

Prepared for  
**John Holland CPB Ghella Joint Venture**

Prepared by  
**Ramboll Australia Pty Ltd**

Date  
**20 October 2020**

Project Number  
**318000323-001**

Audit Number  
**TO-024-4**

# **SITE AUDIT REPORT**

## **SYDNEY METRO**

### **CHATSWOOD DIVE**

#### **STRUCTURE, 339**

20 October 2020

John Holland CPB Ghella Joint Venture  
Attn.: Krissy Vajda  
Level 9, 50 Bridge Street  
Sydney NSW 2000

**By email: [krissy.vajda@sydneymetro2.com.au](mailto:krissy.vajda@sydneymetro2.com.au)**

Dear Krissy

**SITE AUDIT REPORT - SYDNEY METRO CHATSWOOD  
DIVE STRUCTURE, 339 MOWBRAY ROAD, CHATSWOOD  
NSW**

I have pleasure in submitting the Site Audit Report for the subject site. The Site Audit Statement, produced in accordance with the NSW *Contaminated Land Management Act 1997*, is included as Appendix B of the Site Audit Report. The Audit was commissioned by John Holland CPB Ghella Joint Venture to assess the suitability of the site for its intended Metro train dive structure (commercial/industrial) land use.

The Audit was initiated to comply with requirements of *Condition E67 of Infrastructure Approval, application SSI 15\_7400*, approved by the Minister for Planning on 9 January 2017, and is therefore a statutory audit.

Thank you for giving me the opportunity to conduct this Audit. Please call me on 9954 8100 if you have any questions.

Yours faithfully,  
Ramboll Australia Pty Ltd



Tom Onus  
EPA Accredited Site Auditor 1505

cc: NSW EPA – Statement only  
Willoughby Council

Ramboll Australia  
Level 3, 100 Pacific Highway  
PO Box 560  
North Sydney NSW 2060

T +61 2 9954 8100  
[www.ramboll.com](http://www.ramboll.com)

Ref 318000323-001

Ramboll Australia Pty Ltd  
ACN 095 437 442  
ABN 49 095 437 442

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Interim Audit Advice

## LIST OF ABBREVIATIONS

### *Measures*

%	per cent
µg/L	Micrograms per Litre
ha	Hectare
km	Kilometres
m	Metre
mAHD	Metres Australian Height Datum
mbgl	Metres below ground level
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
mm	Millimetre
ppm	Parts Per Million

### *General*

ACM	Asbestos Containing Material
ADWG	Australian Drinking Water Guidelines
AHD	Australian Height Datum
ANZG	Australian & New Zealand Guidelines
ASS	Acid Sulphate Soil
AST	Aboveground Storage Tank
ANZECC	Australian and New Zealand Environment and Conservation Council
BaP	Benzo(a)pyrene
BGL	Below Ground Level
BTEXN	Benzene, Toluene, Ethylbenzene, Xylenes & Naphthalene
CLM Act	NSW Contaminated Land Management Act 1997
COC	Chain of Custody
Council	North Sydney Council
CSM	Conceptual Site Model
DGV	Default Guideline Value
Douglas	Douglas Partners Pty Ltd
DP	Deposited Plan
DQI	Data Quality Indicator
DQO	Data Quality Objective
DSI	Detailed Site Investigation
ENM	Excavated Natural Material
EPA	Environment Protection Authority (NSW)
EPL	Environment Protection Licence
GIL	Groundwater Investigation Level
GSW	General Solid Waste
HIL	Health Investigation Level
HSL	Health Screening Level
HW	Hazardous Waste
IAA	Interim Audit Advice
JHCPBG JV	John Holland CPB Ghella Joint Venture
LCS	Laboratory Control Sample
LEP	Local Environment Plan
Metals	As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Ni: Nickel, Pb: Lead, Zn: Zinc,
Hg: Mercury	
ML	Management Limits
MS	Matrix Spike
NATA	National Association of Testing Authorities
NC	Not Calculated
ND	Not Detected
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NL	Non-Limiting
n	Number of Samples
OCPs	Organochlorine Pesticides
OEH	Office of Environment and Heritage

OPPs	Organophosphorus Pesticides
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PFAS	Per- and Poly-fluoroalkyl substances
pH	A measure of acidity, hydrogen ion activity
PID	Photoionisation Detector
PQL	Practical Quantitation Limit
PSI	Preliminary Site Investigation
QA/QC	Quality Assurance/Quality Control
Ramboll ENVIRON	Ramboll Australia Pty Ltd – previously Ramboll Environ Australia Pty Ltd and Australia Pty Ltd
RAP	Remediation Action Plan
RPD	Relative Percent Difference
RRE	Resource Recovery Exemption
RRO	Resource Recovery Order
RSL	Regional Screening Level
SAR	Site Audit Report
SAS	Site Audit Statement
SPR	Source-pathway-receptor
SSI	State Significant Infrastructure
TEQ	Toxic Equivalence Quotient
TPHs	Total Petroleum Hydrocarbons
TRHs	Total Recoverable Hydrocarbons
TV	Trigger Value
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VENM	Virgin Excavated Natural Material
VOCs	Volatile Organic Compounds
-	On tables is "not calculated", "no criteria" or "not applicable"

# 1. INTRODUCTION

## 1.1 Audit Details

A site contamination audit has been conducted in relation to the Chatswood Dive site of the Sydney Metro City and South West, which is located at 339 Mowbray Road, Chatswood.

The Audit was conducted to provide an independent review by an EPA Accredited Auditor of whether the land is suitable for any specified use or range of uses, i.e. a "Site Audit" as defined in Section 4 (1) (b) (iii) of the NSW *Contaminated Land Management Act 1997* (the CLM Act).

A State Significant Infrastructure (SSI) development application (SSI 15\_7400) was approved by the NSW Minister for Planning on 9 January 2017 for the construction and operation of a metro rail line, approximately 16.5 km long (of which approximately 15.5 km is located in underground rail tunnels) between Chatswood and Sydenham, including the construction of a tunnel under Sydney Harbour, links with the existing rail network, seven metro stations, and associated ancillary infrastructure. Condition E67 of the SSI development approval relates to contamination and requires a site audit as follows:

*"If a Site Contamination Report prepared under Condition E66 finds such land contains contamination, a site audit is required to determine the suitability of a site for a specified use. If a site audit is required, a Site Audit Statement and Site Audit Report must be prepared by a NSW EPA Accredited Site Auditor. Contaminated land must not be used for the purpose approved under the terms of this approval until a Site Audit Statement is obtained that declares the land is suitable for that purpose and any conditions on the Site Audit Statement have been complied with."*

The Audit was initiated to comply with condition E67 of the SSI approval and is therefore a statutory audit. The site audit is also a requirement of Clause 10.14B of the Sydney Metro City & Southwest Tunnel and Station Excavation Works Design and Construction Deed (Contract No: 00013/11200).

Details of the Audit are:

Requested by:	Caitlin Richards on behalf of John Holland CPB Ghella Joint Venture (JHCPBG JV)
Request/Commencement Date:	5 October 2017
Auditor:	Tom Onus
Accreditation No.:	1505

## 1.2 Project Background

As part of the Sydney Metro City and South West (Sydney Metro) Tunnel and Station Excavation (TSE) Works Package, a Remediation Action Plan (RAP) was developed to detail the work required to remediate impacted fill material during construction of the dive structure and tunnel portal. The RAP was reviewed by the Auditor (see Section 1.3 for details) prior to remediation commencing.

The site comprises the 'excavation footprint' shown in blue on Attachment 1 (Appendix A). The surrounding 'Worksite Area' shown in red is not part of the site. Remediation was undertaken by excavation and off-site disposal of all fill material and natural soil/bedrock to an average depth of approximately 21.6 metres below ground level (mbgl) within the site. The base of the site will comprise approximately 200 mm thick concrete slab and the walls will include bored piles with shotcrete between the piles. A water collection sump will be located at the base of the excavation at the tunnel portal wall.

### 1.3 Interim Audit Advice

Interim Audit Advice (IAA) was prepared by the Auditor in 2018 which provided an initial review of the suitability and appropriateness of a RAP, as well as a review of the previous investigations undertaken at the site. The reports reviewed for the IAA are listed in Section 1.4 below.

The IAA concluded that the proposed process for remediation of fill material was practical and that the site could be made suitable for the proposed land use if remediated in accordance with the RAP. The IAA noted that "*At the completion of remediation of the site, a Section A Site Audit Statement and supporting Site Audit Report certifying suitability for the proposed use should be prepared.*"

The IAA is attached in Appendix C and is referenced throughout this Site Audit Report (SAR) where required, however, full details of the IAA are not repeated.

### 1.4 Scope of the Audit

The scope of work undertaken for the IAA included:

- Review of the following reports:
  - 'Report on Preliminary Site Investigation, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Chatswood Dive, Mowbray Road, Chatswood, prepared for John Holland CPB Ghella JV, Project 85608.02, February 2018', report reference: Rev0, dated 27 February 2017, prepared by Douglas Partners Pty Ltd (Douglas) (*the PSI*).
  - 'Report on Detailed Site Investigation, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Chatswood Dive, Mowbray Road, Chatswood, prepared for John Holland CPB Ghella JV, Project 85608.02, March 2018', report reference: Revision 1, dated 7 March 2018, prepared by Douglas (*the DSI*).
  - 'Report on Remediation Action Plan, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Chatswood Dive, 339 Mowbray Road, Chatswood, prepared for John Holland CPB Ghella JV, Project 85608.02, April 2018', report reference: Revision 1, dated 12 April 2018, prepared by Douglas (*the RAP*).
- A site visit by the Auditor on 27 October 2017.
- Discussions with JHCPBG JV, and with Douglas who undertook the investigations and prepared the RAP.

The PSI makes reference to a number of previous contamination investigation reports prepared for the site by various consultants including Douglas, Golder Associates Pty Ltd (Golder), Johnstone Environmental Technology, AGC Woodward-Clyde Pty Ltd, Energy Australia, PPK Environment and Infrastructure, and Ausgrid. The RAP made reference to a hydrogeological interpretive report (dated 19 March 2018) prepared by Pells Sullivan Meynink (PSM). A summary of relevant information from these reports was included in the Douglas reports. Copies of these reports have not been provided to the Auditor for this review.

The scope of work undertaken in competing the SAR included:

- Review of the following report:
  - 'Report on Validation of Remediation, Sydney Metro City and South West - Tunnel and Station Excavation Works Package, Sydney Metro City and South West - Chatswood Dive, 339 Mowbray Road, Chatswood, NSW', report reference: Revision 1, dated 15 October 2020, prepared by Douglas (*the Validation Report*).



- Review of 11 waste classification reports prepared by Douglas for material disposed from the site.
- Discussions with JHCPBG JV, and with Douglas who undertook the remediation and validation works.

## 2. SITE DETAILS

### 2.1 Location

The site is identified as the 'excavation footprint' (the site) for the station, shown in blue on Attachment 1 (Appendix A). The 'Worksite Area' shown in red on Attachment 1 surrounding the 'excavation footprint' has been excluded from the Douglas investigations and is not part of the site audit area. The site details are as follows:

Street address:	339 Mowbray Road, Chatswood, NSW 2067
Identifier:	Part Lot 2 DP221896
Local Government:	Willoughby Council
Owner:	Transport for New South Wales
Site Area:	Approximately 0.3 ha

The boundaries of the site comprise the walls of the excavation. The Worksite Area is bound by the Pacific Highway to the west, Nelson Street to the north, rail corridor to the east and Mowbray Road to the south.

A survey plan of the site has been provided in Attachment 2 (Appendix A) and the purple outline identifies the Site Audit boundary.

### 2.2 Zoning

The current zoning of the site is SP2 Infrastructure under the Willoughby Local Environment Plan (LEP) 2012.

### 2.3 Adjacent Uses

The site is located within an area of commercial and residential land use. The surrounding site use includes:

North: Nelson Street and high-rise residential apartments beyond.

East: Railway corridor and high-rise residential apartments beyond the corridor.

South: The worksite area, then Mowbray Road. Sydney Water Chatswood Reservoir is located further south of Mowbray Road.

West: The Worksite Area and Pacific Highway. Beyond the highway is a service station (572 Pacific Highway) and high-rise residential apartments with ground floor commercial.

The railway corridor is in a cutting approximately 6-10 m below the Worksite Area. A steep batter was located along the eastern boundary which sloped down to the railway corridor. Douglas identified the closest sensitive ecological receptor for groundwater as Scotts Creek located approximately 2.4 km to the northeast.

The Worksite Area was previously occupied by various commercial land uses, including a service station, electrical substation and transformer facility, which have resulted in localised contamination. The former Caltex service station on 607 Pacific Highway (west of the subject site) was impacted by petroleum hydrocarbon contamination and was the subject of a Declaration of Investigation Area and an approved voluntary management proposal (VMP). The PSI describes a number of former USTs previously installed within the Worksite Area. No USTs were previously located on the site. A UST and associated pipework are located immediately to the southwest of the site (Attachment 1, Appendix A).

A search of the NSW EPA list of notified contaminated sites shows two properties (service stations at 607 Pacific Highway and 572 Pacific Highway) located within a radius of 200 m from the site.

## 2.4 Site Condition

### 2.4.1 Pre-Remediation

Douglas inspected the site on 20 September 2017 and noted the following:

- Former depot buildings had been demolished except for Mowbray House (a heritage listed former school) and the former substation transformer workshop. These are located within the Worksite Area, outside of the audit site.
- The majority of the Worksite Area was paved with concrete and asphalt with exposed soil in garden beds along the southern Worksite Area boundary.
- Fibre-cement fragments potentially containing asbestos were observed at the surface of the exposed soil along the southern Worksite Area boundary (off-site).
- A concrete pad associated with a former fuel pump and pipeline was located on the southwest site boundary and extended onto the Worksite Area (Attachment 1, Appendix A). The pipeline led to a decommissioned underground fuel storage tank (UST) located to the north of Mowbray House in the central section of the Worksite Area.

During the Auditors site visit on 27 October 2017, the site condition was consistent with observations made by Douglas, with the following additional features noted:

- A large area of pavement had been removed in the south section of the site. Exposed fill soil was visible at the surface.
- An open excavation to the west of the site (within the Worksite Area) had exposed asbestos pipes. The excavation was fenced limiting access to the area.
- Temporary site sheds had been setup to the west of the site along Pacific Highway.
- The concrete pad of the former fuel pump was located in the southwest section of the site.

### 2.4.2 Post-Remediation

Douglas noted in the Validation Report that the final maximum excavation depth for the site was approximately 21.3 m (to RL 82.7 m) which was at the southern end of the site where the tunnel boring machines were positioned for launch. The top of the capping beam was at RL 103.6 m.

Douglas indicated that at the time of preparation of the Validation Report, the walls of the site were concreted and much of the base of the site was also covered in concrete. A ramp was present in the northern portion of the site which provided access to the base of the dive structure. The adjacent embankment of the rail corridor to the east had been excavated and removed. Work was continuing at the rail corridor for the Metro line to tie in with the Dive Structure construction.

## 2.5 Proposed Development

The proposed development includes the construction of a dive structure to launch and support two tunnel boring machines. The maximum depth of excavation for the dive structure is approximately 21.3 mbgl. The base of the structure comprises approximately 200 mm thick concrete slab and the walls include bored piles with shotcrete between the piles. A water collection sump will be located at the base of the excavation at the tunnel portal wall.

For the purposes of this audit, the 'commercial/ industrial' land use scenario will be assumed.

### 3. SITE HISTORY

The IAA provided a summary of the site history provided in the PSI, including a review of historical title deeds, aerial photographs, NSW EPA records and Section 149 (now termed Section 10.7) certificates. Douglas reviewed NSW SafeWork records as part of the DSI. The site history from the IAA is summarised as follows.

The site was used as part of a school and playing fields up until the late 1950s before being developed and used for various commercial purposes (depot and workshop). The site was used for substation transformer servicing, circuit fabrication, testing of components and transformer oils, vehicle maintenance, carpentry, wiring and photographic processing. Sections of the site were owned by Railways, Sydney Country Council, Ausgrid and a small portion as a road reserve. The former Caltex service station in the west of the Worksite Area (offsite) was developed between 1956 and 1972 and decommissioned and demolished between 2002 and 2009.

