSW

Project: Bay Precinct NSW - PSI

Job No: 43503 File Name: 43503_2012

Appendix E – NSW EPA Public Registers Search Results

Home Contaminated land Record of notices

Search results

Your search for:Suburb: PYRMONT

Matched 7 notices relating to 1 site.

Search Again

Refine Search

Suburb	Address	Site Name	Notices related to this site
PYRMONT	Pyrmont ROAD	Pyrmont Power Station	7 former

Page 1 of 1

28 March 2019

For business and industry

For local government

Contact us

- 131 555 (tel:131555)
- info@epa.nsw.gov.au (mailto:info@epa.nsw.gov.au)
- EPA Office Locations (https://www.epa.nsw.gov.au/about-us/contact-us/locations)

Accessibility (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/help-index)
Disclaimer (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/disclaimer)
Privacy (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/privacy)
Copyright (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/copyright)

Find us on (https://au.linkedin.com/company/nsw-environment-protection-authority-epa) (https://twitter.com/NSW_EPA) (https://www.youtube.com/channel/UC

Search results

Your search for:Suburb: GLEBE

Search Again
Refine Search

did not find any records in our database.

If a site does not appear on the record it may still be affected by contamination. For example:

- Contamination may be present but the site has not been regulated by the EPA under the Contaminated Land Management Act 1997 or the Environmentally Hazardous Chemicals Act 1985.
- The EPA may be regulating contamination at the site through a licence or notice under the Protection of the Environment Operations Act 1997 (POEO Act).
- Contamination at the site may be being managed under the planning process.

Search TIP

To search for a specific site, search by LGA (local government area) and carefully review all sites listed.

... more search tips

More information about particular sites may be available from:

- The POEO public register
- The appropriate planning authority: for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act.

See What's in the record and What's not in the record.

If you want to know whether a specific site has been the subject of notices issued by the EPA under the CLM Act, we suggest that you search by Local Government Area only and carefully review the sites that are listed.
This public record provides information about sites regulated by the EPA under the Contaminated Land Management Act 1997, including sites currently and previously regulated under the Environmentally Hazardous Chemicals Act 1985. Your inquiry using the above search criteria has not matched any record of current or former regulation. You should consider searching again using different criteria. The fact that a site does not appear on the record does not necessarily mean that it is not affected by contamination. The site may have been notified to the EPA but not yet assessed, or contamination may be present but the site is not yet being regulated by the EPA. Further information about particular sites may be available from the appropriate planning authority, for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act. In addition the EPA may be regulating contamination at the site through a licence under the Protection of the Environment Operations Act 1997. You may wish to search the POEO public register.POEO public register

29 March 2019

Search results

Your search for: **General Search** with the following criteria

Suburb - pyrmont

returned 6 results

Export to excel 1 of 1 Pages Search Again

Number	Name	Location	Type	Status	Issued date
3085775321	Environmental Investigations Australia Pty Ltd	Suite 601, 55 Miller Street, PYRMONT, NSW 2009	Penalty Notice	Withdrawn	
3085775606	Environmental Investigations Australia Pty Ltd	Suite 601, 55 Miller Street, PYRMONT, NSW 2009	Penalty Notice	Issued	02 Jan 2015
1253	HYMIX AUSTRALIA PTY LIMITED	41-45 BANK STREET, PYRMONT, NSW 2009	POEO licence	No longer in force	25 May 2000
1009061	HYMIX AUSTRALIA PTY LIMITED	41-45 BANK STREET, PYRMONT, NSW 2009	s.58 Licence Variation	Issued	21 Jun 2001
11718	LENDLEASE BUILDING PTY LIMITED	BOWMAN STREET, PYRMONT, NSW 2009	POEO licence	Surrendered	23 Aug 2002
5949	SYDNEY HARBOUR CASINO PROPERTIES PTY LIMITED	80 PYRMONT STREET, PYRMONT, NSW 2009	POEO licence	Surrendered	13 Jun 2000

28 March 2019

Search results

Your search for: **General Search** with the following criteria

Suburb - glebe

returned 13 results

Export to excel 1 of 1 Pages Search Again

Number	Name	Location	Type	Status	Issued date
3801	HANSON CONSTRUCTION MATERIALS PTY LTD	BRIDGE ROAD, GLEBE, NSW 2037	POEO licence	Issued	09 Dec 1999
1007251	HANSON CONSTRUCTION MATERIALS PTY LTD	BRIDGE ROAD, GLEBE, NSW 2037	s.58 Licence Variation	Issued	23 May 2001
1109626	HANSON CONSTRUCTION MATERIALS PTY LTD	BRIDGE ROAD, GLEBE, NSW 2037	s.58 Licence Variation	Issued	22 Jan 2010
1511596	HANSON CONSTRUCTION MATERIALS PTY LTD	BRIDGE ROAD, GLEBE, NSW 2037	s.58 Licence Variation	Issued	10 Jul 2015
10026	METROPOLITAN DEMOLITIONS & RECYCLING PTY LIMITED	Sommerville Road, GLEBE, NSW 2037	POEO licence	Surrendered	01 Nov 1999
7093	NEWCASTLE PORT CORPORATION	SOMMERVILLE ROAD, GLEBE, NSW 2037	POEO licence	Issued	03 Aug 2000
1028783	NEWCASTLE PORT CORPORATION	SOMMERVILLE ROAD, GLEBE, NSW 2037	s.58 Licence Variation	Issued	22 Aug 2003
1102072	NEWCASTLE PORT CORPORATION	SOMMERVILLE ROAD, GLEBE, NSW 2037	s.58 Licence Variation	Issued	13 Oct 2009
1523091	NEWCASTLE PORT CORPORATION	SOMMERVILLE ROAD, GLEBE, NSW 2037	s.58 Licence Variation	Issued	30 Jun 2014
3052	REMATH INVESTMENTS NO 6 PTY LTD	45-51 FORSYTH STREET, GLEBE, NSW 2037	POEO licence	Surrendered	22 Feb 2000
6799	SUMMIT MOTORS PTY LIMITED	36 PARRAMATTA ROAD, GLEBE, NSW 2037	POEO licence	Surrendered	02 Aug 2000
11888	SYDNEY SOUTH WEST AREA HEALTH SERVICE	50 PARRAMATTA ROAD, GLEBE, NSW 2037	POEO licence	No longer in force	02 May 2003
1050841	SYDNEY SOUTH WEST AREA HEALTH SERVICE	50 PARRAMATTA ROAD, GLEBE, NSW 2037	s.58 Licence Variation	Issued	01 Sep 2005

28 March 2019

For business and industry

For local government

Contact us

- 131 555 (tel:131555)
- info@epa.nsw.gov.au (mailto:info@epa.nsw.gov.au)
- EPA Office Locations (https://www.epa.nsw.gov.au/about-us/contact-us/locations)

Accessibility (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/help-index)
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Find us on (https://au.linkedin.com/company/nsw-environment-protection-authority-epa) (https://www.youtube.com/channel/UC

Environment Protection Licence

Licence - 3801

Licence Details	
Number:	3801
Anniversary Date:	15-July

Licensee
HANSON CONSTRUCTION MATERIALS PTY LTD
LOCKED BAG 5260
PARRAMATTA NSW 2124

Premises
HANSON CONSTRUCTION MATERIALS PTY LTD
BRIDGE ROAD
GLEBE NSW 2037

Scheduled Activity
Shipping in Bulk

Fee Based Activity	Scale
Shipping in bulk	> 100000-500000 T loaded and unloaded

Region
Metropolitan Infrastructure
Level 13, 10 Valentine Ave PARRAMATTA NSW 2150
Phone: (02) 9995 5000
Fax: (02) 9995 6900
PO Box 668 PARRAMATTA
NSW 2124

Environment Protection Licence

Licence - 3801

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Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

HANSON CONSTRUCTION MATERIALS PTY LTD
LOCKED BAG 5260
PARRAMATTA NSW 2124

subject to the conditions which follow.

Environment Protection Licence

Licence - 3801

1 Administrative Conditions

A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Shipping in Bulk	Shipping in bulk	> 100000 - 500000 T loaded and unloaded

A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
HANSON CONSTRUCTION MATERIALS PTY LTD
BRIDGE ROAD
GLEBE
NSW 2037
LOT 5 DP 1064339

A3 Other activities

A3.1 This licence applies to all other activities carried on at the premises, including:

Ancillary Activity
Concrete works

A4 Information supplied to the EPA

A4.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:
a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

2 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Noise limits

L2.1 Noise from the premises must not exceed the noise limits presented in the table below:

Receiver Location	Day LAeq(15 minute)	Day LAeq(period)	Evening LAeq(15 minute)	Evening LAeq(period)
Taylor Street (Residential)	52	52	52	52
Cardigan Street & Bellevue Street (Residential)	45	52	45	52
Boathouse Restaurant (Commercial)	56	62	56	62

L2.2 For the purpose of condition L2.1:-

- Day is defined as the period from 6am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays.

- Evening is defined as the period from 6pm to 10pm Monday to Sunday.

L2.3 Noise from the premises is to be measured or computed at the most affected point on or within the residential boundary to determine compliance with the noise limits in condition L2.1.

L2.4 The noise emission limits identified in condition L2.1 apply under all meteorological conditions of:
- Wind speeds up to 3m/s at 10 metres above ground level; and
- Temperature inversions up to 3°C/100 metres.

Note: Where it can be demonstrated that direct measurement of noise from the premises is impractical, the EPA may accept alternative means of determining compliance. See Chapter 11 of the NSW Industrial Noise Policy.

The modification factors presented in Chapter 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise level where applicable.

3 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

O3 Dust

O3.1 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.

4 Monitoring and Recording Conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:
a) in a legible form, or in a form that can readily be reduced to a legible form;
b) kept for at least 4 years after the monitoring or event to which they relate took place; and
c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
a) the date(s) on which the sample was taken;
b) the time(s) at which the sample was collected;
c) the point at which the sample was taken; and
d) the name of the person who collected the sample.

M2 Recording of pollution complaints

M2.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M2.2 The record must include details of the following:

a) the date and time of the complaint;
b) the method by which the complaint was made;
c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M2.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M2.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M3 Telephone complaints line

M3.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M3.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M3.3 The preceding two conditions do not apply until 3 months after: the date of the issue of this licence.

5 Reporting Conditions

R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
a) a Statement of Compliance; and
b) a Monitoring and Complaints Summary.
At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:

a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

R1.7 Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
a) the licence holder; or
b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R2 Notification of environmental harm

R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
a) where this licence applies to premises, an event has occurred at the premises; or
b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:
a) the cause, time and duration of the event;
b) the type, volume and concentration of every pollutant discharged as a result of the event;

c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

6 General Conditions

G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

Environment Protection Licence

Licence - 3801

Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environmen t Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder describe d at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 mo nths. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.