Douglas concluded in the PSI that no USTs were located within the site. However, Douglas noted a concrete pad for a former fuel pump and pipeline of a decommissioned UST was located close to the western site boundary (outside the site boundary). Douglas indicated that other USTs located beyond the site boundary had been removed.

A review of the NSW EPA public records indicates two properties located close to the site notified as contaminated to the EPA. The properties include: a former Caltex service station at 607 Pacific Highway (within the Worksite Area) and an operating service station on 572 Pacific Highway, located to the west of the Worksite Area. Based on the site location and history, potential contamination could have impacted the site from on-site and/or off-site sources.

#### 3.1 Auditor's Opinion

In the Auditor's opinion, the site history indicates past activities that may have resulted in site contamination, including the fuel pump in the south of site and other activities undertaken within the greater Worksite Area including substation transformer servicing, circuit fabrication, testing of components and transformer oils, vehicle maintenance, carpentry, wiring and photographic processing. Details of site operations were not provided, such as chemical use and storage locations. The current and former service stations located to the west of the site are also potential sources of contamination. The Auditor considers that the site history is broadly understood and adequate for identification of contaminants of concern (Section 4) and remediation of the site (Section 11).

## 4. CONTAMINANTS OF CONCERN

As outlined in the IAA, the PSI and DSI provided a list of contaminants of concern and potentially contaminating activities. These have been tabulated in Table 4.1.

**Table 4.1: Contaminants of Concern**

Area	Activity	Potential Contaminants
Entire Site	Fill and surface soil imported from unknown sources. Ash and slag were identified in the fill. Demolition of former buildings containing hazardous materials.	Metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylenes & naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphorus pesticides (OPPs), polychlorinated biphenyls (PCBs), phenols, lead (from paint) and asbestos.
Entire Site	Former land use as a depot workshop and testing building. Use of chemicals, engine oil, solvents, fuels, reagents and cleaning chemicals. Former fuel pump and pipework associated with the decommissioned UST.	Petroleum hydrocarbons (BTEX, TPH), PAHs, volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs), metals, cyanide and phenols.
Off-Site Sources	Migration of contaminated groundwater from the Caltex service stations and other USTs on the Worksite.	Metals, petroleum hydrocarbons (BTEX, TPH), PAHs, VOCs and phenols.

The DSI stated that, based on the site topography and review of previous investigation reports, contaminated groundwater associated with the former Caltex service station in the west of the Worksite Area is likely to migrate to the north with low risk of migration onto the site.

### 4.1 Auditor’s Opinion

The Auditor reviewed the groundwater data presented in the DSI, as well as knowledge of the remediation of the former Caltex service station and agrees with the Douglas conclusion. Less than 10 m to the east is a railway corridor cut approximately 6-10 m below the Worksite Area, which would already be acting to draw groundwater towards the east. The risk of migration of contamination from these potential sources to the site as a result of the development is therefore considered to be low.

The Auditor considers that the analyte list used by Douglas adequately reflects the site history and condition.

## 5. STRATIGRAPHY AND HYDROGEOLOGY

### 5.1 Stratigraphy

Douglas reviewed geological maps and reported that the site is underlain by Ashfield Shale which comprises black to dark grey shale and laminite.

The sub-surface profile of the site encountered during the Douglas DSI prior to remediation is summarised by the Auditor in Table 5.1.

**Table 5.1: Stratigraphy**

Depth (mbgl)	Subsurface Profile
0.0 – 0.3	Asphaltic concrete and concrete pavements underlain by grey sandy gravel roadbase.
0.3 – 0.6	Fill material comprising clay and sand with inclusions of brick, charcoal and sandstone. Grey ash was detected in 5 sampling locations between depths of 0.3 mbgl and 0.38 mbgl. A fragment of asbestos containing material (ACM) was detected in one test pit between 0.38 mbgl and 0.48 mbgl.
1 – 2.7	Natural clay.
0.6 to termination depth (9.9)	Weathered shale bedrock with ironstone gravel.

mbgl – metres below ground level

The subsurface profile comprised relatively shallow fill underlain by natural clay soil and shale bedrock.

Douglas indicated that the site is located within an area of no known occurrence of acid sulfate soils (ASS) and is not close to an area of associated risk of ASS.

Following remediation of the site (discussed in Section 11), fill material and natural soil/rock were removed from the entire site area to a depth of up to approximately 21.3 mbgl.

### 5.2 Hydrogeology

The PSI included a search of the groundwater information database maintained by the NSW Government and identified 17 registered groundwater bores within a 0.5 km radius of the site. The majority of the bores (16) were located in the west of the Worksite Area (off-site). The bores were registered for monitoring purposes associated with investigation and remediation of the former Caltex service station. Groundwater data was not included in the work summary documents. The PSI concluded that based on the topography and information from the previous investigations, groundwater is anticipated to flow to the north. Groundwater flow may be impacted by the railway cutting located along the eastern site boundary and may also be impacted by the proposed development. Douglas identified the closest sensitive ecological receptor for groundwater to be Scotts Creek located approximately 2.4 km to the northeast. The creek drains into Castle Cove located approximately 3.7 km to the east of the site. Excess surface water run-off is anticipated to flow into the local stormwater network.

As part of the DSI, three groundwater monitoring wells were installed on the site (Attachment 3, Appendix A). Groundwater seepage was noted during drilling in CWMW06 at 7.8 mbgl. Groundwater observations and sampling was undertaken as part of the DSI on 27 November 2017. Depth to groundwater in the monitoring wells was recorded between 5.50 mbgl to 5.55 mbgl. The DSI stated that based on groundwater levels and the site topography, the groundwater is anticipated to flow to the north.

The DSI included field records of groundwater parameters recorded during sampling. They indicated that the pH was 4.89 to 5.31, dissolved oxygen (DO) was 3.27 to 3.86 mg/L, redox was 86 to 114 mV, and electrical conductivity (EC) was 145 to 311 mS/cm.

The RAP includes a summary of the PSM (2018) Hydrogeological Interpretive Report, which modelled the groundwater seepage rates expected during and post construction. Details of the modelling and the results are included in the Hydrogeological Interpretive Report. Douglas summarised the findings as follows:

- Maximum modelled seepage rate during construction was 35 kL/day;
- Modelled steady state seepage rate post-construction was 35 kL/day;
- Water bearing zone is from residual soils of Ashfield Shale at depths of 7 to 15 m. The model has fill and residual soil as the primary source of seepage/inflows;
- The modelled zone of capture for the first 10 years would extend to approximately 250 m from the site; and
- Historical land use (former Caltex and Ausgrid depot) may have an impact on groundwater quality and potential for contamination migration (TRH and VOC).

The Auditor has not reviewed the PSM (2018) Hydrogeological Interpretive Report, however, considers that the primary source of seepage/inflows is likely to be shale, rather than fill and residual soil as noted above by Douglas. This is based on the stratigraphy and hydrogeology encountered during the DSI.

### **5.3 Auditor's Opinion**

The Auditor considers that the site stratigraphy and hydrogeology are sufficiently well known for the purpose of the Audit.

## 6. EVALUATION OF QUALITY ASSURANCE AND QUALITY CONTROL

An evaluation of the overall quality of the data obtained in previous investigations (DSI) at the site was presented in the IAA (Appendix C). In considering the data as a whole the Auditor concluded in the IAA that:

- The data are likely to be representative of the overall site conditions, including fill, natural soil and groundwater. Results for volatile organics in soil samples collected by solid stem auger may underestimate actual concentrations. Results for volatile organics in groundwater may underestimate concentrations due to inappropriate sample bottles and the inability of the laboratory to dilute the sample within the calibration range.
- The investigation data are considered to be complete.
- There is a high degree of confidence that the data are comparable for each sampling and analytical event.
- The laboratories provided adequate information to conclude that the data are of sufficient precision.
- There is a high degree of confidence that the data are accurate.



## 7. ENVIRONMENTAL QUALITY CRITERIA

The Auditor has assessed the results against Tier 1 criteria from National Environmental Protection Council (NEPC) *National Environmental Protection (Assessment of Site Contamination) Measure 1999*, as Amended 2013 (NEPM, 2013). Other guidance has been adopted where NEPM (2013) is not applicable or criteria are not provided. Based on the proposed development (excavation and construction of a dive structure and tunnel portal), the human health criteria for 'commercial/industrial' and ecological criteria appropriate for 'commercial/industrial' were adopted. This was considered to be most relevant during remediation and ongoing operation of the site, however is likely to be conservative for short term exposure by construction workers.

### 7.1 Soil Assessment Criteria

#### 7.1.1 Human Health Assessment Criteria

The Auditor has adopted human health assessment criteria from the following sources:

- NEPM (2013) Health Investigation Levels (HILs) for 'Commercial/Industrial' (HIL D) land use.
- NEPM (2013) Health Screening Levels (HSLs) for 'Commercial/Industrial' (HSL D) land use. The HSLs assumed a sand soil type. Depth to source adopted was <1 m as an initial screen.
- NEPM (2013) Management Limits (MLs) for petroleum hydrocarbons for 'Commercial/Industrial' land use and assuming coarse soil texture.
- The presence/absence of asbestos.
- Friebel & Nadebaum (2011) HSLs for direct contact for all land use categories, and vapour inhalation/direct contact pathways for intrusive maintenance workers.

#### 7.1.2 Ecological Assessment Criteria

The Auditor has not adopted ecological soil assessment criteria as soil from the site was excavated to a depth of up to 21.6 mbgl and disposed off-site during development of the dive structure. Ecological soil criteria are applicable to depths of up to 2 mbgl and are therefore not applicable for the remaining natural soil.

#### 7.1.3 Soil Aesthetic Considerations

The Auditor has considered the need for soil remediation based on 'aesthetic' contamination as outlined in *Section 3.6 Aesthetic Considerations* of NEPM (2013) Schedule B1, which acknowledges that there are no chemical-specific numerical aesthetic guidelines. Instead, site assessment requires a balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity.

#### 7.1.4 Imported Fill

Imported fill has been assessed in relation to attributes expected of virgin excavated natural material (VENM). The NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste* defines VENM as "...natural material (such as clay, gravel, sand, soil or rock fines):

- *'that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining or agricultural activities*
- *'that does not contain sulphidic ores or soils, or any other waste, and includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice in the NSW Government Gazette.'*

On this basis, the Auditor considers that for soil to be classified as VENM, the following criteria generally apply:

- Organic compounds (including petroleum hydrocarbons, PAHs, OCPs, PCBs and phenols) should be less than the PQLs.
- Inorganic compounds should be consistent with background concentrations.
- The material should not contain or comprise actual or potential acid sulphate soil.

Imported material, such as excavated natural material (ENM) or non-VENM construction materials, was assessed against the requirements of the applicable resource recovery order (RRO) and resource recovery exemption (RRE) issued by the EPA under clause 93 of the *Protection of the Environment Operations (Waste) Regulation 2014*.

## 7.2 Groundwater Assessment Criteria

### 7.2.1 Human Health Assessment Criteria

NEPM (2013) HSLs are not appropriate for assessing risks from groundwater to human health at the site due to the potential for direct contact. The Auditor has adopted human health assessment criteria from the following sources to assess risk from direct contact, inhalation and incidental ingestion:

- NHMRC (2011) *National Water Quality Management Strategy, Australian Drinking-Water Guidelines* (ADWG), Version 3.5 Updated August 2018.
- USEPA Regional Screening Levels (RSLs) Residential Tap Water Criteria. Online database of assessment criteria that are current as of May 2020. Tap water assessment criteria derived for carcinogenic compounds were multiplied by a factor of 10 to adjust the target cancer risk level from 1:1,000,000 to 1:100,000 to be consistent with Australia's recommended target cancer risk level. For some chemicals, where a criteria has been derived using both non-cancer and cancer toxicity data, the lower criteria was adopted.
- WHO (2017) *Guidelines for Drinking-water Quality, Fourth Edition, incorporating the 1st addendum*.
- WHO (2008) *Petroleum Products in Drinking-water. Background document of WHO Guidelines for Drinking-water Quality* (adopted in absence of health-based criteria in WHO (2017) because the taste and odour of petroleum products will in most cases be detectable at concentrations below those of health concern).

### 7.2.2 Ecological Assessment Criteria

The Auditor has adopted ecological groundwater assessment criteria from the following sources:

- ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia ([www.waterquality.gov.au/anz-guidelines](http://www.waterquality.gov.au/anz-guidelines)). Criteria for freshwater and 95% level of protection were adopted.

## 7.3 Auditor's Opinion

The water bearing zone is within Ashfield Shale at depths of 7 to 15 m. Given the absence of bores for beneficial groundwater use and presence of a reticulated water supply for the area, extraction and use of groundwater as a resource is unlikely. Direct contact with groundwater may occur at the site during construction based on the depth of excavation and SWL.

The environmental quality criteria referenced by the Auditor are consistent with those adopted by Douglas with the exception of the following:

- The DSI does not mention assessment of 'aesthetic' contamination as outlined in the NEPM (2013). However, the report results discuss potential aesthetic issues detected during sampling.

- The DSI and RAP adopted 'hardness modified trigger values' (HMTV) for the assessment of individual metals in GILs. The hardness conditions of the receiving water body have not been assessed to justify the use of HMTV.
- The DSI and IAA adopted GILs listed in NEPM (2013) for protection of aquatic ecosystems referenced in ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. The 95% freshwater level of protection was adopted. The ANZG (2018) DGVs for freshwater and 95% level of protection adopted by the Auditor are largely based on trigger values (TVs) from ANZECC (2000).

Given the results obtained, the Auditor considers that these discrepancies do not affect the overall conclusions reached by Douglas and the Auditor.

## 8. EVALUATION OF SOIL RESULTS

The soil analytical results from the investigations (DSI) undertaken prior to the preparation of the RAP were reviewed by the Auditor and presented in the IAA (Appendix C). Soil sample locations are shown on Attachment 3, Appendix A. In assessing the results reviewed in the IAA, the Auditor made the following observations:

- The soil analytical results for the fill and natural samples were below the human health screening criteria.
- One ACM fragment (sample TP11-ASB01) within fill material in test pit TP11 tested positive for Chrysotile, Amosite and Crocidolite asbestos. The fill profile at this location extended to approximately 0.48 mbgl. ACM was not detected in the other sampling locations. Natural soil was not tested by Douglas for asbestos. The Auditor considered there to be a high likelihood of ACM fragments within fill material as a result of the demolition of former school and residential buildings prior to construction of the depot in the 1950s.
- Metals, heavy fraction TRH, individual VOCs and PAHs were detected in the fill samples at concentrations below the screening criteria. The fill appeared to have been impacted by the historical activities undertaken on the Worksite Area (Section 4).
- Marginal detections of metals, TRH, B(a)P, Chlordane and DDE below the screening criteria were detected in some natural soil samples. The source of these contaminants was attributed to the following:
  - B(a)P, Chlordane and DDE were attributed to the overlying fill material or samples obtained very close to the boundary of fill and natural profiles. The sampling method used by Douglas (sampling from spiral augers) may have also resulted in cross contamination.
  - Metal concentrations were considered consistent with background concentrations.
  - The source of TRH in natural soil sample MW04 (4-4.95 mbgl) may be attributed to the TRH detected in groundwater at this location. The results of groundwater analysis are discussed in Section 9.

### 8.1 Auditor's Opinion

The soil analytical results obtained during the DSI are consistent with the site history and field observations. The results indicated that fill was locally impacted by ACM, however more widespread contamination from ACM was considered possible. Low level contamination of fill and underlying natural soil was identified, however at concentrations less than the assessment criteria.

In the Auditor's opinion, the soil analytical results reviewed in the IAA indicate that contamination was present at the site and remediation was required. Remediation of fill material was undertaken and is discussed further in Section 11.

## 9. EVALUATION OF GROUNDWATER RESULTS

Groundwater monitoring was undertaken during the DSI. Douglas installed three monitoring wells at the site (Attachment 3, Appendix A) and undertook one groundwater monitoring event as part of the DSI. The groundwater analytical results from the DSI, undertaken prior to the preparation of the RAP, were reviewed by the Auditor in preparation of the IAA (Appendix C). In assessing the results reviewed in the IAA, the Auditor made the following observations:

- The groundwater analytical results for the majority of the analytes were below the human health and ecological screening criteria.
- Elevated zinc concentrations were detected in the groundwater samples. The DSI concluded that the zinc can be attributed to diffuse urban-sourced background levels and is not from a site-specific source.
- An elevated concentration of tetrachloroethene (PCE) was detected in groundwater sample MW04 (150 µg/L) above the ecological (70 µg/L) and ADWG human health screening criteria (50 µg/L). The source of PCE is likely to be from historical activities within the greater Worksite Area, however the source location is not known. Groundwater at MW04 also contained elevated concentrations of PCE breakdown products 1,1-dichloroethene and 1,2-dichloroethane. Other breakdown products (1,2-dichloroethene and vinyl chloride) were not detected. The DSI reported that the PCE concentration was below the WA Department of Water and Environmental Regulation (DWER) *Assessment and Management of Contaminated Sites* (2014) non-potable criteria of 500 µg/L which are more applicable for the site than the ADWG (this is the same value as the ADWG criteria for incidental direct contact). The DSI also stated that considering the end-use of the site as a dive structure open to ambient air, the potential for human receptors to be exposed to vapours was considered to be very low. The Auditor notes that the reported PCE concentration is also less than the USEPA RSL for dermal contact (650 µg/L).
- The identification of volatile TRH (C<sub>6</sub>-C<sub>10</sub> minus BTEX) (TRH F1) fraction in groundwater sample MW04 is considered to be representative of the volatile chlorinated hydrocarbons detected in the sample. Considering the depth of excavation, excavation workers will likely come in contact with contaminated groundwater. The WHO (2017) criteria were adopted to assess risk of exposure by direct contact. The TRH F1 concentration was below the assessment criteria.

The IAA concluded that *"the analytical results indicate that groundwater at the site has been impacted from on-site and/or off-site up gradient sources consistent with the historical land use. The PCE concentration detected is considered unlikely to present a risk ... to construction workers based [on] the concentrations reported and the proposed development of the site as an open rail dive structure. Other contaminants detected in groundwater are not considered to be present at concentrations presenting a risk to site receptors."*

### 9.1 Auditor's Opinion

Groundwater assessments undertaken at the site have not identified significant groundwater contamination. The Auditor is satisfied that further investigation or remediation of groundwater is not required to demonstrate suitability of the site for the proposed use however groundwater encountered will require capture, treatment and disposal.

## 10. EVALUATION OF CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is a representation of the source, pathway and receptor linkages at a site. Douglas developed a CSM and used it iteratively throughout the site assessment to inform decisions around investigation and remediation requirements. The CSM was initially developed following the preliminary investigations and included in the RAP and was reviewed by the Auditor in the IAA. Table 10.1 provides the Auditors review of the CSM based on the PSI and DSI (presented in the IAA).

**Table 10.1: Review of the Conceptual Site Model**

Element of CSM	Consultant	Auditor Opinion
<i>Contaminant source and mechanism</i>	Contaminated fill material containing fragments of ACM impacted by demolition of former buildings or imported to the site from unknown sources. Detections of TRH, VOCs and PAHs in groundwater from former on-site or off-site land use. Unexpected contamination finds during excavation.	The source and mechanism for soil is considered appropriate. The source of VOCs in groundwater was not identified, however is likely to be from within the larger Worksite Area. The low concentrations identified on the site are not considered to present a potential risk to human health or the environment.
<i>Affected media</i>	Fill material and groundwater	Fill material is considered to be the primary affected media. Low level contamination was also reported in natural soil. Groundwater contamination was identified, however concentrations were less than the primary human health screening criteria and is therefore not considered affected media for the purposes of remedial planning.
<i>Receptor identification</i>	Future maintenance workers in the rail corridor, construction workers, adjacent land users, surface water receptors, and groundwater. The contaminants are not considered to pose a risk to in-ground built structures.	The receptors have been adequately identified.
<i>Exposure pathways</i>	Inhalation of dust and vapours, ingestion and/or dermal contact, surface water runoff, lateral migration of groundwater, and extraction for dewatering and disposal.	The CSM identified all potential exposure pathways. Complete exposure pathways are considered to be inhalation, direct contact and incidental ingestion during construction. No complete pathways are considered likely to be present following construction of the dive structure.
<i>Presence of preferential pathways for contaminant movement</i>	Not discussed	Not considered relevant for fill material removed during remediation. Preferential pathways for groundwater and vapour migration are likely to be present on the site, however are not considered relevant as contamination representing a risk to human health has not been identified.
<i>Potentially complete source-pathway-receptor (SPR) linkages requiring remediation or management</i>	The pre-remediation CSM did not clearly specify potentially complete SPR linkages.	Potentially complete SPR linkages were to be largely addressed during excavation of the dive structure.

Element of CSM	Consultant	Auditor Opinion
<i>Evaluation of data gaps</i>	The RAP proposes review of groundwater test results during dewatering to assess if the contaminants pose a risk to site receptors.	No potentially significant data gaps were identified during review of the PSI, DSI and RAP.

The Auditor concluded in the IAA that the CSM presented was an adequate representation of the contamination at the site.

**10.1 Auditor’s Opinion**

The Auditor is of the opinion that the CSM was a reasonable representation of the contamination at the site prior to remediation during the dive structure excavation.

## 11. EVALUATION OF REMEDIATION

### 11.1 Remediation Required

Douglas determined remedial requirements based on review of investigation results against screening criteria and consideration of aesthetic issues. The RAP considered the horizontal extent of the remediation to be the excavation footprint, and the vertical extent to be the depth of contaminated or potentially contaminated soils, or the base of the excavation (whichever occurs first). Douglas anticipated that all contaminated or potentially contaminated soils within the excavation footprint will be removed as part of the bulk excavation works required for the development. Excavation and off-site reuse or disposal of the soil was therefore considered in the RAP by Douglas to be the only practicable remediation strategy.

An evaluation of the RAP was undertaken by the Auditor as part of the IAA (Appendix C), which included a comparison with the requirements of OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites* (current at the time of the IAA). The RAP was found to address the required information, and the Auditor concluded that the remediation approach was adequate to address contaminated fill material during redevelopment of the site through excavation and off-site disposal of contaminated fill material and natural soil and successful validation.

### 11.2 Remedial Works Undertaken

General excavation was carried out by JHCPBG JV with East West Operators. Delta Pty Ltd coordinated the asbestos remediation works who subcontracted ASP Australia (Licence AD210968) as the licensed asbestos removal contractor with WSP Australia Pty Ltd (WSP) providing occupational hygiene services (air monitoring and surface clearances). Environmental consulting was provided by Douglas between September 2017 and September 2020.

Following the demolition of site buildings and structures, the following sequence of remediation/bulk earthworks were undertaken:

- Assessment of imported materials to be temporarily used during construction. Imported materials were subsequently classified for off-site disposal purposes by Douglas and others and, following completion of use on site, were disposed of off-site to licensed facilities.
- Further in situ and ex situ waste classification testing and assessments were performed to better define waste classification extents.
- The defined waste classification extents were then progressively excavated and disposed offsite in accordance with their assigned classification.
- Unexpected finds of asbestos conduits were encountered during bulk earthworks. The Validation Report indicated that protocols from the JHCPBG JV Construction Environment Management Plan (CEMP) were adopted to address the unexpected finds (to carry out the removal works appropriately).

### 11.3 Validation Activities

#### 11.3.1 Validation of Impacted Natural Soils

The Validation Report indicated that prior to excavation of the impacted natural soils at MW04, in situ delineation test pits were undertaken to confirm the extent and for waste classification purposes. Douglas noted that one of these test pits was located at the original depth and the result could not be replicated and on this basis was considered by Douglas to be an anomaly. The Validation Report indicated that the defined extent of impacted material was excavated and disposed offsite as General Solid Waste and based on the results of the delineation sampling that the surrounding natural soils were classified as VENM.



11.3.2 Validation of Asbestos Fill Excavations

The Validation Report indicates that asbestos clearances were provided (by others) following removal of fill materials containing asbestos. Douglas indicated that the extent of asbestos impacted fill was determined by the licensed asbestos removalist and the licensed asbestos assessor (WSP). Douglas also note that asbestos removal works were undertaken prior to issue of the final RAP. Documentation provided in the Validation Report included asbestos clearance documentation prepared by WSP which appeared to be documenting asbestos clearance for exposed surface soils following removal of asbestos impacted soils and unexpected finds of asbestos conduits encountered during excavation works. Douglas noted that the area subject to clearance (i.e. the area subject to asbestos removal) covered a large portion of the site, well in excess of the original asbestos find at TP11 in the DSI.

11.3.3 Imported Material

The Validation Report indicates that approximately 2,700 m<sup>3</sup> of material was temporarily imported to the site to allow for construction activities that formed part of the excavation works. The materials imported are summarised in Table 11.1.

**Table 11.1: Imported Fill**

Source	Volume Imported (m <sup>3</sup> )	Material Type	Supporting Documentation
WestConnex M5 Tunnel (Arncliffe)	2,250	Grey to brown sandstone	VENM Classification Report prepared by ADE (April 2017). ADE obtained 15 samples from a tunnel shaft noted to be approximately 40 mbgl. ADE described the material as in situ rock materials generally consisting of grey to brown sandstone. Samples were analysed for a range of potential contaminants including metals, TRH, BTEX, PAHs, PCBs, OCP, OPP, total phenols, PFAS, ammonia and asbestos. Concentrations of organic analytes were below the PQLs, asbestos was not detected and metals concentrations were low and consistent with expectations for natural soils/bedrock.  Three groundwater samples were also obtained by ADE from fractures along the exposed sandstone face. Groundwater samples were analysed for ammonia, nitrate and nitrite. The laboratory results were not provided however ADE indicated that a slight detection of nitrate and nitrite were recorded in one sample with all other results below the PQL.
Metropolitan Demolitions and Recycling (St Peters)	450	Recycled Densely Graded Base (DGB): light grey/grey sandy gravel (road base) with brick and concrete fragments.	Documentation classifying the material under the <i>Protection of the Environment Operations Act 1997</i> (POEO Act) were not provided, supply dockets from Metropolitan Demolitions and Recycling were also not provided.

The Validation report indicates that the NSW EPA, *The Metropolitan Demolitions recovered aggregate order September 2017* (Resource Recovery Order under Part 9, Clause 93 of the POEO (Waste) Regulation 2014) was the applicable resource recovery order for the DGB material processed by Metropolitan Demolitions and Recycling.

Following completion of use on site, Douglas indicated that the imported DGB was classified by Douglas and disposed offsite and the imported sandstone was re-used in the Worksite Area surrounding the site. The Auditor notes that the sampling of the placed DGB material prior to removal from site identified elevated concentrations of PCBs, with 11 samples recording concentrations above 2 mg/kg and a maximum concentration of 5.9 mg/kg. Following removal of

the DGB, Douglas obtained samples from the underlying imported sandstone which identified elevated concentrations of PCBs in two samples. Further excavation was undertaken in these two areas with further sampling undertaken by Douglas. PCBs were not detected in the additional samples. Douglas indicate in the Validation Report that following approval from the NSW EPA the impacted PCB impacted DGB was returned to the processor Metropolitan Demolitions and Recycling (St Peters). The off-site disposal of these imported materials is discussed in Section 14.4.

#### 11.3.4 Material Disposed Off-Site

Waste materials generated on-site were sampled and classified in accordance with the EPA (2014) *Waste Classification Guidelines*. Sampling from stockpiles of excavated soils and in-situ material was undertaken to characterise and classify the waste materials prior to off-site disposal. The Validation Report reports that 97,900.25 tonnes (t) of waste material was disposed off-site including the following waste types:

- General Solid Waste (non-putrescible) (GSW)
- GSW Special Waste (Asbestos)
- Excavated Natural Material (ENM)
- Virgin Excavated Natural Material (VENM)

Quantities of other wastes associated with demolition and construction activities were also documented in the Validation Report.

Waste materials were disposed from the site between November 2017 and March 2020. Douglas included supporting documentation from the contractors including waste disposal dockets, tipping information and registers for receival sites.

The Auditor has reviewed the documentation provided and is of the opinion that the supplied documentation is consistent with the remedial works described. Further assessment of the waste classifications and disposal quantities is provided in Section 14.4.

#### 11.4 Auditor's Opinion

In the Auditors' opinion, the excavation works were appropriate to remediate onsite contamination.

## 12. CONTAMINATION MIGRATION POTENTIAL

Based on the remediation/excavation works outlined in the Validation Report, it is considered that all on-site sources of contamination have been removed during remediation/excavation works. Contaminants detected prior to remediation within the soil at the site have not adversely affected the groundwater quality except possibly locally. As localised soils impacts were removed as part of the remediation works, ongoing impacts to groundwater are unlikely. In the Auditors opinion, the site in its remediated condition has a negligible potential for migration of contamination, including to groundwater.

## 13. ASSESSMENT OF RISK

Based on assessment of results against relevant guidelines and consideration of the overall investigations and remediation performed, the Auditor considers that contaminant concentrations remaining onsite do not pose a risk to site users or the environment under the proposed land use scenario.

Contaminants within groundwater are not likely to pose a risk to human health as the impacts are mostly localised and concentrations were less than adopted human health criteria. It is also noted that abstraction and use on-site is not expected as a viable aquifer is not readily accessible.

The Validation Report notes that potential vapour accumulation and inhalation is unlikely as the dive structure is open to the air. It also noted that the sump would be considered a confined space and appropriate health and safety precautions would be required.

## 14. COMPLIANCE WITH REGULATORY GUIDELINES AND DIRECTIONS

### 14.1 General

The Auditor has used guidelines currently made and approved by the EPA under section 105 of the NSW *Contaminated Land Management Act 1997*.

The investigation was generally conducted in accordance with SEPP 55 Planning Guidelines and reported in accordance with the OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites* (which was applicable at the time the reports were prepared). The Validation Report was generally prepared in accordance with the NSW EPA (2020) *Consultants Reporting on Contaminated Land*.

### 14.2 Development Approvals

A statutory site audit is required for the proposed Chatswood dive site, part of the Sydney Metro rail project between Chatswood and Sydenham, to address the requirements of Condition E67 of Infrastructure Approval, application SSI 15\_7400, approved by the NSW Minister for Planning on 9 January 2017. Condition E67 relates to contamination and requires a site audit as follows:

*"If a Site Contamination Report prepared under Condition E66 finds such land contains contamination, a site audit is required to determine the suitability of a site for a specified use. If a site audit is required, a Site Audit Statement and Site Audit Report must be prepared by a NSW EPA Accredited Site Auditor. Contaminated land must not be used for the purpose approved under the terms of this approval until a Site Audit Statement is obtained that declares the land is suitable for that purpose and any conditions on the Site Audit Statement have been complied with."*

This SAR and accompanying Site Audit Statement (SAS) were prepared to comply with this condition.

### 14.3 Duty to Report

Consideration has been given to the requirements of the EPA (2015) *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*. Based on the findings of this SAR, the Auditor considers that the site is not required to be notified under the Duty to Report requirements.

### 14.4 Waste Management

In accordance with Section 4.3.7 of the NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme (3<sup>rd</sup> Edition)*, the Auditor has checked the following aspects relating to waste disposal and recycling.

#### 14.4.1 Waste Classification

Eleven waste classification letters were prepared by Douglas and although they were referenced, were not included within the Validation Report. These were provided separately to the Auditor and were reviewed during the course of the audit. It was reported that wastes were classified in accordance with the NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste*. The adopted waste classification strategy included sampling from stockpiles of excavated soils and in-situ material.

Based on the summary of waste classification reports presented in Table 2 of the Validation Report, the waste classification reports were prepared for the following soils at the site:

- GSW (non-putrescible) - Special waste (asbestos waste) for selected fill in the vicinity of TP11.
- GSW (non-putrescible) for select in-situ and stockpiled fill materials, non-VENM natural soils (MW04) and imported materials.
- ENM for piling spoil stockpile (CNSP07).
- VENM for select piling spoil stockpiles, remaining natural soils and bedrock.

14.4.2 Waste Volumes, Disposal Receipts and Disposal Facilities

The Validation Report provides disposal dockets for the off-site disposal of different wastes which occurred between November 2017 and March 2020. Dockets include materials disposed during demolition and excavation stages of the project. The Validation Report also includes a waste receiving site register and a waste tracking register prepared by JHCPBG JV.