Environment Protection Licence

Licence - 3801

TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non - putrescible), special waste or hazardous waste

Ms Nadia Kanhoush

Environment Protection Authority

(By Delegation)

Date of this edition: 09-December-1999

Environment Protection Licence

Licence - 3801

End Notes

1	Licence varied by notice 1007251, issued on 23-May-2001, which came into effect on 23-May-2001.
2	Licence varied by notice 1017215, issued on 07-May-2002, which came into effect on 01-Jun-2002.
3	Licence varied by correction to EPA Sub Region data record, issued on 17-Sep-2002, which came into effect on 17-Sep-2002.
4	Licence varied by Correction to EPA LGA data record, issued on 11-Jun-2003, which came into effect on 11-Jun-2003.
5	Licence varied by change to record due to LGA amalgamation, issued on 03-Nov-2004, which came into effect on 03-Nov-2004.
6	Licence fee period changed by notice 1066363 approved on 23-Oct-2006.
7	Licence varied by Change common name & electorate, issued on 31-Jan-2008, which came into effect on 31-Jan-2008.
8	Condition A1.3 Not applicable varied by notice issued on <issue date> which came into effect on <effective date>
9	Licence varied by notice 1109626, issued on 22-Jan-2010, which came into effect on 22-Jan-2010.
10	Licence varied by notice 1511596 issued on 10-Jul-2015

Appendix F - Data Set Statistical Analysis Outputs

1	**UCL Statistics for Uncensored Full Data Sets**										
2											
3	User Selected Options										
4	Date/Time of Computation			29/03/2019 12:26:08 AM							
5	From File			WorkSheet.xls							
6	Full Precision			OFF							
7	Confidence Coefficient			95%							
8	Number of Bootstrap Operations			2000							
9											
10											
11	**As in Soil**										
12											
13	**General Statistics**										
14	Total Number of Observations				76	Number of Distinct Observations				25	
15						Number of Missing Observations				0	
16	Minimum				2	Mean				10.66	
17	Maximum				36	Median				6.5	
18	SD				9.898	Std. Error of Mean				1.135	
19	Coefficient of Variation				0.929	Skewness				0.756	
20											
21	**Normal GOF Test**										
22	Shapiro Wilk Test Statistic				0.805	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk P Value				5.673E-14	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic				0.257	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value				0.102	Data Not Normal at 5% Significance Level					
26	**Data Not Normal at 5% Significance Level**										
27											
28	**Assuming Normal Distribution**										
29	**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL				12.55	95% Adjusted-CLT UCL (Chen-1995)				12.63	
31						95% Modified-t UCL (Johnson-1978)				12.57	
32											
33	**Gamma GOF Test**										
34	A-D Test Statistic				5.933	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value				0.78	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic				0.288	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value				0.105	Data Not Gamma Distributed at 5% Significance Level					
38	**Data Not Gamma Distributed at 5% Significance Level**										
39											
40	**Gamma Statistics**										
41	k hat (MLE)				1.056	k star (bias corrected MLE)				1.023	
42	Theta hat (MLE)				10.09	Theta star (bias corrected MLE)				10.42	
43	nu hat (MLE)				160.5	nu star (bias corrected)				155.5	
44	MLE Mean (bias corrected)				10.66	MLE Sd (bias corrected)				10.54	
45						Approximate Chi Square Value (0.05)				127.7	
46	Adjusted Level of Significance				0.0468	Adjusted Chi Square Value				127.2	
47											
48	**Assuming Gamma Distribution**										
49	95% Approximate Gamma UCL (use when n>=50))				12.98	95% Adjusted Gamma UCL (use when n<50)				13.03	
50											
51	**Lognormal GOF Test**										
52	Shapiro Wilk Test Statistic				0.771	**Shapiro Wilk Lognormal GOF Test**					
53	5% Shapiro Wilk P Value				1.110E-16	Data Not Lognormal at 5% Significance Level					
54	Lilliefors Test Statistic				0.294	**Lilliefors Lognormal GOF Test**					
55	5% Lilliefors Critical Value				0.102	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**										
57											
58	**Lognormal Statistics**										
59	Minimum of Logged Data				0.693	Mean of logged Data				1.823	
60	Maximum of Logged Data				3.584	SD of logged Data				1.107	
61											
62	**Assuming Lognormal Distribution**										
63	95% H-UCL				15.45	90% Chebyshev (MVUE) UCL				16.54	
64	95% Chebyshev (MVUE) UCL				18.93	97.5% Chebyshev (MVUE) UCL				22.24	
65	99% Chebyshev (MVUE) UCL				28.75						
66											
67	**Nonparametric Distribution Free UCL Statistics**										
68	**Data do not follow a Discernible Distribution (0.05)**										
69											
70	**Nonparametric Distribution Free UCLs**										
71	95% CLT UCL				12.53	95% Jackknife UCL				12.55	
72	95% Standard Bootstrap UCL				12.51	95% Bootstrap-t UCL				12.7	
73	95% Hall's Bootstrap UCL				12.61	95% Percentile Bootstrap UCL				12.49	
74	95% BCA Bootstrap UCL				12.62						
75	90% Chebyshev(Mean, Sd) UCL				14.06	95% Chebyshev(Mean, Sd) UCL				15.61	
76	97.5% Chebyshev(Mean, Sd) UCL				17.75	99% Chebyshev(Mean, Sd) UCL				21.95	
77											
78	**Suggested UCL to Use**										
79	95% Chebyshev (Mean, Sd) UCL				15.61						
80											
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.										
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)										
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.										
84	For additional insight the user may want to consult a statistician.										
85											

	A	B	C	D	E	F	G	H	I	J	K	L
86												
87	**Cd in Soil**											
88												
89	**General Statistics**											
90	Total Number of Observations					76	Number of Distinct Observations					12
91							Number of Missing Observations					0
92	Minimum					0	Mean					0.992
93	Maximum					7	Median					0.2
94	SD					1.376	Std. Error of Mean					0.158
95	Coefficient of Variation					1.387	Skewness					1.989
96												
97	**Normal GOF Test**											
98	Shapiro Wilk Test Statistic					0.684	**Shapiro Wilk GOF Test**					
99	5% Shapiro Wilk P Value					0	Data Not Normal at 5% Significance Level					
100	Lilliefors Test Statistic					0.336	**Lilliefors GOF Test**					
101	5% Lilliefors Critical Value					0.102	Data Not Normal at 5% Significance Level					
102	**Data Not Normal at 5% Significance Level**											
103												
104	**Assuming Normal Distribution**											
105	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
106	95% Student's-t UCL					1.255	95% Adjusted-CLT UCL (Chen-1995)					1.29
107							95% Modified-t UCL (Johnson-1978)					1.261
108	**Gamma Statistics Not Available**											
109	**Lognormal Statistics Not Available**											
110												
111	**Nonparametric Distribution Free UCL Statistics**											
112	**Data do not follow a Discernible Distribution (0.05)**											
113												
114	**Nonparametric Distribution Free UCLs**											
115	95% CLT UCL					1.252	95% Jackknife UCL					1.255
116	95% Standard Bootstrap UCL					1.247	95% Bootstrap-t UCL					1.298
117	95% Hall's Bootstrap UCL					1.314	95% Percentile Bootstrap UCL					1.26
118	95% BCA Bootstrap UCL					1.29						
119	90% Chebyshev(Mean, Sd) UCL					1.466	95% Chebyshev(Mean, Sd) UCL					1.68
120	97.5% Chebyshev(Mean, Sd) UCL					1.978	99% Chebyshev(Mean, Sd) UCL					2.563
121												
122	**Suggested UCL to Use**											
123	95% Chebyshev (Mean, Sd) UCL					1.68						
124												
125	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
126	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
127	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
128	For additional insight the user may want to consult a statistician.											
129												
130												

	A	B	C	D	E	F	G	H	I	J	K	L
131	Cr in Soil (tot)											
132												
133						General Statistics						
134					Total Number of Observations	76			Number of Distinct Observations			42
135									Number of Missing Observations			0
136					Minimum	0.5			Mean			25.2
137					Maximum	71			Median			18
138					SD	21.67			Std. Error of Mean			2.485
139					Coefficient of Variation	0.86			Skewness			0.751
140												
141						Normal GOF Test						
142					Shapiro Wilk Test Statistic	0.856			Shapiro Wilk GOF Test			
143					5% Shapiro Wilk P Value	5.285E-10			Data Not Normal at 5% Significance Level			
144					Lilliefors Test Statistic	0.155			Lilliefors GOF Test			
145					5% Lilliefors Critical Value	0.102			Data Not Normal at 5% Significance Level			
146						Data Not Normal at 5% Significance Level						
147												
148						Assuming Normal Distribution						
149					95% Normal UCL				95% UCLs (Adjusted for Skewness)			
150					95% Student's-t UCL	29.34			95% Adjusted-CLT UCL (Chen-1995)			29.51
151									95% Modified-t UCL (Johnson-1978)			29.37
152												
153						Gamma GOF Test						
154					A-D Test Statistic	1.1			Anderson-Darling Gamma GOF Test			
155					5% A-D Critical Value	0.783			Data Not Gamma Distributed at 5% Significance Level			
156					K-S Test Statistic	0.0863			Kolmogrov-Smirnoff Gamma GOF Test			
157					5% K-S Critical Value	0.106			Detected data appear Gamma Distributed at 5% Significance Level			
158						Detected data follow Appr. Gamma Distribution at 5% Significance Level						
159												
160						Gamma Statistics						
161					k hat (MLE)	0.959			k star (bias corrected MLE)			0.93
162					Theta hat (MLE)	26.28			Theta star (bias corrected MLE)			27.1
163					nu hat (MLE)	145.7			nu star (bias corrected)			141.3
164					MLE Mean (bias corrected)	25.2			MLE Sd (bias corrected)			26.13
165									Approximate Chi Square Value (0.05)			114.8
166					Adjusted Level of Significance	0.0468			Adjusted Chi Square Value			114.4
167												
168						Assuming Gamma Distribution						
169					95% Approximate Gamma UCL (use when n>=50)	31.01			95% Adjusted Gamma UCL (use when n<50)			31.13
170												
171						Lognormal GOF Test						
172					Shapiro Wilk Test Statistic	0.863			Shapiro Wilk Lognormal GOF Test			
173					5% Shapiro Wilk P Value	1.8660E-9			Data Not Lognormal at 5% Significance Level			
174					Lilliefors Test Statistic	0.145			Lilliefors Lognormal GOF Test			
175					5% Lilliefors Critical Value	0.102			Data Not Lognormal at 5% Significance Level			
176						Data Not Lognormal at 5% Significance Level						
177												
178						Lognormal Statistics						
179					Minimum of Logged Data	-0.693			Mean of logged Data			2.622
180					Maximum of Logged Data	4.263			SD of logged Data			1.382
181												
182						Assuming Lognormal Distribution						
183					95% H-UCL	54.73			90% Chebyshev (MVUE) UCL			56.92
184					95% Chebyshev (MVUE) UCL	66.88			97.5% Chebyshev (MVUE) UCL			80.71
185					99% Chebyshev (MVUE) UCL	107.9						
186												
187						Nonparametric Distribution Free UCL Statistics						
188						Data appear to follow a Discernible Distribution at 5% Significance Level						
189												
190						Nonparametric Distribution Free UCLs						
191					95% CLT UCL	29.29			95% Jackknife UCL			29.34
192					95% Standard Bootstrap UCL	29.15			95% Bootstrap-t UCL			29.6
193					95% Hall's Bootstrap UCL	29.59			95% Percentile Bootstrap UCL			29.28
194					95% BCA Bootstrap UCL	29.63						
195					90% Chebyshev(Mean, Sd) UCL	32.65			95% Chebyshev(Mean, Sd) UCL			36.03
196					97.5% Chebyshev(Mean, Sd) UCL	40.72			99% Chebyshev(Mean, Sd) UCL			49.93
197												
198						Suggested UCL to Use						
199					95% Approximate Gamma UCL	31.01						
200												
201						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
202						These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)						
203						and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.						
204						For additional insight the user may want to consult a statistician.						
205												
206												