Douglas report in Table 4 and 5 of the Validation Report that a total of 97,900.25 t of material (including VENM) was removed off-site. The JHCPBG JV records provided in Appendix J of the Validation Report indicate that a total of 106,373.93 t was removed off-site. The Auditor has assessed the volumes presented and calculates a similar number to those provided by JHCPBG JV. Based on the volumes presented by Douglas, it would appear that the construction and demolition wastes included in JHCPBG JV information are not included in the Douglas calculations. The addition of the construction and demolition waste volumes to the Douglas calculated total would provide a similar value to the Auditor and JHCPBG JV. This discrepancy is therefore not considered to be significant.

Table 14.1 summarises the waste disposal information for soil disposed off-site to several waste management facilities that are licensed to receive the specified waste under their Environmental Protection Licence (EPL).

**Table 14.1: Summary of Waste Disposal**

Waste Classification	Tonnage (t)	Disposal Facility	EPL No.
GSW (non-putrescible)	608.88	Brandown (Kemps Creek)	5186
GSW (non-putrescible)	617.18	Hi-Quality Waste Management (St Marys)	5857
GSW (non-putrescible)	750.24	Sydney Recycling Park (Kemps Creek)	12901
GSW (non-putrescible)	684.68	MET recycling (Silverwater)	20948
GSW (non-putrescible)	452.92	Breen Holdings (Kurnell)	4608
GSW (non-putrescible) and Special waste (Asbestos)	127.5	Genesis Dial A Dump (Eastern Creek)	13426

14.4.3 Auditor’s Opinion

The Auditor considers that the waste management assessed as part of the remedial works was undertaken in accordance with the relevant guidelines and regulations. As discussed in Section 11.3, validation sampling was not undertaken following removal of defined extents of different (higher) classified wastes, however VENM assessments were performed on the underlying natural soils and asbestos clearance inspections were completed following removal of asbestos impacted fill. In the Auditors opinion, the lack of validation sampling has been compensated for by the VENM assessments and visual observations.

#### **14.5 VENM and Other Imported Materials**

As detailed in Section 11.3.3, VENM and other materials were imported to the site temporarily to allow for construction activities. The Auditor is of the opinion that the materials imported from Metropolitan Demolitions and Recycling did not have supporting documentation which may have made the material not compliant with the NSW EPA RRO for recovered aggregates (2014) or the *The Metropolitan Demolitions recovered aggregate order September 2017*. Douglas indicated in the Validation Report that these materials were excavated, waste classified and returned to Metropolitan Demolitions and Recycling and therefore are no longer present at the site. The Validation Report indicates that the imported VENM has been removed from the site and used in the 'Worksite Area' adjacent to the site.

#### **14.6 Licenses**

Excavation and off-site removal of ACM contaminated soils were required to be conducted by at least a Class B licensed contractor. Douglas did not confirm that the asbestos remediation works involved a Class B Asbestos removal contractor however did confirm that ASP Australia (ASP) were contracted for removal of small quantities of asbestos. The asbestos materials clearance reports prepared by WSP and provided by Douglas in the Validation Report indicate that ASP were the licenced asbestos removal contractors who undertook the removal works. Copies of the appropriate licences were not provided to the Auditor, however the Auditor undertook a search of the SafeWork NSW asbestos licence database on 20 August 2020 which indicates that ASP are licenced for non-friable asbestos removal works (Licence number: AD210968).

#### **14.7 Conflict of Interest**

The Auditor has considered the potential for a conflict of interest in accordance with the requirements of section 3.2.3 of the NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme*.

The Auditor considers that there are no conflicts of interest, given that:

1. The Auditor is not related to a person by whom any part of the land is owned or occupied.
2. The Auditor does not have a pecuniary interest in any part of the land or any activity carried out on any part of the land.
3. The Auditor has not reviewed any aspect of work carried out by, or a report written by, the site auditor or a person to whom the site auditor is related.

## 15. CONCLUSIONS AND RECOMMENDATIONS

Based on the results documented in the Validation Report, Douglas concluded that *"all on-site sources of contamination have been removed and suitably validated. Accordingly, it is considered that the site has been made suitable for the proposed development"*.

Based on the information presented in Douglas reports and observations made on site, and following the Decision-making process for assessing urban redevelopment sites in NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme (3<sup>rd</sup> Edition)*, the Auditor concludes that the site is suitable for the purposes of 'commercial/industrial' land use (proposed rail dive structure and tunnel portal).

Groundwater has not been assessed for any beneficial re-use. Any future use of groundwater would require appropriate assessment and regulatory approvals from the NSW Office of Water.



## 16. OTHER RELEVANT INFORMATION

This Audit was conducted on the behalf of JHCPBG JV for the purpose of assessing whether the land is suitable for the proposed commercial/industrial uses, i.e. a "Site Audit" as defined in Section 4 (definition of a 'site audit' (b)(iii)) of the CLM Act.

This summary report may not be suitable for other uses. Douglas included limitations in their reports. The Audit must also be subject to those limitations. The Auditor has prepared this document in good faith, but is unable to provide certification outside of areas over which the Auditor had some control or is reasonably able to check.

The Auditor has relied on the documents referenced in Section 1 of the Site Audit Report in preparing the Auditors' opinion. If the Auditor is unable to rely on any of those documents, the conclusions of the audit could change.

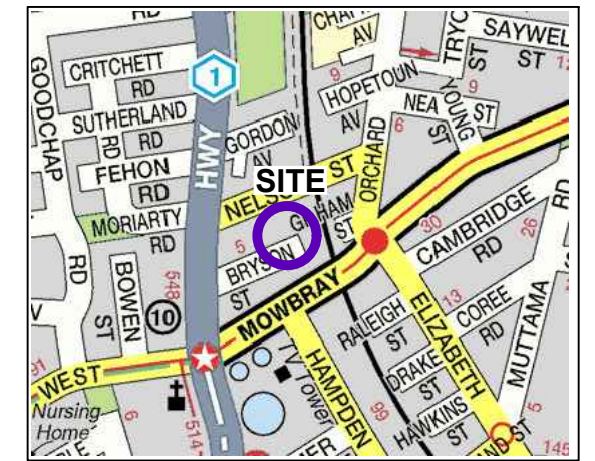
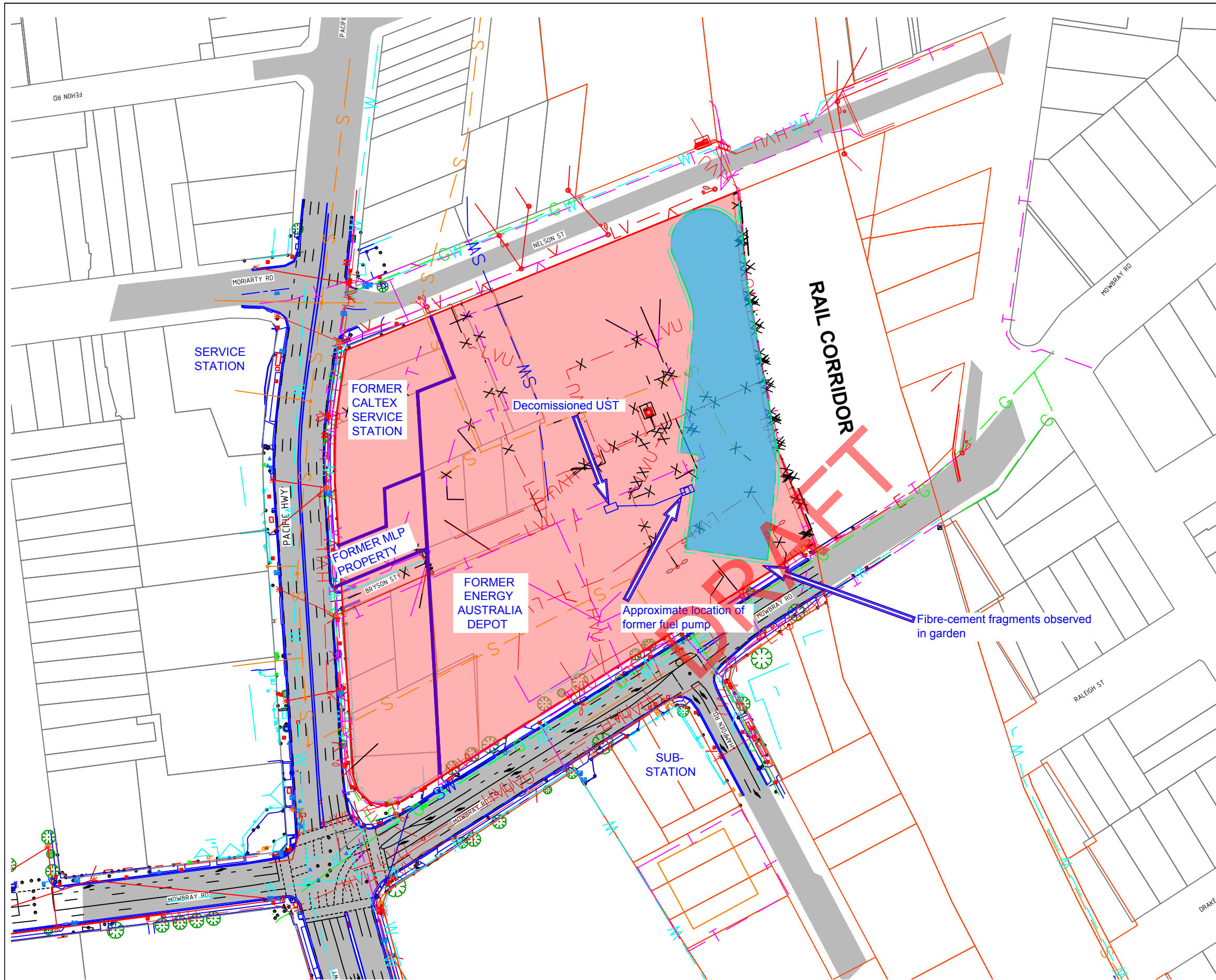
It is not possible in a Site Audit Report to present all data which could be of interest to all readers of this report. Readers are referred to the referenced reports for further data. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

## **APPENDIX A ATTACHMENTS**

Attachment 1: Site Location

Attachment 2: Site Survey

Attachment 3: Douglas Sample Locations



Locality Plan

NOTE:  
 1: Base drawing from  
 (Dwg SMCSWTSE-JCG-TPW-CN-SKE-071xxx)

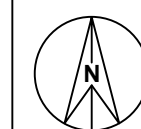
**LEGEND**

- WORKSITE AREA
- EXCAVATION AREA (THE SITE)
- 1.2-1.5m PILING ZONE



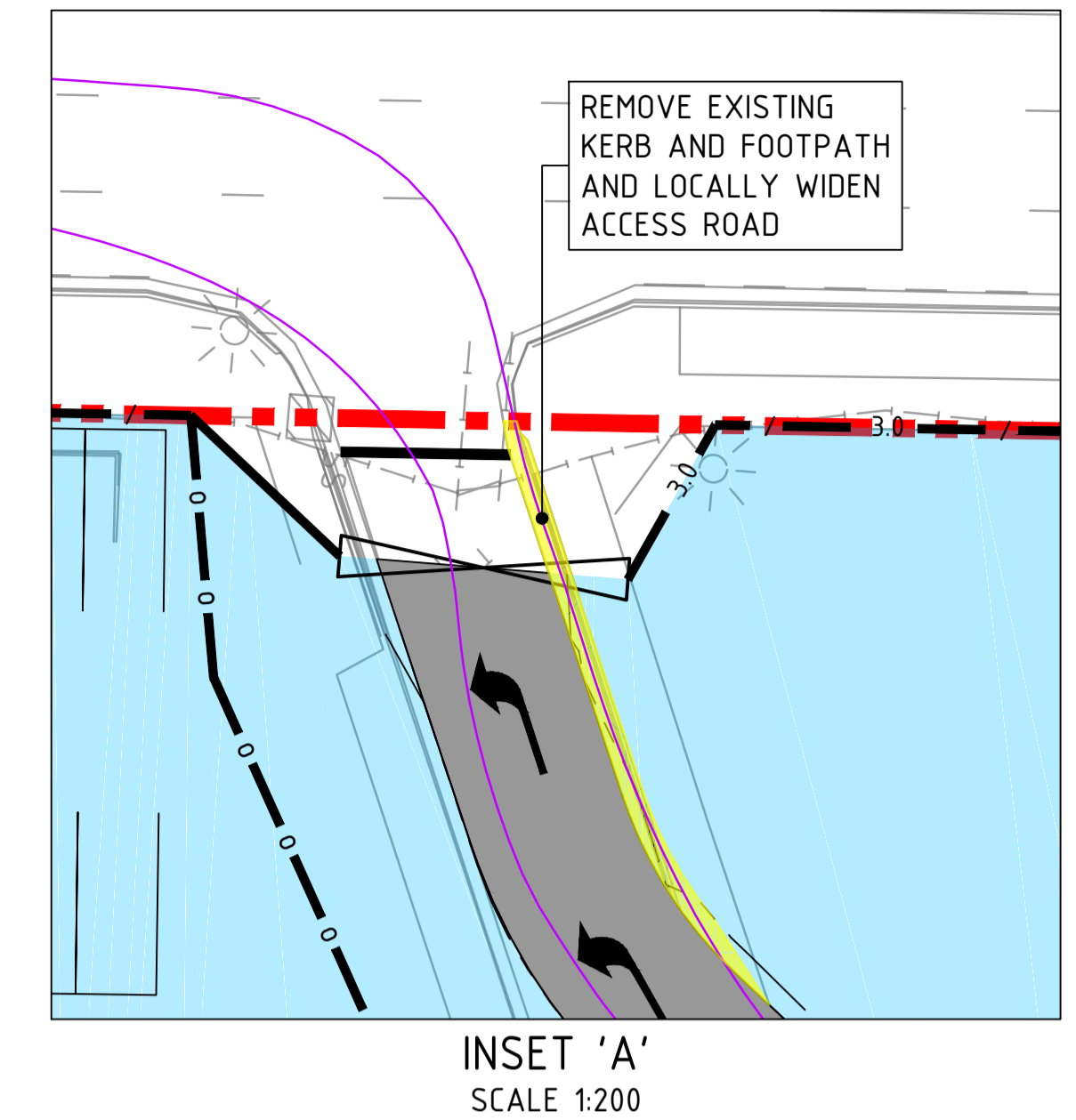
CLIENT: John Holland CPB Ghella JV  
 OFFICE: Sydney      DRAWN BY: PSCH  
 SCALE: 1:1500 @ A3      DATE: 21.9.2017

TITLE: **Site Location and Features**  
**Sydney Metro City & South West, Tunnel and Station Works**  
**Package, Proposed Chatswood Dive, Mowbray Rd, CHATSWOOD**



PROJECT No: 85608.02  
 DRAWING No: 1  
 REVISION: 0





**LEGEND**

**GENERAL**

- CADASTRAL BOUNDARY
- TSE PROJECT SITE AS PER TSE PROJECT DEED SCHEDULE D1
- CHATSWOOD NORTHERN DIVE AND PRECINCT LOCAL AREA WORKS. REFER TO DESIGN LOT DP-S-480 FOR DETAILS
- CHATSWOOD NORTHERN DIVE AND PRECINCT OPEN BOX EXCAVATION, SHORING AND SUPPORT. REFER TO DESIGN LOT DP-S-460
- DRIVEWAY AND LAYBACK FOR DETAILS REFER TO DESIGN LOT DP-S-480
- SITE ACCESS ROAD
- PRIME MOVER AND SEMI-TRAILER (19m) (AUSTRADS, 2013)
- TRUCK AND DOG (19m)

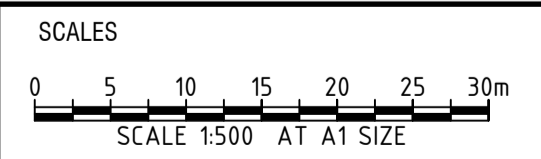


KEY PLAN  
NOT TO SCALE

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

**FOR CONSTRUCTION**

00	ASSURED FOR CONSTRUCTION	CH/28.02.18	DT/28.02.18	DR/28.02.18
AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
CO-ORDINATE SYSTEM:	MGA	HEIGHT DATUM:	AHD	SCALE: 1:500



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SERVICE PROVIDERS		DRAWN	D. THOMSON	28.02.18
		DESIGNED	C. HIGGIN	28.02.18
		DRG CHECK	J. MACADANGDANG	28.02.18
		DESIGN CHECK	G. TRIVIC	28.02.18
		APPROVED	D. ROBERTSON	28.02.18

<b>SYDNEY METRO CITY &amp; SOUTHWEST</b>		
CHATSWOOD NORTHERN DIVE AND PRECINCT		
CIVIL WORKS (STATIONS & SURROUNDS)		
SWEEP PATH PLAN		
FILE No.	SHEET: 29 OF 35	A1
STATUS: FOR CONSTRUCTION		
DRG No.	EDMS No.	
SMCSWTSE-JAB-DCH-CW-DRG-557401	00	

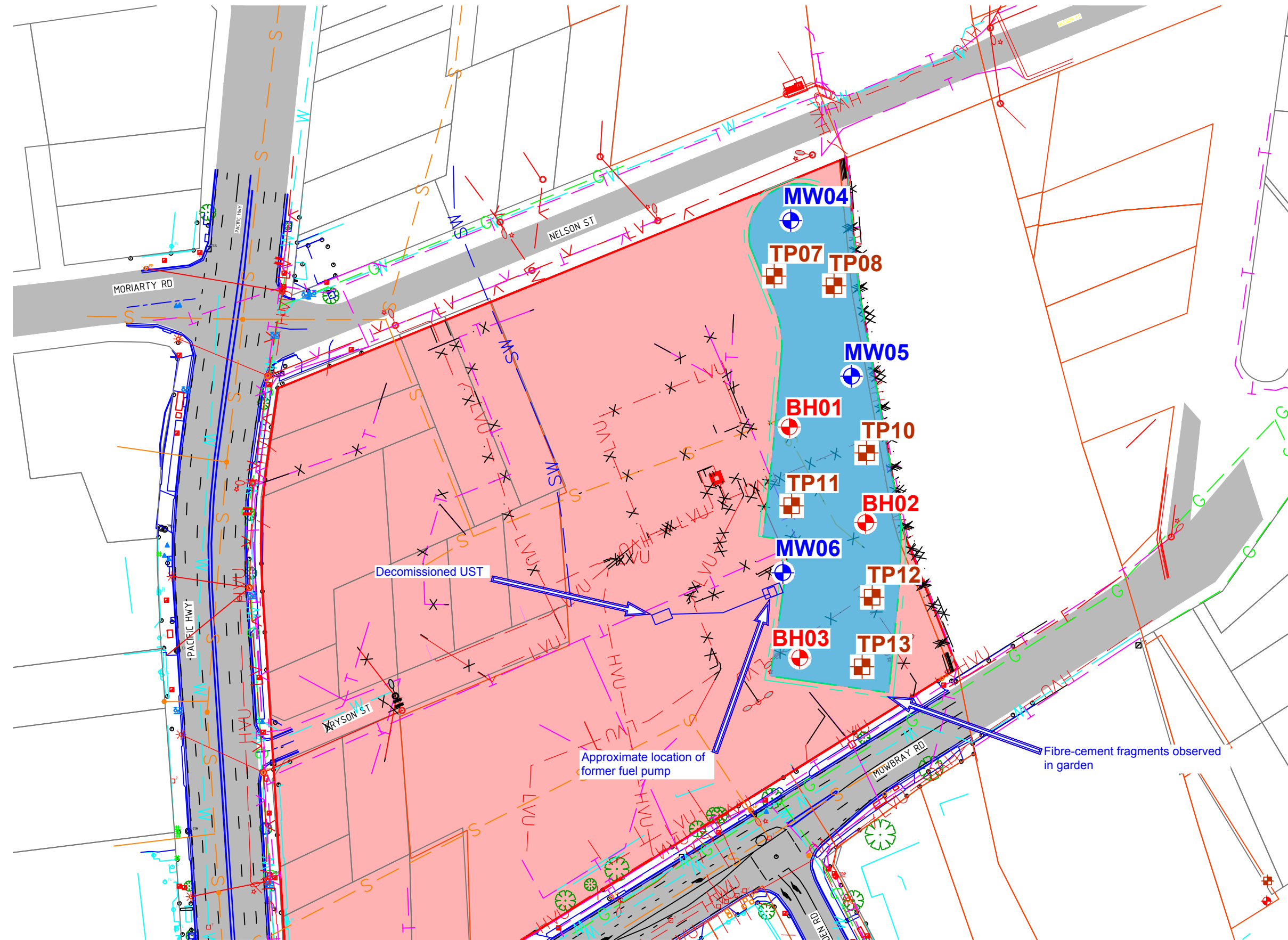
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 Plot Date & Time: 2/28/2018 10:41 AM  
 Plotted by: JULIUS MACADANGDANG  
 DR 801-954



0 10 20 30 40 50 75 100m

1:1000 @ A3

NOTE:  
1: Base drawing from  
(Dwg SMCSWTSE-JCG-TPW-CN-SKE-071xxx)



**LEGEND**

- WORKSITE AREA
- EXCAVATION AREA (THE SITE)
- 1.2-1.5m PILING ZONE
- Proposed test pit location
- Proposed soil bore location
- Proposed groundwater monitoring well location



CLIENT: John Holland CPB Ghella JV  
 OFFICE: Sydney      DRAWN BY: PSCH  
 SCALE: 1:1000 @ A3      DATE: 21.9.2017

TITLE: **Proposed Test Locations**  
**Sydney Metro City & South West, Tunnel and Station Works**  
**Package, Proposed Chatswood Dive, Mowbray Rd, CHATSWOOD**



PROJECT No: 85608.02  
 DRAWING No: 2  
 REVISION: 0

## **APPENDIX B SITE AUDIT STATEMENT**



NSW Site Auditor Scheme

**Site Audit Statement**

A site audit statement summarises the findings of a site audit. For full details of the site auditor’s findings, evaluations and conclusions, refer to the associated site audit report.

This form was approved under the *Contaminated Land Management Act 1997* on 12 October 2017.

For information about completing this form, go to Part IV.

**Part I: Site audit identification**

Site audit statement no. TO-024-4

---

This site audit is a:

- statutory audit
- non-statutory audit

within the meaning of the *Contaminated Land Management Act 1997*.

**Site auditor details**

(As accredited under the *Contaminated Land Management Act 1997*)

Name: Tom Onus

---

Company: Ramboll Australia Pty Ltd

---

Address: Level 3  
100 Pacific Highway, North Sydney

---

Postcode: 2060

---

Phone: 02 9954 8133

---

Email: tonus@ramboll.com

---

**Site details**

Address: 339 Mowbray Road, Chatswood, NSW

---

Postcode: 2067

---

## Property description

Part Lot 2 DP221896. The site covers an irregular rectangular shape (see purple outline in figure at end of Part I of this statement).

---

Local government area: Willoughby Council

---

Area of site (include units, e.g. hectares): Approximately 0.3 hectares

---

Current zoning: SP2 Infrastructure under the Willoughby Local Environment Plan 2012

---

## Regulation and notification

To the best of my knowledge:

- the site is** the subject of a declaration, order, agreement, proposal or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985*, as follows: (provide the no. if applicable)
- Declaration no. \_\_\_\_\_
- Order no. \_\_\_\_\_
- Proposal no. \_\_\_\_\_
- Notice no. \_\_\_\_\_
- the site is not** the subject of a declaration, order, proposal or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985*.

To the best of my knowledge:

- the site **has** been notified to the EPA under section 60 of the *Contaminated Land Management Act 1997*
- the site **has not** been notified to the EPA under section 60 of the *Contaminated Land Management Act 1997*.

## Site audit commissioned by

Name: Caitlin Richards

---

Company: John Holland CPB Ghella Joint Venture

---

Address: Level 9, 50 Bridge Street, Sydney, NSW

---

Postcode: 2000

---

Phone: 0407 176 672

---

Email: caitlin.richards@sydneymetro2.com.au

---



**Contact details for contact person** (if different from above)

Name: Krissy Vajda

---

Phone: 0439 477 649

---

Email: krissy.vajda@sydneymetro2.com.au

---

**Nature of statutory requirements** (not applicable for non-statutory audits)

- Requirements under the *Contaminated Land Management Act 1997* (e.g. management order; please specify, including date of issue)
- 
- 

- Requirements imposed by an environmental planning instrument (please specify, including date of issue)

Condition E67 of Infrastructure Approval, application SSI 15\_7400, approved by the Minister for Planning on 9 January 2017

---

---

- Development consent requirements under the *Environmental Planning and Assessment Act 1979* (please specify consent authority and date of issue)
- 
- 

- Requirements under other legislation (please specify, including date of issue)
- 
-

### Purpose of site audit

- A1** To determine land use suitability

Intended uses of the land: Dive structure for below ground train network

---

OR

- A2** To determine land use suitability subject to compliance with either an active or passive environmental management plan

Intended uses of the land:

---

OR

(Tick all that apply)

- B1** To determine the nature and extent of contamination
- B2** To determine the appropriateness of:
- an investigation plan
  - a remediation plan
  - a management plan
- B3** To determine the appropriateness of a **site testing plan** to determine if groundwater is safe and suitable for its intended use as required by the *Temporary Water Restrictions Order for the Botany Sands Groundwater Resource 2017*
- B4** To determine the compliance with an approved:
- voluntary management proposal** or
  - management order** under the *Contaminated Land Management Act 1997*
- B5** To determine if the land can be made suitable for a particular use (or uses) if the site is remediated or managed in accordance with a specified plan.

Intended uses of the land:

---

---

### Information sources for site audit

Consultancies which conducted the site investigations and/or remediation:

Douglas Partners Pty Ltd (Douglas)

---

Titles of reports reviewed:

'Report on Preliminary Site Investigation, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Chatswood Dive, Mowbray Road, Chatswood, prepared for John Holland CPB Ghella JV, Project 85608.02, February 2018', report reference: Rev0, dated 27 February 2017, prepared by Douglas Partners Pty Ltd Douglas

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'Report on Detailed Site Investigation, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Chatswood Dive, Mowbray Road, Chatswood, prepared for John Holland CPB Ghella JV, Project 85608.02, March 2018', report reference: Revision 1, dated 7 March 2018, prepared by Douglas

'Report on Remediation Action Plan, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Chatswood Dive, 339 Mowbray Road, Chatswood, prepared for John Holland CPB Ghella JV, Project 85608.02, April 2018', report reference: Revision 1, dated 12 April 2018, prepared by Douglas

---

'Report on Validation of Remediation, Sydney Metro City and South West - Tunnel and Station Excavation Works Package, Sydney Metro City and South West – Chatswood Dive, 339 Mowbray Road, Chatswood, NSW', report reference: Revision 1, dated 15 October 2020, prepared by Douglas

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Other information reviewed, including previous site audit reports and statements relating to the site:

Approximately 11 waste classification reports prepared by Douglas for material disposed from the site.

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### **Site audit report details**

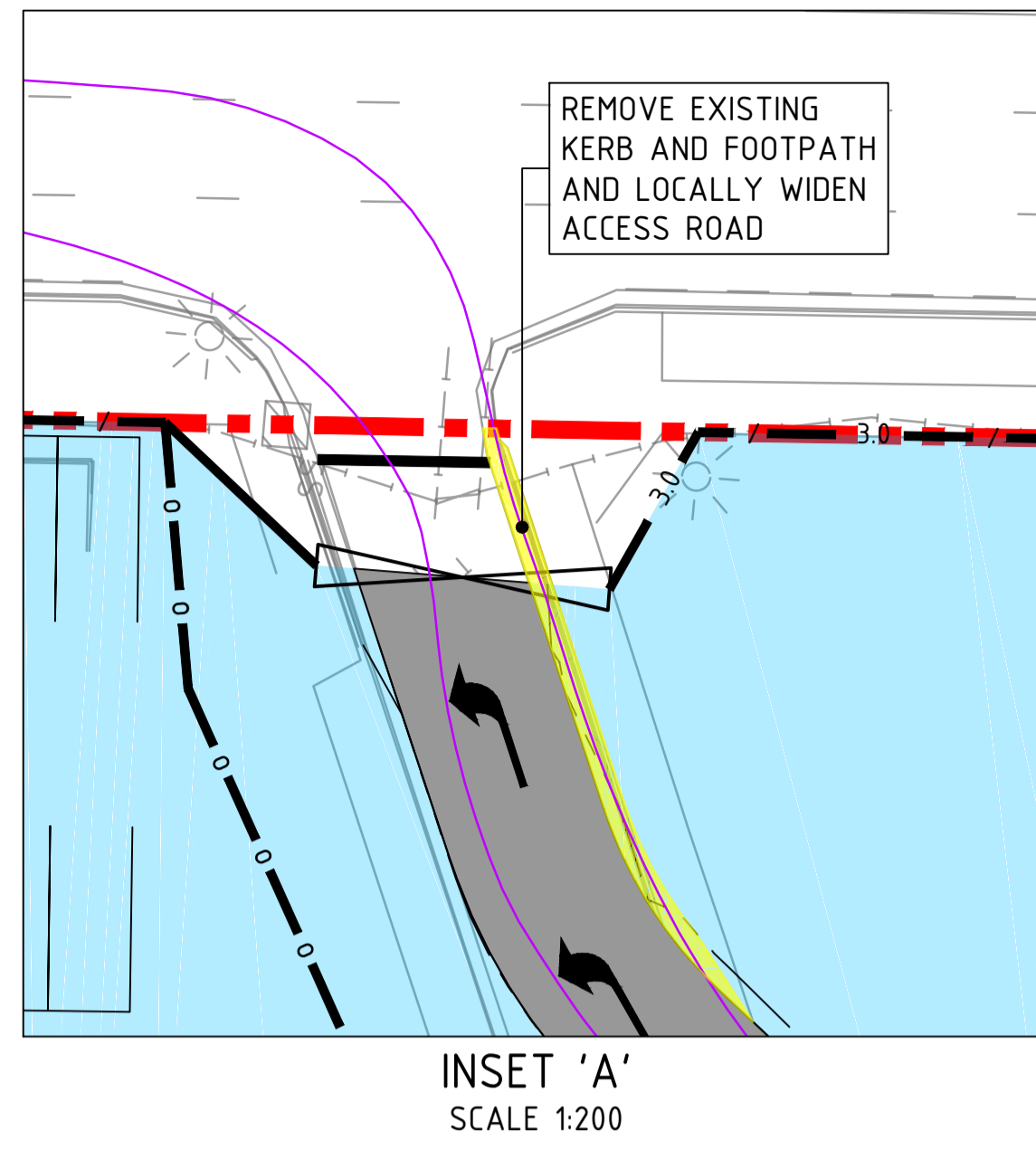
Title: Site Audit Report – Sydney Metro Chatswood Dive Structure, 339 Mowbray Road, Chatswood NSW

---

Report no.: TO-024-4 (Ramboll Ref: 318000323-001) Date: 20 October 2020

---





- LEGEND**
- GENERAL**
- CADASTRAL BOUNDARY
  - TSE PROJECT SITE AS PER TSE PROJECT DEED SCHEDULE D1
  - CHATSWOOD NORTHERN DIVE AND PRECINCT LOCAL AREA WORKS. REFER TO DESIGN LOT DP-S-480 FOR DETAILS
  - CHATSWOOD NORTHERN DIVE AND PRECINCT OPEN BOX EXCAVATION, SHORING AND SUPPORT. REFER TO DESIGN LOT DP-S-460
  - DRIVEWAY AND LAYBACK FOR DETAILS REFER TO DESIGN LOT DP-S-480
  - SITE ACCESS ROAD
  - PRIME MOVER AND SEMI-TRAILER (19m) (AUSTRoadS, 2013)
  - TRUCK AND DOG (19m)
  - The Audit Site



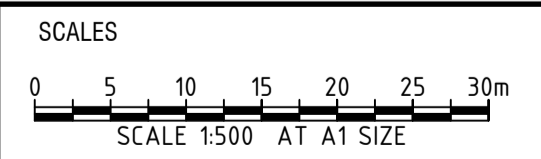
KEY PLAN  
NOT TO SCALE

**FOR CONSTRUCTION**

**SYDNEY METRO CITY & SOUTHWEST**  
CHATSWOOD NORTHERN DIVE AND PRECINCT  
CIVIL WORKS (STATIONS & SURROUNDS)  
SWEEP PATH PLAN

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

00	ASSURED FOR CONSTRUCTION	CH/28.02.18	DT/28.02.18	DR/28.02.18
AMD	DESCRIPTION	DESIGNER SIGN_DATE	VERIFIED SIGN_DATE	APPROVED SIGN_DATE
CO-ORDINATE SYSTEM:	MGA	HEIGHT DATUM:	AHD	SCALE: 1:500



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CLIENT

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		DRG CHECK	J. MACADANGDANG	28.02.18
		DESIGN CHECK	G. TRVIC	28.02.18
		APPROVED	D. ROBERTSON	28.02.18

FILE No.	SHEET: 29 OF 35	A1
STATUS: FOR CONSTRUCTION	©	
DRG No. SMCSWTSE-JAB-DCH-CW-DRG-557401	00	EDMS No.