	A	B	C	D	E	F	G	H	I	J	K	L
207	**Cu in Soil**											
208												
209						**General Statistics**						
210					Total Number of Observations	26			Number of Distinct Observations			26
211									Number of Missing Observations			1
212					Minimum	2			Mean			210.1
213					Maximum	386			Median			260.5
214					SD	123.6			Std. Error of Mean			24.25
215					Coefficient of Variation	0.588			Skewness			-0.571
216												
217						**Normal GOF Test**						
218					Shapiro Wilk Test Statistic	0.885			**Shapiro Wilk GOF Test**			
219					5% Shapiro Wilk Critical Value	0.92			Data Not Normal at 5% Significance Level			
220					Lilliefors Test Statistic	0.189			**Lilliefors GOF Test**			
221					5% Lilliefors Critical Value	0.174			Data Not Normal at 5% Significance Level			
222						**Data Not Normal at 5% Significance Level**						
223												
224						**Assuming Normal Distribution**						
225					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
226					95% Student's-t UCL	251.5			95% Adjusted-CLT UCL (Chen-1995)			247.1
227									95% Modified-t UCL (Johnson-1978)			251.1
228												
229						**Gamma GOF Test**						
230					A-D Test Statistic	2.769			**Anderson-Darling Gamma GOF Test**			
231					5% A-D Critical Value	0.773			Data Not Gamma Distributed at 5% Significance Level			
232					K-S Test Statistic	0.303			**Kolmogrov-Smirnoff Gamma GOF Test**			
233					5% K-S Critical Value	0.176			Data Not Gamma Distributed at 5% Significance Level			
234						**Data Not Gamma Distributed at 5% Significance Level**						
235												
236						**Gamma Statistics**						
237					k hat (MLE)	1.038			k star (bias corrected MLE)			0.944
238					Theta hat (MLE)	202.4			Theta star (bias corrected MLE)			222.6
239					nu hat (MLE)	53.97			nu star (bias corrected)			49.08
240					MLE Mean (bias corrected)	210.1			MLE Sd (bias corrected)			216.3
241									Approximate Chi Square Value (0.05)			34
242					Adjusted Level of Significance	0.0398			Adjusted Chi Square Value			33.17
243												
244						**Assuming Gamma Distribution**						
245					95% Approximate Gamma UCL (use when n>=50))	303.3			95% Adjusted Gamma UCL (use when n<50)			310.9
246												
247						**Lognormal GOF Test**						
248					Shapiro Wilk Test Statistic	0.689			**Shapiro Wilk Lognormal GOF Test**			
249					5% Shapiro Wilk Critical Value	0.92			Data Not Lognormal at 5% Significance Level			
250					Lilliefors Test Statistic	0.305			**Lilliefors Lognormal GOF Test**			
251					5% Lilliefors Critical Value	0.174			Data Not Lognormal at 5% Significance Level			
252						**Data Not Lognormal at 5% Significance Level**						
253												
254						**Lognormal Statistics**						
255					Minimum of Logged Data	0.693			Mean of logged Data			4.794
256					Maximum of Logged Data	5.956			SD of logged Data			1.557
257												
258						**Assuming Lognormal Distribution**						
259					95% H-UCL	1135			90% Chebyshev (MVUE) UCL			793.4
260					95% Chebyshev (MVUE) UCL	985.3			97.5% Chebyshev (MVUE) UCL			1251
261					99% Chebyshev (MVUE) UCL	1774						
262												
263						**Nonparametric Distribution Free UCL Statistics**						
264						**Data do not follow a Discernible Distribution (0.05)**						
265												
266						**Nonparametric Distribution Free UCLs**						
267					95% CLT UCL	250			95% Jackknife UCL			251.5
268					95% Standard Bootstrap UCL	248.8			95% Bootstrap-t UCL			248.6
269					95% Hall's Bootstrap UCL	245.7			95% Percentile Bootstrap UCL			249.8
270					95% BCA Bootstrap UCL	248.3						
271					90% Chebyshev(Mean, Sd) UCL	282.9			95% Chebyshev(Mean, Sd) UCL			315.8
272					97.5% Chebyshev(Mean, Sd) UCL	361.5			99% Chebyshev(Mean, Sd) UCL			451.4
273												
274						**Suggested UCL to Use**						
275					95% Chebyshev (Mean, Sd) UCL	315.8						
276												
277						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
278						These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)						
279						and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.						
280						For additional insight the user may want to consult a statistician.						
281												
282						**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**						
283						**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**						
284												
285												

	A	B	C	D	E	F	G	H	I	J	K	L
286	**Pb in Soil**											
287												
288						**General Statistics**						
289					Total Number of Observations	76			Number of Distinct Observations			51
290									Number of Missing Observations			0
291					Minimum	0.5			Mean			201.2
292					Maximum	1270			Median			18.5
293					SD	276			Std. Error of Mean			31.66
294					Coefficient of Variation	1.372			Skewness			1.53
295												
296						**Normal GOF Test**						
297					Shapiro Wilk Test Statistic	0.748			**Shapiro Wilk GOF Test**			
298					5% Shapiro Wilk P Value	0			Data Not Normal at 5% Significance Level			
299					Lilliefors Test Statistic	0.281			**Lilliefors GOF Test**			
300					5% Lilliefors Critical Value	0.102			Data Not Normal at 5% Significance Level			
301						**Data Not Normal at 5% Significance Level**						
302												
303						**Assuming Normal Distribution**						
304					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
305					95% Student's-t UCL	253.9			95% Adjusted-CLT UCL (Chen-1995)			259.2
306									95% Modified-t UCL (Johnson-1978)			254.8
307												
308						**Gamma GOF Test**						
309					A-D Test Statistic	3.294			**Anderson-Darling Gamma GOF Test**			
310					5% A-D Critical Value	0.838			Data Not Gamma Distributed at 5% Significance Level			
311					K-S Test Statistic	0.235			**Kolmogrov-Smirnoff Gamma GOF Test**			
312					5% K-S Critical Value	0.11			Data Not Gamma Distributed at 5% Significance Level			
313						**Data Not Gamma Distributed at 5% Significance Level**						
314												
315						**Gamma Statistics**						
316					k hat (MLE)	0.414			k star (bias corrected MLE)			0.406
317					Theta hat (MLE)	485.9			Theta star (bias corrected MLE)			495
318					nu hat (MLE)	62.92			nu star (bias corrected)			61.77
319					MLE Mean (bias corrected)	201.2			MLE Sd (bias corrected)			315.5
320									Approximate Chi Square Value (0.05)			44.69
321					Adjusted Level of Significance	0.0468			Adjusted Chi Square Value			44.41
322												
323						**Assuming Gamma Distribution**						
324					95% Approximate Gamma UCL (use when n>=50))	278			95% Adjusted Gamma UCL (use when n<50)			279.8
325												
326						**Lognormal GOF Test**						
327					Shapiro Wilk Test Statistic	0.905			**Shapiro Wilk Lognormal GOF Test**			
328					5% Shapiro Wilk P Value	4.0404E-6			Data Not Lognormal at 5% Significance Level			
329					Lilliefors Test Statistic	0.168			**Lilliefors Lognormal GOF Test**			
330					5% Lilliefors Critical Value	0.102			Data Not Lognormal at 5% Significance Level			
331						**Data Not Lognormal at 5% Significance Level**						
332												
333						**Lognormal Statistics**						
334					Minimum of Logged Data	-0.693			Mean of logged Data			3.723
335					Maximum of Logged Data	7.147			SD of logged Data			2.146
336												
337						**Assuming Lognormal Distribution**						
338					95% H-UCL	1015			90% Chebyshev (MVUE) UCL			818.1
339					95% Chebyshev (MVUE) UCL	1018			97.5% Chebyshev (MVUE) UCL			1295
340					99% Chebyshev (MVUE) UCL	1839						
341												
342						**Nonparametric Distribution Free UCL Statistics**						
343						**Data do not follow a Discernible Distribution (0.05)**						
344												
345						**Nonparametric Distribution Free UCLs**						
346					95% CLT UCL	253.2			95% Jackknife UCL			253.9
347					95% Standard Bootstrap UCL	253.3			95% Bootstrap-t UCL			261.4
348					95% Hall's Bootstrap UCL	257.9			95% Percentile Bootstrap UCL			253.9
349					95% BCA Bootstrap UCL	259.5						
350					90% Chebyshev(Mean, Sd) UCL	296.1			95% Chebyshev(Mean, Sd) UCL			339.2
351					97.5% Chebyshev(Mean, Sd) UCL	398.9			99% Chebyshev(Mean, Sd) UCL			516.2
352												
353						**Suggested UCL to Use**						
354					95% Chebyshev (Mean, Sd) UCL	339.2						
355												
356						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
357						These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)						
358						and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.						
359						For additional insight the user may want to consult a statistician.						
360												
361												

	A	B	C	D	E	F	G	H	I	J	K	L
362	**Hg in Soil**											
363												
364						**General Statistics**						
365					Total Number of Observations	76			Number of Distinct Observations			39
366									Number of Missing Observations			0
367					Minimum	0.05			Mean			1.396
368					Maximum	14.8			Median			0.06
369					SD	2.524			Std. Error of Mean			0.29
370					Coefficient of Variation	1.808			Skewness			3.613
371												
372						**Normal GOF Test**						
373					Shapiro Wilk Test Statistic	0.569			**Shapiro Wilk GOF Test**			
374					5% Shapiro Wilk P Value	0			Data Not Normal at 5% Significance Level			
375					Lilliefors Test Statistic	0.297			**Lilliefors GOF Test**			
376					5% Lilliefors Critical Value	0.102			Data Not Normal at 5% Significance Level			
377						**Data Not Normal at 5% Significance Level**						
378												
379						**Assuming Normal Distribution**						
380					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
381					95% Student's-t UCL	1.878			95% Adjusted-CLT UCL (Chen-1995)			2
382									95% Modified-t UCL (Johnson-1978)			1.898
383												
384						**Gamma GOF Test**						
385					A-D Test Statistic	6.973			**Anderson-Darling Gamma GOF Test**			
386					5% A-D Critical Value	0.839			Data Not Gamma Distributed at 5% Significance Level			
387					K-S Test Statistic	0.301			**Kolmogrov-Smirnoff Gamma GOF Test**			
388					5% K-S Critical Value	0.11			Data Not Gamma Distributed at 5% Significance Level			
389						**Data Not Gamma Distributed at 5% Significance Level**						
390												
391						**Gamma Statistics**						
392					k hat (MLE)	0.411			k star (bias corrected MLE)			0.403
393					Theta hat (MLE)	3.398			Theta star (bias corrected MLE)			3.461
394					nu hat (MLE)	62.43			nu star (bias corrected)			61.3
395					MLE Mean (bias corrected)	1.396			MLE Sd (bias corrected)			2.198
396									Approximate Chi Square Value (0.05)			44.29
397					Adjusted Level of Significance	0.0468			Adjusted Chi Square Value			44.01
398												
399						**Assuming Gamma Distribution**						
400					95% Approximate Gamma UCL (use when n>=50))	1.932			95% Adjusted Gamma UCL (use when n<50)			1.944
401												
402						**Lognormal GOF Test**						
403					Shapiro Wilk Test Statistic	0.754			**Shapiro Wilk Lognormal GOF Test**			
404					5% Shapiro Wilk P Value	0			Data Not Lognormal at 5% Significance Level			
405					Lilliefors Test Statistic	0.314			**Lilliefors Lognormal GOF Test**			
406					5% Lilliefors Critical Value	0.102			Data Not Lognormal at 5% Significance Level			
407						**Data Not Lognormal at 5% Significance Level**						
408												
409						**Lognormal Statistics**						
410					Minimum of Logged Data	-2.996			Mean of logged Data			-1.262
411					Maximum of Logged Data	2.695			SD of logged Data			1.939
412												
413						**Assuming Lognormal Distribution**						
414					95% H-UCL	3.921			90% Chebyshev (MVUE) UCL			3.489
415					95% Chebyshev (MVUE) UCL	4.284			97.5% Chebyshev (MVUE) UCL			5.387
416					99% Chebyshev (MVUE) UCL	7.555						
417												
418						**Nonparametric Distribution Free UCL Statistics**						
419						**Data do not follow a Discernible Distribution (0.05)**						
420												
421						**Nonparametric Distribution Free UCLs**						
422					95% CLT UCL	1.872			95% Jackknife UCL			1.878
423					95% Standard Bootstrap UCL	1.873			95% Bootstrap-t UCL			2.151
424					95% Hall's Bootstrap UCL	3.21			95% Percentile Bootstrap UCL			1.891
425					95% BCA Bootstrap UCL	2.069						
426					90% Chebyshev(Mean, Sd) UCL	2.264			95% Chebyshev(Mean, Sd) UCL			2.658
427					97.5% Chebyshev(Mean, Sd) UCL	3.204			99% Chebyshev(Mean, Sd) UCL			4.276
428												
429						**Suggested UCL to Use**						
430					95% Chebyshev (Mean, Sd) UCL	2.658						
431												
432						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
433						These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)						
434						and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.						
435						For additional insight the user may want to consult a statistician.						
436												
437												