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 Plot Date & Time: 2/28/2018 10:41 AM  
 Plotted by: JULIUS MACADANGDANG  
 DR 801-954



## Part II: Auditor's findings

Please complete either Section A1, Section A2 or Section B, not more than one section.  
(Strike out the irrelevant sections.)

- Use **Section A1** where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land uses **without the implementation** of an environmental management plan.
- Use **Section A2** where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land uses **with the implementation** of an active or passive environmental management plan.
- Use **Section B** where the audit is to determine:
  - (B1) the nature and extent of contamination, and/or
  - (B2) the appropriateness of an investigation, remediation or management plan<sup>1</sup>, and/or
  - (B3) the appropriateness of a site testing plan in accordance with the *Temporary Water Restrictions Order for the Botany Sands Groundwater Source 2017*, and/or
  - (B4) whether the terms of the approved voluntary management proposal or management order have been complied with, and/or
  - (B5) whether the site can be made suitable for a specified land use (or uses) if the site is remediated or managed in accordance with the implementation of a specified plan.

---

<sup>1</sup> For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

## Section A1

### I certify that, in my opinion:

The **site is suitable** for the following uses:

(Tick all appropriate uses and strike out those not applicable.)

- ~~Residential, including substantial vegetable garden and poultry~~
  - ~~Residential, including substantial vegetable garden, excluding poultry~~
  - ~~Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry~~
  - ~~Day care centre, preschool, primary school~~
  - ~~Residential with minimal opportunity for soil access, including units~~
  - ~~Secondary school~~
  - ~~Park, recreational open space, playing field~~
  - Commercial/industrial
  - ~~Other (please specify):~~
- 

### **OR**

- ~~I certify that, in my opinion, the **site is not suitable** for any use due to the risk of harm from contamination.~~

Overall comments:

Historical investigations at the site identified asbestos contamination in fill soils. The contamination sources are from demolition of former buildings or imported to the site from unknown sources. Low concentrations of hydrocarbons and volatile organic compounds (VOCs) were detected in groundwater samples, however at concentrations below the site assessment criteria. The groundwater detections are from historic commercial/industrial onsite and offsite land uses including upgradient underground storage tanks (USTs). The development (dive structure and tunnel portal) required excavation to a maximum depth of approximately 21.3 m. Excavated soils and rock were classified and disposed offsite. The excavation works successfully removed the onsite sources of contamination.

---

## Section A2

### ~~I certify that, in my opinion:~~

~~Subject to compliance with the **attached** environmental management plan<sup>2</sup> (EMP), the site is suitable for the following uses:~~

~~(Tick all appropriate uses and strike out those not applicable.)~~

- ~~Residential, including substantial vegetable garden and poultry~~
- ~~Residential, including substantial vegetable garden, excluding poultry~~
- ~~Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry~~
- ~~Day care centre, preschool, primary school~~
- ~~Residential with minimal opportunity for soil access, including units~~
- ~~Secondary school~~
- ~~Park, recreational open space, playing field~~
- ~~Commercial/industrial~~
- ~~Other (please specify):~~

---

### ~~EMP details~~

~~Title: \_\_\_\_\_~~

~~Author: \_\_\_\_\_~~

~~Date: \_\_\_\_\_ No. of pages: \_\_\_\_\_~~

### ~~EMP summary~~

~~This EMP (attached) is required to be implemented to address residual contamination on the site.~~

~~The EMP: (Tick appropriate box and strike out the other option.)~~

- ~~requires operation and/or maintenance of **active** control systems<sup>3</sup>~~
- ~~requires maintenance of **passive** control systems only<sup>3</sup>.~~

---

<sup>2</sup> Refer to Part IV for an explanation of an environmental management plan.

<sup>3</sup> Refer to Part IV for definitions of active and passive control systems.

Purpose of the EMP:

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Description of the nature of the residual contamination:

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---

Summary of the actions required by the EMP:

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How the EMP can reasonably be made to be legally enforceable:

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---

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How there will be appropriate public notification:

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Overall comments:

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## Section B

Purpose of the plan<sup>4</sup> which is the subject of this audit:

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**I certify that, in my opinion:**

(B1)

- ~~The nature and extent of the contamination **has** been appropriately determined~~
- ~~The nature and extent of the contamination **has not** been appropriately determined~~

AND/OR (B2)

- ~~The investigation, remediation or management plan **is** appropriate for the purpose stated above~~
- ~~The investigation, remediation or management plan **is not** appropriate for the purpose stated above~~

AND/OR (B3)

- ~~The site testing plan:
  - ~~**is** appropriate to determine~~
  - ~~**is not** appropriate to determine~~~~

~~if groundwater is safe and suitable for its intended use as required by the *Temporary Water Restrictions Order for the Botany Sands Groundwater Resource 2017*~~

AND/OR (B4)

- ~~The terms of the approved voluntary management proposal\* or management order\*\* (strike out as appropriate):
  - ~~**have been** complied with~~
  - ~~**have not** been complied with.~~~~

~~\*voluntary management proposal no.~~

~~\*\*management order no.~~

AND/OR (B5)

- ~~The site **can be made suitable** for the following uses:  
(Tick all appropriate uses and strike out those not applicable.)
  - ~~Residential, including substantial vegetable garden and poultry~~
  - ~~Residential, including substantial vegetable garden, excluding poultry~~~~

---

<sup>4</sup> For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

- Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
- Day care centre, preschool, primary school
- Residential with minimal opportunity for soil access, including units
- Secondary school
- Park, recreational open space, playing field
- Commercial/industrial
- Other (please specify):

---

IF the site is remediated/managed\* in accordance with the following plan (attached):

\*Strike out as appropriate

Plan title

Plan author

Plan date

No. of pages

SUBJECT to compliance with the following condition(s):

---

---

---

---

---

Overall comments:

---

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---

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---

## Part III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority (EPA) under the *Contaminated Land Management Act 1997*.

Accreditation no. 1505

---

### I certify that:

- I have completed the site audit free of any conflicts of interest as defined in the *Contaminated Land Management Act 1997*, and
- with due regard to relevant laws and guidelines, I have examined and am familiar with the reports and information referred to in Part I of this site audit, and
- on the basis of inquiries I have made of those individuals immediately responsible for making those reports and obtaining the information referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete, and
- this statement is, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties under the *Contaminated Land Management Act 1997* for wilfully making false or misleading statements.

Signed



---

Date

20 October 2020

---

## Part IV: Explanatory notes

To be complete, a site audit statement form must be issued with all four parts.

### How to complete this form

#### Part I

Part I identifies the auditor, the site, the purpose of the audit and the information used by the auditor in making the site audit findings.

#### Part II

Part II contains the auditor's opinion of the suitability of the site for specified uses or of the appropriateness of an investigation, or remediation plan or management plan which may enable a particular use. It sets out succinct and definitive information to assist decision-making about the use or uses of the site or a plan or proposal to manage or remediate the site.

The auditor is to complete either Section A1 or Section A2 or Section B of Part II, **not** more than one section.

#### Section A1

In Section A1 the auditor may conclude that the land is *suitable* for a specified use or uses OR *not suitable* for any beneficial use due to the risk of harm from contamination.

By certifying that the site is *suitable*, an auditor declares that, at the time of completion of the site audit, no further investigation or remediation or management of the site was needed to render the site fit for the specified use(s). **Conditions must not be** imposed on a Section A1 site audit statement. Auditors may include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

#### Section A2

In Section A2 the auditor may conclude that the land is *suitable* for a specified use(s) subject to a condition for implementation of an environmental management plan (EMP).

##### *Environmental management plan*

Within the context of contaminated sites management, an EMP (sometimes also called a 'site management plan') means a plan which addresses the integration of environmental mitigation and monitoring measures for soil, groundwater and/or hazardous ground gases throughout an existing or proposed land use. An EMP succinctly describes the nature and location of contamination remaining on site and states what the objectives of the plan are, how contaminants will be managed, who will be responsible for the plan's implementation and over what time frame actions specified in the plan will take place.

By certifying that the site is suitable subject to implementation of an EMP, an auditor declares that, at the time of completion of the site audit, there was sufficient information satisfying guidelines made or approved under the *Contaminated Land Management Act 1997*

(CLM Act) to determine that implementation of the EMP was feasible and would enable the specified use(s) of the site and no further investigation or remediation of the site was needed to render the site fit for the specified use(s).

Implementation of an EMP is required to ensure the site remains suitable for the specified use(s). The plan should be legally enforceable: for example, a requirement of a notice under the CLM Act or a development consent condition issued by a planning authority. There should also be appropriate public notification of the plan, e.g. on a certificate issued under s.149 of the *Environmental Planning and Assessment Act 1979*.

#### *Active or passive control systems*

Auditors must specify whether the EMP requires operation and/or maintenance of active control systems or requires maintenance of passive control systems only. Active management systems usually incorporate mechanical components and/or require monitoring and, because of this, regular maintenance and inspection are necessary. Most active management systems are applied at sites where if the systems are not implemented an unacceptable risk may occur. Passive management systems usually require minimal management and maintenance and do not usually incorporate mechanical components.

#### *Auditor's comments*

Auditors may also include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

## **Section B**

In Section B the auditor draws conclusions on the nature and extent of contamination, and/or suitability of plans relating to the investigation, remediation or management of the land, and/or the appropriateness of a site testing plan in accordance with the *Temporary Water Restrictions Order for the Botany Sands Groundwater Source 2017*, and/or whether the terms of an approved voluntary management proposal or management order made under the CLM Act have been complied with, and/or whether the site can be made suitable for a specified land use or uses if the site is remediated or managed in accordance with the implementation of a specified plan.

By certifying that a site *can be made suitable* for a use or uses if remediated or managed in accordance with a specified plan, the auditor declares that, at the time the audit was completed, there was sufficient information satisfying guidelines made or approved under the CLM Act to determine that implementation of the plan was feasible and would enable the specified use(s) of the site in the future.

For a site that *can be made suitable*, any **conditions** specified by the auditor in Section B should be limited to minor modifications or additions to the specified plan. However, if the auditor considers that further audits of the site (e.g. to validate remediation) are required, the auditor must note this as a condition in the site audit statement. The condition must not specify an individual auditor, only that further audits are required.

Auditors may also include **comments** which are observations in light of the audit which provide a more complete understanding of the environmental context to aid decision-making in relation to the site.

### **Part III**

In **Part III** the auditor certifies their standing as an accredited auditor under the CLM Act and makes other relevant declarations.

### **Where to send completed forms**

In addition to furnishing a copy of the audit statement to the person(s) who commissioned the site audit, statutory site audit statements must be sent to

- the **NSW Environment Protection Authority**:  
[nswauditors@epa.nsw.gov.au](mailto:nswauditors@epa.nsw.gov.au) or as specified by the EPA
- AND
- the **local council** for the land which is the subject of the audit.

## **APPENDIX C INTERIM AUDIT ADVICE**

16 April 2018

John Holland CPB Ghella Joint Venture  
Attn: Robert Muir  
Senior Environment Coordinator  
Sydney Metro City & Southwest  
Level 3, 140 Sussex Street, Sydney NSW 2000

**By email:** [Robert.Muir@sydneymetro2.com.au](mailto:Robert.Muir@sydneymetro2.com.au)

Dear Robert

**RE: INTERIM AUDIT ADVICE LETTER NO. 2 - REMEDIATION ACTION PLAN, CHATSWOOD DIVE, MOWBRAY ROAD, CHATSWOOD, NSW**

## 1. INTRODUCTION

As a NSW Environment Protection Authority (EPA) accredited Contaminated Sites Auditor, I am conducting an Audit in relation to the subject site. This initial review has been undertaken to provide an independent review of the suitability and appropriateness of a Remediation Action Plan (RAP).

A statutory site audit is required for the proposed Chatswood Dive development, part of the Sydney Metro rail project between Chatswood and Sydenham, to address the requirements of Condition E67 of Infrastructure Approval, application SSI 15\_7400, approved by the Minister for Planning on 9 January 2017. The site audit is also a requirement of Clause 10.14B of the Sydney Metro City & Southwest Tunnel and Station Excavation Works Design and Construction Deed (Contract No: 00013/11200).

This IAA letter is based on a review of the documents listed below and observations made during a site visit on 27 October 2017, as well as discussions with John Holland CPB Ghella Joint Venture (JHCPBG JV) and Douglas Partners Pty Ltd (DP) who undertook the investigations.

The reports reviewed were:

- *'Report on Preliminary Site Investigation, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Chatswood Dive, Mowbray Road, Chatswood, prepared for John Holland CPB Ghella JV, Project 85608.02, February 2018', report reference: Rev0, dated 27 February 2017, prepared by DP (the PSI).*
- *'Report on Detailed Site Investigation, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Chatswood Dive, Mowbray Road, Chatswood, prepared for John Holland CPB Ghella JV, Project 85608.02, March 2018', report reference: Revision 1, dated 7 March 2018, prepared by DP (the DSI).*

**Ramboll Australia Pty Ltd**

Level 3, 100 Pacific Highway  
PO Box 560  
North Sydney NSW 2060

T +61 2 9954 8100

[www.ramboll.com](http://www.ramboll.com)

Ref 318000323-001



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- 'Report on Remediation Action Plan, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Chatswood Dive, 339 Mowbray Road, Chatswood, prepared for John Holland CPB Ghella JV, Project 85608.02, April 2018', report reference: Revision 1, dated 12 April 2018, prepared by DP (the RAP).

A copy of the PSI (draft), DSI (Rev0) and RAP (draft) reports were issued for audit review. Review comments (issued by the Auditor by email) were incorporated into the final DP reports (listed above). The PSI makes reference to two previous DP and Golder Associates Pty Ltd (Golder) geotechnical investigation and contamination assessment reports for the proposed dive site prepared in May 2016 and January 2017 (Report No. 1418746-088-R-Rev4; 1650773-042-R-Rev0). Copies of these reports have not been provided to the Auditor for this review.

The PSI makes reference to a number of contamination investigation reports (total 9) prepared for the site by various consultants including Johnstone Environmental Technology, AGC Woodward-Clyde Pty Ltd, Energy Australia, PPK Environment and Infrastructure, Golder Associates and Ausgrid. The RAP makes reference to a hydrogeological interpretive report (dated 19 March 2018) prepared by Pells Sullivan Meynink (PSM). A summary of relevant information from these reports was included in the DP reports. Copies of these reports have not been provided to the Auditor for this review.

## 2. SITE DETAILS

### 2.1 Location

The site is identified as the 'excavation footprint' (the site) for the dive structure shown on Attachment 1. The 'Worksite Area' shown on Attachment 1 surrounding the 'excavation footprint' has been excluded from the DP investigations and is not part of the site audit.

The site details are as follows:

Street address:	339 Mowbray Road, Chatswood, NSW 2067
Identifier:	Part Lot 2 DP221896
Local Government:	Willoughby Council
Owner:	Transport for New South Wales
Site Area:	Approximately 0.3 ha
Zoning:	SP2 – Infrastructure: Classified Road SP2 – Infrastructure: Electricity Transmission & Distribution
Heritage:	Part of Lot 2 in DP 221896 (Mowbray House) is listed heritage item

### 2.2 Site Condition

DP inspected the site on 20 September 2017 and noted the following:

- Former depot buildings had been demolished except for Mowbray House (a heritage listed former school) and the former substation transformer workshop. These are located off-site.
- The majority of the site was paved with concrete and asphalt with exposed soil in garden beds along the southern Worksite Area boundary.
- Fibre-cement fragments potentially containing asbestos were observed at the surface of the exposed soil along the southern Worksite Area boundary (off-site).
- A concrete pad associated with a former fuel pump and pipeline was located on the southwest site boundary and extended onto the Worksite Area (Attachment 2). The pipeline led to a

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decommissioned underground fuel storage tank (UST) located to the north of Mowbray House in the central section of the Worksite Area.

During the Auditors site visit on 27 October 2017, the site condition was consistent with observations made by DP, with the following additional features noted:

- A large area of pavement had been removed in the south section of the site. Exposed fill soil was visible at the surface.
- An open excavation to the west of the site (within the Worksite Area) had exposed asbestos pipes. The excavation was fenced limiting access to the area.
- Temporary site sheds had been setup to the west of the site along Pacific Highway.
- The concrete pad of the former fuel pump was located in the southwest section of the site.

### 2.3 Adjacent Uses

The site is located within an area of commercial and residential land use. The surrounding site use includes:

North: Nelson Street and high rise residential apartments beyond.

East: Railway corridor and high rise residential apartments beyond the corridor.

South: Mowbray Road. Sydney Water Chatswood Reservoir is located further south of Mowbray Road.

West: Worksite Area and Pacific Highway to the west.

The railway corridor has been cut into the former ground and was approximately 6-10 m below the Worksite Area. A steep batter was located along the eastern boundary which sloped down to the railway corridor. DP identified the closest sensitive ecological receptor for groundwater as Scotts Creek located approximately 2.4 km to the northeast.

The Worksite Area was previously occupied by various commercial land uses, including a service station, electrical substation and transformer facility, which have resulted in localised contamination. A former Caltex service station on 607 Pacific Highway (west of the subject site) has been impacted by petroleum hydrocarbon contamination and was the subject of a Declaration of Investigation Area and an approved voluntary management proposal (VMP). The PSI describes a number of former USTs previously installed within the Worksite Area. No USTs were previously located on the site. A UST and associated pipework is located immediately to the southwest of the site (Attachment 2).

A search of the NSW EPA list of notified contaminated sites shows two properties (Caltex Service Stations at 607 Pacific Highway and 572 Pacific Highway) located within a radius of 200 m from the site.

### 2.4 Proposed Development

The proposed development includes the excavation and construction of a dive structure and tunnel portal for the launch and support of two boring machines. The depth of excavation will range from the surface (north corner) to approximately 21.6 metres below ground level (mbgl) at the tunnel portal wall in the southern end (Attachment 2). The base of the structure will comprise approximately 200 mm thick concrete slab and the walls will include bored piles with shotcrete between the piles. A water collection sump will be located at the base of the excavation at the tunnel portal wall.

For the purposes of this audit, the 'commercial/industrial' land use scenario will be assumed.

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### 3. SITE HISTORY

The PSI site history assessment included a review of historical title deeds, aerial photographs, NSW EPA records and Section 149 (2&5) certificates. NSW Safe Work records were not reviewed by DP. The site history is summarised in Table 3.1.

<b>Table 3.1: Site History</b>	
<b>Date</b>	<b>Activity</b>
1900s – 1953	The site was owned by a school teacher/master and was occupied by a park, and residential and school buildings.
1950s – 2016	The site was developed for commercial purposes including a depot with warehouses and paved areas. The site was used for substation transformer servicing, circuit fabrication, testing of components and transformer oils, vehicle maintenance, carpentry, wiring and photographic processing. Sections of the site were owned by Railways, Sydney Country Council, Ausgrid and a small portion as a road reserve. The former Caltex service station in the west of the Worksite Area (offsite) was developed between 1956 and 1972 and decommissioned and demolished between 2002 and 2009.
2016 to date	The site is currently owned and occupied by Transport for NSW. The demolition of previous site structures commenced in 2017.

The summary indicates that the site has been used for various commercial purposes (depot and workshop) since the 1950s. DP concluded that no USTs were located within the site. A concrete pad of a former fuel pump and pipeline is located on the southwest excavation boundary.

A review of the NSW EPA public records indicates two properties located close to the site notified as contaminated to the EPA. The properties include: Caltex service station at 607 Pacific Highway (within Worksite Area) and another Caltex service station on 572 Pacific Highway. Based on the site location and history, potential contamination could have impacted the site from on-site and/or off-site sources.

#### 3.1 Auditor's Opinion

In the Auditor's opinion, the site history indicates past activities that may have resulted in site contamination, including the fuel pump in the south of site and other activities undertaken within the greater Worksite Area including substation transformer servicing, circuit fabrication, testing of components and transformer oils, vehicle maintenance, carpentry, wiring and photographic processing. Details of site operations were not provided, such as chemical use and storage locations. The current and former service stations located to the west of the site are also potential sources of contamination. The Auditor considers that the site history is broadly understood and adequate for identification of contaminants of concern (Section 4) and remedial planning (Section 10).

### 4. CONTAMINANTS OF CONCERN

The PSI and DSI provided a list of the contaminants of concern and potentially contaminating activities. These have been tabulated in Table 4.1.

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<b>Table 4.1: Contaminants of Concern</b>		
<b>Area</b>	<b>Activity</b>	<b>Potential Contaminants</b>
Entire Site	Fill and surface soil imported from unknown sources. Ash and slag has been identified in the fill.  Demolition of former buildings containing hazardous materials.	Metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylenes & naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphorus pesticides (OPPs), polychlorinated biphenyls (PCBs), phenols, lead (from paint) and asbestos.
Entire Site	Former land use as a depot workshop and testing building. Use of chemicals, engine oil, solvents, fuels, reagents and cleaning chemicals.  Former fuel pump and pipework associated with the decommissioned UST.	Petroleum hydrocarbons (BTEX, TPH), PAHs, Volatile Organic Compounds (VOCs), Semi Volatile Organic Compounds (SVOCs), metals, cyanide and phenols.
Off-Site Sources	Migration of contaminated groundwater from the Caltex service stations and other USTs on the Worksite.	Metals, petroleum hydrocarbons (BTEX, TPH), PAHs, VOC and phenols.

The DSI stated that based on the site topography and review of previous investigation reports, contaminated groundwater associated with the former Caltex service station in the west of the Worksite Area is likely to migrate to the north with low risk of migration onto the site. The Auditor has reviewed the groundwater data presented in the DSI, as well as knowledge of the remediation of the former Caltex service station, and agrees with the DP conclusion. Less than 10 m to the east is a railway corridor cut approximately 6-10 m below the Worksite Area, which would already be acting to draw groundwater towards the east. The risk of migration of contamination from these potential sources to the site as a result of the development is therefore considered to be low.

#### 4.1 Auditor's Opinion

The Auditor considers that the analyte list used by DP adequately reflects the site history and condition.

## 5. STRATIGRAPHY AND HYDROGEOLOGY

Following a review of the DP reports, a summary of the site stratigraphy and hydrogeology conditions at the site are compiled below.

#### 5.1 Topography, Geology and Stratigraphy

The PSI states that the site is located in a relatively elevated area on a ridge line at approximately 103 m Australian Height Datum (AHD) with slopes to the north and northwest. The railway corridor to the immediate east has been cut into the ground and was approximately 6 m below the site. The site is located within the Glenorie soil landscape underlain by erosional soils and by deeper Ashfield Shale bedrock. The Council Local Environmental Plan (LEP) and NSW Acid Sulfate Soil (ASS) Risk Map show that the site is located in a Class 5 risk area of 'no known occurrences of ASS'.

The sub-surface profile detailed by DP in the DSI is summarised in Table 5.1.

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<b>Depth (mbgl)</b>	<b>Subsurface Profile</b>
0.0 – 0.3	Asphaltic concrete and concrete pavements underlain by grey sandy gravel roadbase.
0.3 – 0.6	Fill material comprising clay and sand with inclusions of brick, charcoal, and sandstone. Grey ash was detected in 5 sampling locations between depths of 0.3 mbgl and 0.38 mbgl. A fragment of asbestos containing material (ACM) was detected in one test pit between 0.38 mbgl and 0.48 mbgl.
1 – 2.7	Natural clay.
0.6 to termination depth (9.9)	Weathered shale bedrock with ironstone gravel.

mbgl – metres below ground level

The subsurface profile comprised relatively shallow fill underlain by natural clay soil and shale bedrock.

## 5.2 Hydrogeology

The PSI undertook a search of the groundwater information database maintained by the NSW Government and identified 17 registered groundwater bores within a 0.5 km radius of the site. The majority of the bores (16) were located in the west of the Worksite Area (off-site). The bores were registered for monitoring purposes associated with investigation and remediation of the former Caltex service station. Groundwater data was not included in the work summary documents. The PSI concluded that based on the topography and the information from the previous investigations, groundwater is anticipated to flow to the north. Groundwater flow may be impacted by the railway cutting located along the eastern site boundary, and may also be impacted by the proposed development. DP identified the closest sensitive ecological receptor for groundwater to be Scotts Creek located approximately 2.4 km to the northeast. The creek drains into Castle Cove located approximately 3.7 km to the east of the site. Excess surface water run-off is anticipated to flow into the local stormwater network.

As part of the DSI, three groundwater monitoring wells were installed on the site (Attachment 2). Groundwater seepage was noted during drilling in CWMW06 at 7.8 mbgl. Groundwater observations and sampling was undertaken as part of the DSI on 27 November 2017. Depth to groundwater in the monitoring wells was recorded between 5.50 mbgl to 5.55 mbgl. The DSI stated that based on groundwater levels and the site topography, the groundwater is anticipated to flow to the north.

The DSI included field records of groundwater parameters recorded during sampling. They indicated that the pH was 4.89 to 5.31, dissolved oxygen (DO) was 3.27 to 3.86 mg/L, redox was 86 to 114 mV, and electrical conductivity (EC) was 145 to 311 mS/cm.

The RAP includes a summary of the PSM (2018) Hydrogeological Interpretive Report, which modelled the groundwater seepage rates expected during and post construction. Details of the modelling and the results are included in the Hydrogeological Interpretive Report. DP summarised the findings as follows:

- Maximum modelled seepage rate during construction was 35 kL/day;
- Modelled steady state seepage rate post construction was 35 kL/day;
- Water bearing zone is from residual soils of Ashfield Shale at depths of 7 to 15 m. The model has fill and residual soil as the primary source of seepage/inflows;
- The modelled zone of capture for the first 10 years would extend to approximately 250 m from the site; and

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- Historical land use (former Caltex and Ausgrid depot) may have an impact on groundwater quality and potential for contamination migration (TRH and VOC).

The Auditor has not reviewed the PSM (2018) Hydrogeological Interpretive Report, however considers that the primary source of seepage/inflows is likely to be shale, rather than fill and residual soil as noted above by DP. This is based on the stratigraphy and hydrogeology encountered during the DSI.

### 5.3 Auditor's Opinion

The Auditor considers that the site stratigraphy and hydrogeology conditions detailed by DP adequately reflects the site conditions and are sufficient for remediation planning.

## 6. EVALUATION OF QUALITY ASSURANCE AND QUALITY CONTROL

The Auditor has assessed the overall quality of the data by review of the information presented in the referenced reports, supplemented by field observations. The Auditor's assessment follows in Tables 6.1 and 6.2.

<b>Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment</b>	
<b>Sampling and Analysis Plan and Sampling Methodology</b>	<b>Auditor's Opinion</b>
<p><b>Data Quality Objectives (DQO)</b></p> <p>The PSI and DSI defined specific DQOs in accordance with the seven step process outlined in Schedule B2 of NEPM (2013).</p>	<p>These were considered appropriate for the investigations conducted.</p>
<p><b>Sampling pattern and locations</b></p> <p><i>Soil:</i> The DSI adopted a general grid pattern or systematic sampling plan. Investigation locations were spaced to gain coverage of the majority of the site, with one location (MW06) targeting the former fuel dispenser. The various fill materials at the site were also targeted for sampling.</p> <p><i>Groundwater:</i> three monitoring wells (MW04, MW05 and MW06) were distributed across the site. MW04 was down-gradient of the site. MW06 was located in the southwest section of the site, down-gradient to the former fuel pump/dispenser.</p>	<p>In the Auditor's opinion these investigation locations provide adequate site coverage and target the main known areas of concern.</p>
<p><b>Sampling density</b></p> <p><i>Soil:</i> The DSI included a sampling density of 12 locations (Attachment 2) over approximately 0.3 ha, which exceeds the minimum recommended by EPA (1995) <i>Sampling Design Guidelines</i>. The coverage provides a 95% confidence of detecting a residual hot spot of approximately 19 m diameter.</p> <p>Samples analysed for asbestos were not collected in accordance with the density outlined in NEPM (2013) (Schedule B1).</p> <p><i>Groundwater:</i> A total of 3 groundwater samples were obtained from the 3 monitoring wells installed at the site.</p>	<p>In the Auditor's opinion the sampling density was appropriate. Considering that the fill from the entire site would be excavated and disposed off-site as part of the development, the sampling adopted by DP is acceptable to assess the presence/absence of asbestos in soil.</p>

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<b>Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment</b>	
<b>Sampling and Analysis Plan and Sampling Methodology</b>	<b>Auditor's Opinion</b>
<p><b>Sample depths</b></p> <p><i>Soil:</i> Samples were collected and analysed from a range of depths targeting the fill and natural clay and shale bedrock. The sample depth intervals ranged from 0.2 m to 8.45 mbgl.</p> <p><i>Groundwater:</i> Groundwater samples were obtained from the standing water level (SWL) depths observed in the monitoring wells during sampling. The depth ranged from approximately 5.50 mbgl to 5.55 mbgl.</p>	<p>In the Auditor's opinion, this sampling strategy was appropriate and adequate to characterise the primary material types present on site.</p>
<p><b>Well construction</b></p> <p>The wells were installed from the surface to depths of approximately 10 mbgl to 10.45 mbgl, and were constructed of 50 mm diameter acid washed, class 18, PVC casing and machine slotted well screen intervals.</p> <p>The top of the screened interval was up to 1 mbgl, and therefore the screens of the wells should extend above the groundwater table. The wells were completed to assess shallow perched aquifer conditions.</p>	<p>The Auditor notes that, whilst it is preferable for monitoring wells to be screened over a discrete short vertical interval, the wells are sufficient to provide an indication of the groundwater conditions.</p> <p>Deeper groundwater was not assessed. The proposed excavation will extend to a depth of 21.9 mbgl and may therefore intercept deeper groundwater.</p>
<p><b>Sample collection method</b></p> <p><i>Soil:</i> Sample collection was by test pit and drilling (solid stem auger). Test pit samples were obtained directly from the excavator bucket. Drilling samples were collected from the auger flights, with external material removed prior to collecting the sample.</p> <p><i>Groundwater:</i> Wells were installed by solid flight augers, developed with a pump and samples were collected by low flow peristaltic pump with dedicated sample tubing.</p>	<p>Sample collection from the auger flights is not ideal as it can result in loss of volatiles and sample cross contamination, although cross contamination was minimised by removing external material. Results for samples collected from solid flight augers may underestimate concentrations of volatile contaminants.</p>
<p><b>Decontamination procedures</b></p> <p><i>Soil:</i> Sampling equipment was cleaned with detergent (3% Decon 90 solution), tap water and then de-ionised water prior to sampling and between sampling events to prevent cross contamination. New gloves were reportedly used for each new sample.</p> <p><i>Groundwater:</i> Dedicated sampling equipment was used for each well. New gloves were reportedly used for each new sample.</p>	<p>Acceptable.</p>
<p><b>Sample handling and containers</b></p> <p>Soil samples were placed into prepared and preserved sampling bottles provided by the laboratory and chilled during storage and subsequent transport to the labs. Laboratory</p>	<p>Acceptable for soil.</p> <p>The VOC, BTEXN and TRH C<sub>6</sub>-C<sub>9</sub>/C<sub>10</sub> results in groundwater may have been underestimated by the laboratory.</p>

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<b>Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment</b>	
<b>Sampling and Analysis Plan and Sampling Methodology</b>	<b>Auditor's Opinion</b>
<p>reports indicate that asbestos analysis was undertaken on sub-samples from soil jars.</p> <p>Groundwater samples to be analysed for heavy metals were field filtered.</p> <p>Envirolab report 180877 stated that VOC/BTEX water samples were subsampled from plastic bottles as appropriate vials were not provided by DP. The laboratory reported that further dilutions could not be carried out due to the presence of headspace in the bottles. The TRH C<sub>6</sub>-C<sub>9</sub>/C<sub>10</sub> results could be underestimated due to analytes being above the laboratory calibration range and inappropriately preservation.</p>	
<p><b>Chain of Custody (COC)</b></p> <p>Completed chain of custody forms were provided in the report.</p>	Acceptable.
<p><b>Detailed description of field screening protocols</b></p> <p>Field screening for volatiles was undertaken using a calibrated hand held PID unit. The PID screening procedure was provided and involved placing the samples in ziplock plastic bags and measuring VOCs in the headspace after allowing time for equilibration.</p> <p>PID readings are provided on selected test pit and borehole logs. The PID values were below 5 ppm indicating a lack of PID-detectable VOCs.</p> <p>The DSI reported groundwater quality parameters measured during well sampling in field logs for each well.</p>	Overall, the field screening protocols were acceptable to assess site contamination.
<p><b>Calibration of field equipment</b></p> <p>Calibration information for the field equipment (PID and groundwater meters) was included in the DSI.</p>	Acceptable.
<p><b>Sampling logs</b></p> <p>Soil logs were provided within the DSI, indicating sample depth, PID readings and lithology. The logs reported inclusions in fill (asbestos, ash) which could pose a contamination risk.</p> <p>Groundwater field sampling records were included in the DSI, which included well development and sampling details.</p>	Acceptable.