	A	B	C	D	E	F	G	H	I	J	K	L
438	**Ni in Soil**											
439												
440						**General Statistics**						
441					Total Number of Observations	76			Number of Distinct Observations			29
442									Number of Missing Observations			0
443					Minimum	0.5			Mean			9.645
444					Maximum	44			Median			5.5
445					SD	10.18			Std. Error of Mean			1.168
446					Coefficient of Variation	1.055			Skewness			1.151
447												
448						**Normal GOF Test**						
449					Shapiro Wilk Test Statistic	0.831			**Shapiro Wilk GOF Test**			
450					5% Shapiro Wilk P Value	5.063E-12			Data Not Normal at 5% Significance Level			
451					Lilliefors Test Statistic	0.184			**Lilliefors GOF Test**			
452					5% Lilliefors Critical Value	0.102			Data Not Normal at 5% Significance Level			
453						**Data Not Normal at 5% Significance Level**						
454												
455						**Assuming Normal Distribution**						
456					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
457					95% Student's-t UCL	11.59			95% Adjusted-CLT UCL (Chen-1995)			11.73
458									95% Modified-t UCL (Johnson-1978)			11.62
459												
460						**Gamma GOF Test**						
461					A-D Test Statistic	1.527			**Anderson-Darling Gamma GOF Test**			
462					5% A-D Critical Value	0.793			Data Not Gamma Distributed at 5% Significance Level			
463					K-S Test Statistic	0.119			**Kolmogrov-Smirnoff Gamma GOF Test**			
464					5% K-S Critical Value	0.106			Data Not Gamma Distributed at 5% Significance Level			
465						**Data Not Gamma Distributed at 5% Significance Level**						
466												
467						**Gamma Statistics**						
468					k hat (MLE)	0.759			k star (bias corrected MLE)			0.738
469					Theta hat (MLE)	12.71			Theta star (bias corrected MLE)			13.08
470					nu hat (MLE)	115.3			nu star (bias corrected)			112.1
471					MLE Mean (bias corrected)	9.645			MLE Sd (bias corrected)			11.23
472									Approximate Chi Square Value (0.05)			88.66
473					Adjusted Level of Significance	0.0468			Adjusted Chi Square Value			88.26
474												
475						**Assuming Gamma Distribution**						
476					95% Approximate Gamma UCL (use when n>=50))	12.19			95% Adjusted Gamma UCL (use when n<50)			12.25
477												
478						**Lognormal GOF Test**						
479					Shapiro Wilk Test Statistic	0.882			**Shapiro Wilk Lognormal GOF Test**			
480					5% Shapiro Wilk P Value	5.3862E-8			Data Not Lognormal at 5% Significance Level			
481					Lilliefors Test Statistic	0.143			**Lilliefors Lognormal GOF Test**			
482					5% Lilliefors Critical Value	0.102			Data Not Lognormal at 5% Significance Level			
483						**Data Not Lognormal at 5% Significance Level**						
484												
485						**Lognormal Statistics**						
486					Minimum of Logged Data	-0.693			Mean of logged Data			1.479
487					Maximum of Logged Data	3.784			SD of logged Data			1.452
488												
489						**Assuming Lognormal Distribution**						
490					95% H-UCL	19.97			90% Chebyshev (MVUE) UCL			20.52
491					95% Chebyshev (MVUE) UCL	24.26			97.5% Chebyshev (MVUE) UCL			29.46
492					99% Chebyshev (MVUE) UCL	39.67						
493												
494						**Nonparametric Distribution Free UCL Statistics**						
495						**Data do not follow a Discernible Distribution (0.05)**						
496												
497						**Nonparametric Distribution Free UCLs**						
498					95% CLT UCL	11.57			95% Jackknife UCL			11.59
499					95% Standard Bootstrap UCL	11.52			95% Bootstrap-t UCL			11.62
500					95% Hall's Bootstrap UCL	11.79			95% Percentile Bootstrap UCL			11.47
501					95% BCA Bootstrap UCL	11.79						
502					90% Chebyshev(Mean, Sd) UCL	13.15			95% Chebyshev(Mean, Sd) UCL			14.73
503					97.5% Chebyshev(Mean, Sd) UCL	16.94			99% Chebyshev(Mean, Sd) UCL			21.26
504												
505						**Suggested UCL to Use**						
506					95% Chebyshev (Mean, Sd) UCL	14.73						
507												
508					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
509					These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)							
510					and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.							
511					For additional insight the user may want to consult a statistician.							
512												
513												

1	UCL Statistics for Uncensored Full Data Sets										
2											
3	User Selected Options										
4	Date/Time of Computation			ProUCL 5.18/04/2019 12:28:30 PM							
5	From File			WorkSheet.xls							
6	Full Precision			OFF							
7	Confidence Coefficient			95%							
8	Number of Bootstrap Operations			2000							
9											
10											
11	Zn										
12											
13	General Statistics										
14	Total Number of Observations				13		Number of Distinct Observations				12
15							Number of Missing Observations				0
16	Minimum				21		Mean				100
17	Maximum				201		Median				82
18	SD				52.58		Std. Error of Mean				14.58
19	Coefficient of Variation				0.526		Skewness				0.705
20											
21	Normal GOF Test										
22	Shapiro Wilk Test Statistic				0.919		Shapiro Wilk GOF Test				
23	5% Shapiro Wilk Critical Value				0.866		Data appear Normal at 5% Significance Level				
24	Lilliefors Test Statistic				0.249		Lilliefors GOF Test				
25	5% Lilliefors Critical Value				0.234		Data Not Normal at 5% Significance Level				
26	Data appear Approximate Normal at 5% Significance Level										
27											
28	Assuming Normal Distribution										
29	95% Normal UCL						95% UCLs (Adjusted for Skewness)				
30	95% Student's-t UCL				126		95% Adjusted-CLT UCL (Chen-1995)				127
31							95% Modified-t UCL (Johnson-1978)				126.5
32											
33	Gamma GOF Test										
34	A-D Test Statistic				0.383		Anderson-Darling Gamma GOF Test				
35	5% A-D Critical Value				0.738		Detected data appear Gamma Distributed at 5% Significance Level				
36	K-S Test Statistic				0.19		Kolmogorov-Smirnov Gamma GOF Test				
37	5% K-S Critical Value				0.238		Detected data appear Gamma Distributed at 5% Significance Level				
38	Detected data appear Gamma Distributed at 5% Significance Level										
39											
40	Gamma Statistics										
41	k hat (MLE)				3.632		k star (bias corrected MLE)				2.845
42	Theta hat (MLE)				27.53		Theta star (bias corrected MLE)				35.15
43	nu hat (MLE)				94.43		nu star (bias corrected)				73.97
44	MLE Mean (bias corrected)				100		MLE Sd (bias corrected)				59.29
45							Approximate Chi Square Value (0.05)				55.16
46	Adjusted Level of Significance				0.0301		Adjusted Chi Square Value				52.85
47											
48	Assuming Gamma Distribution										
49	95% Approximate Gamma UCL (use when n>=50))				134.1		95% Adjusted Gamma UCL (use when n<50)				140
50											
51	Lognormal GOF Test										
52	Shapiro Wilk Test Statistic				0.923		Shapiro Wilk Lognormal GOF Test				
53	5% Shapiro Wilk Critical Value				0.866		Data appear Lognormal at 5% Significance Level				
54	Lilliefors Test Statistic				0.18		Lilliefors Lognormal GOF Test				
55	5% Lilliefors Critical Value				0.234		Data appear Lognormal at 5% Significance Level				
56	Data appear Lognormal at 5% Significance Level										
57											

	A	B	C	D	E	F	G	H	I	J	K	L
58					Lognormal Statistics							
59					Minimum of Logged Data	3.045				Mean of logged Data		4.461
60					Maximum of Logged Data	5.303				SD of logged Data		0.596
61												
62					Assuming Lognormal Distribution							
63					95% H-UCL	151.7				90% Chebyshev (MVUE) UCL		154.1
64					95% Chebyshev (MVUE) UCL	177.7				97.5% Chebyshev (MVUE) UCL		210.6
65					99% Chebyshev (MVUE) UCL	275.1						
66												
67					Nonparametric Distribution Free UCL Statistics							
68					Data appear to follow a Discernible Distribution at 5% Significance Level							
69												
70					Nonparametric Distribution Free UCLs							
71					95% CLT UCL	124				95% Jackknife UCL		126
72					95% Standard Bootstrap UCL	123				95% Bootstrap-t UCL		131.1
73					95% Hall's Bootstrap UCL	130.6				95% Percentile Bootstrap UCL		123.7
74					95% BCA Bootstrap UCL	126.9						
75					90% Chebyshev(Mean, Sd) UCL	143.7				95% Chebyshev(Mean, Sd) UCL		163.6
76					97.5% Chebyshev(Mean, Sd) UCL	191.1				99% Chebyshev(Mean, Sd) UCL		245.1
77												
78					Suggested UCL to Use							
79					95% Student's-t UCL	126						
80												
81					When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test							
82					When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL							
83												
84					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
85					Recommendations are based upon data size, data distribution, and skewness.							
86					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
87					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
88												

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3	Chris Bielby	Joanne Rosner	Joanne Rosner		4/04/2019

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