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<b>Table 6.2: QA/QC – Field and Lab Quality Assurance and Quality Control</b>	
<b>Field and Lab QA/QC</b>	<b>Auditor's Opinion</b>
<p><b>Field quality control samples</b></p> <p>Field quality control samples including trip blanks (1 per field batch), trip spikes (1 per field batch), rinsate blanks (1 per day), field intra-laboratory and inter-laboratory duplicates (5% of primary samples) were undertaken by DP during the DSI.</p>	Acceptable.
<p><b>Field quality control results</b></p> <p>The results of field quality control samples were generally within appropriate limits. The trip blank and majority of the field rinsate blank results were below the laboratory PQL. Slight detections of TRH C<sub>6</sub> – C<sub>10</sub> was detected in the field rinsate blanks. The results were below the screening criteria and DP concluded that the likely source was from the demineralised water used for rinsing. The trip spike recovery was acceptable.</p> <p>Relative Percent Difference (RPDs) calculations for the intra-laboratory soil duplicate sample for 1 metal was 40%. RPDs for the inter-laboratory soil and groundwater duplicate samples for 8 metals ranged from 52% to 143%, 1 B(a)P in soil was 86% and 1 PCE in groundwater was 67%. The DSI has assessed all field duplicate results along with the primary sample results against the site acceptance criteria.</p>	<p>Overall, the field quality control results were found to be acceptable. RPD exceedances were infrequent and minor and do not impact the overall dataset. DP assessed the results for primary samples and field duplicates against the site acceptance criteria which is considered appropriate.</p> <p>The Auditor has adopted the highest concentration from field duplicate and triplicate results.</p>
<p><b>NATA registered laboratory and NATA endorsed methods</b></p> <p>Laboratories used included: Envirolab Services Pty Ltd (primary) and Eurofins Scientific (secondary). Laboratory certificates were NATA stamped.</p>	Acceptable.
<p><b>Analytical methods</b></p> <p>Analytical methods were included in the laboratory test certificates. Both Envirolab and Eurofins provided brief method summaries of in-house NATA accredited methods used based on USEPA and/or APHA methods (excluding asbestos) for extraction and analysis in accordance with the NEPM (2013). Asbestos analysis was based on AS4964-2004.</p>	Acceptable.
<p><b>Holding times</b></p> <p>Review of the COCs and laboratory certificates indicate that the holding times had been met. DP also reported that holding times have been met.</p>	Acceptable.
<p><b>Practical Quantitation Limits (PQLs)</b></p> <p>Soil: PQLs for individual PAHs were slightly raised in three soil samples (Envirolab Report 178652, samples 1, 1d, 11) due to</p>	<p>Overall the PQLs are acceptable.</p> <p>The PQL for asbestos analysis is considered acceptable in the</p>

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<b>Table 6.2: QA/QC – Field and Lab Quality Assurance and Quality Control</b>	
<b>Field and Lab QA/QC</b>	<b>Auditor's Opinion</b>
<p>interference from analytes other than those being tested. The raised PQLs were below the quality criteria.</p> <p><i>Groundwater:</i> PQLs for groundwater were sufficiently low in the majority of the analytes and acceptable for the DSI. The PQL for Azinophos-methyl (OPP compound) was 0.02 µg/L which is above the 99% reliability criteria of 0.01 µg/L.</p>	<p>absence of any other validated analytical method.</p> <p>The elevated Azinophos-methyl PQL in groundwater was only marginally above the trigger value and in the context of the results reported, this discrepancy does not materially affect the outcome of the audit.</p>
<p><b>Laboratory quality control samples</b></p> <p>Laboratory quality control samples including laboratory control samples, matrix spikes, surrogate spikes, blanks, internal standards and duplicates were undertaken by the laboratory.</p>	<p>Acceptable.</p>
<p><b>Laboratory quality control results</b></p> <p>The results of laboratory quality control samples were generally within appropriate limits, with the following exceptions:</p> <ul style="list-style-type: none"> <li>Percentage spike recovery was not possible for some metals and PAHs due to high concentrations, the inhomogeneous nature of the compound in the sample and/or interference from analytes. This was considered acceptable as acceptable recovery was reported for the laboratory control samples (LCS).</li> <li>The laboratory RPD acceptance criteria were exceeded for individual metals and VOCs. The laboratory reported that this was attributed to the non-homogenous nature of the samples. Triplicate results were issued by the laboratory to confirm the metal results exceeding the RPD criteria.</li> </ul>	<p>Overall, the laboratory quality control results are considered acceptable.</p>
<p><b>Data Quality Indicators (DQI) and Data Evaluation (completeness, comparability, representativeness, precision, accuracy)</b></p> <p>The DSI assessed the field and laboratory results against predetermined data quality indicators (DQIs) and internal standards. These were discussed with regard to the five category areas.</p>	<p>An assessment of the data quality with respect to the five category areas has been undertaken by the Auditor and is summarised below.</p>

In considering the data as a whole the Auditor concludes that:

- The laboratories provided adequate information to conclude that the data are of sufficient precision.
- There is a high degree of confidence that the data are accurate.
- The data are likely to be representative of the overall site conditions, including fill, natural soil and groundwater. Results for volatile organics in soil samples collected by solid stem auger may underestimate actual concentrations. Results for volatile organics in groundwater may underestimate concentrations due to inappropriate sample bottles and the inability of the laboratory

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to dilute the sample within the calibration range. The data is considered adequate to identify contaminants of concern for remedial planning purposes.

- The investigation data are considered to be complete.
- There is a high degree of confidence that the data are comparable for each sampling and analytical event.

## 7. ENVIRONMENTAL QUALITY CRITERIA

The Auditor has assessed **soil** data provided with reference to criteria from National Environmental Protection Council (NEPC) *National Environmental Protection (Assessment of Site Contamination) Measure 1999*, as Amended 2013 (NEPM, 2013). Based on the proposed development (excavation and construction of a dive structure and tunnel portal), the Tier 1 (screening) criteria for a 'commercial/industrial' setting were referred to. This was considered to most relevant during remediation and ongoing operation of the site, however is likely to be conservative for short term exposure by construction workers.

- Human Health Assessment:
  - Health Based Investigation Levels (HIL D).
  - Soil Health Screening Levels (HSL D) for Vapour Intrusion. The most conservative criteria were adopted i.e. assumed depth to source < 1 m and sand.
  - Asbestos presence/absence.
  - CRC CARE HSLs for direct contact and vapour inhalation for intrusive maintenance workers.
  - USEPA RSL (on-line) Composite Worker Soil criteria.
- Terrestrial Ecological Assessment (TEA): The soil data has not been assessed against the TEA as soil from the site will be excavated to a maximum depth of 21.6 mbgl and disposed off-site during development of the dive structure. The TEA is applicable to depths of 2 mbgl, and is therefore not applicable for the remaining natural soil.
- Management Limits (ML commercial/industrial) assuming coarse soil.
- Aesthetics
  - The Auditor has considered the need for remediation based on 'aesthetic' contamination as outlined in the NEPM (2013).

The Auditor has assessed the **groundwater** data provided with reference to Tier 1 (screening) criteria for 'commercial/industrial' from the following:

- Human Health Assessment:
  - NEPM HSLs are not applicable for groundwater intercepted during excavation.
  - NHMRC and NRMCC (2011) *Australian Drinking Water Guidelines (ADWG)* where HSLs are not applicable.
  - USEPA RSL (on-line) Residential Tap Water Criteria for use where HSLs are not applicable or where local guidelines are not available for individual contaminants.
  - WHO (2008) Petroleum Products in Drinking-water guidelines where HSLs are not applicable.
  - ADWG (2011) criteria with a factor of 10 for incidental direct contact (for non-volatiles).

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- Ecological Assessment:
  - Groundwater Investigation Levels (GILs) listed in NEPM (2013) for protection of aquatic ecosystems referenced in ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Trigger values (TVs) provided are concentrations that, if exceeded, indicate a potential environmental problem at the point of use and 'trigger' further investigation. The 95% fresh water level of protection was adopted.

The water bearing zone is Ashfield Shale at depths of 7 to 15 m. Given the absence of bores for beneficial groundwater use and presence of a reticulated water supply for the area, extraction and use of groundwater as a resource is unlikely. Direct contact with groundwater may occur at the site during construction based on the proposed depth of excavation and SWL.

The environmental quality criteria referenced by the Auditor are consistent with those adopted by DP, with the exception of the following:

- The DSI does not mention assessment of 'aesthetic' contamination as outlined in the NEPM (2013). However, the report results discuss potential aesthetic issues detected during sampling.
- The DSI and RAP adopted 'hardness modified trigger values' (HMTV) for the assessment of individual metals in GILs. The hardness conditions of the receiving water body have not been assessed to justify the use of HMTV.

## 8. EVALUATION OF SOIL ANALYTICAL RESULTS

Soil samples were analysed for a variety of contaminants detailed in Tables 8.1 (fill) and 8.2 (natural). The results have been assessed against the environmental quality criteria and summarised below. Soil sampling locations are presented in Attachment 2.

<b>Table 8.1: Evaluation of Fill Soil Analytical Results – Summary Table (mg/kg)</b>				
<b>Analyte</b>	<b>n</b>	<b>Detections</b>	<b>Maximum</b>	<b>n &gt; Human Health Screening Criteria (NEPM, 2013)</b>
Asbestos in soil (presence/ absence)	9	0	<PQL	-
Asbestos in fragments (ACM)	1	1	<b>ACM detected</b>	<b>Chrysotile, Amosite and Crocidolite asbestos detected</b>
Arsenic	11	2	6	0 above HIL D 3,000 mg/kg
Beryllium	11	0	<PQL	0 above HIL D 500 mg/kg
Cadmium	11	0	<PQL	0 above HIL D 900 mg/kg
Total Chromium	11	11	83	0 above HIL D 3,600 mg/kg
Copper	11	9	170	0 above HIL D 240,000 mg/kg
Lead	11	11	240	0 above HIL D of 1,500 mg/kg
Manganese	11	11	400	0 above HIL D 60,000 mg/kg
Mercury (inorganic)	11	4	1	0 above HIL D 730 mg/kg
Nickel	11	11	50	0 above HIL D 6,000 mg/kg

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Analyte	n	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013)
Selenium	11	0	<PQL	0 above HIL D 10,000 mg/kg
Zinc	11	11	340	0 above HIL D 400,000 mg/kg
TRH (C <sub>6</sub> -C <sub>10</sub> minus BTEX)	11	0	<PQL	0 above HSL D (sand 0-1 m) 260 mg/kg 0 above ML 700 mg/kg
TRH (>C <sub>10</sub> -C <sub>16</sub> minus naphthalene)	11	0	<PQL	0 above HSL D (sand 0-1 m) NL 0 above ML 1,000 mg/kg
TRH (>C <sub>16</sub> -C <sub>34</sub> )	11	2	280	0 above ML 3500 mg/kg
TRH (>C <sub>34</sub> -C <sub>40</sub> )	11	2	270	0 above ML 10,000 mg/kg
BTEXN	11	0	<PQL	0 above HSL D (sand 0-1 m)
Total VOCs	9	1	11 <sup>a</sup>	0 above RSL 1,000 <sup>b</sup> mg/kg for PCE
Total SVOCs	1	0	<PQL	0 above HIL D
Total PAHs	11	6	14	0 above HIL D 4,000 mg/kg
Carcinogenic PAHs (BaP TEQ)	11	3	2	0 above HIL D 40 mg/kg
Benzo(a)pyrene	11	3	1	-
Total Phenols	9	0	<PQL	0 above HIL D 240,000 mg/kg
Cyanide (free)	9	0	<PQL	0 above HIL D 1,500 mg/kg
PCBs	9	0	<PQL	0 above HIL D 7 mg/kg
OPPs	9	0	<PQL	0 above HIL D
OCPs	9	0	<PQL	0 above HIL D

n number of samples

- No criteria available/used

NL Non limiting

TEQ Toxicity equivalent quotient

a Tetrachloroethene (PCE) was detected in fill sample CWTP08 (0.2-0.25 mbgl)

b USEPA Carcinogenic Screening Level (SL) has been adjusted by a factor of 10 to address cancer risk acceptance rates (1:100,000) in Australia

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013)
Arsenic	16	7	9	0 above HIL D 3,000 mg/kg
Beryllium	16	0	<PQL	0 above HIL D 500 mg/kg

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<b>Table 8.2: Evaluation of Natural Soil Analytical Results – Summary Table (mg/kg)</b>				
<b>Analyte</b>	<b>n</b>	<b>Detections</b>	<b>Maximum</b>	<b>n &gt; Human Health Screening Criteria (NEPM, 2013)</b>
Cadmium	16	1	1	0 above HIL D 900 mg/kg
Total Chromium	16	16	100	0 above HIL D 3,600 mg/kg
Copper	16	3	10	0 above HIL D 240,000 mg/kg
Lead	16	16	16	0 above HIL D of 1,500 mg/kg
Manganese	16	15	80	0 above HIL D 60,000 mg/kg
Mercury (inorganic)	16	0	<PQL	0 above HIL D 730 mg/kg
Nickel	16	15	10	0 above HIL D 6,000 mg/kg
Selenium	16	0	<PQL	0 above HIL D 10,000 mg/kg
Zinc	16	13	23	0 above HIL D 400,000 mg/kg
TRH (C <sub>6</sub> -C <sub>10</sub> minus BTEX)	16	0	<PQL	0 above HIL D (sand 0-1 m) 260 mg/kg 0 above ML 700 mg/kg
TRH (>C <sub>10</sub> -C <sub>16</sub> minus naphthalene)	16	0	<PQL	0 above HSL D (sand 0-1 m) NL 0 above ML 1,000 mg/kg
TRH (>C <sub>16</sub> -C <sub>34</sub> )	16	1	260	0 above ML 3,500 mg/kg
TRH (>C <sub>34</sub> -C <sub>40</sub> )	16	0	<PQL	0 above ML 10,000 mg/kg
BTEXN	16	0	<PQL	0 above HSL D (sand 0-1 m)
Total VOCs	12	0	<PQL	-
Total PAHs	16	0	<PQL	0 above HIL D 4,000 mg/kg
Carcinogenic PAHs (BaP TEQ)	16	1	1.2 <sup>a</sup>	0 above HIL D 40 mg/kg
Benzo(a)pyrene	16	0	<PQL	-
Total Phenols	12	0	<PQL	0 above HIL D 240,000 mg/kg
Cyanide (free)	4	0	<PQL	0 above HIL D 1,500 mg/kg
PCBs	12	0	<PQL	0 above HIL D 7 mg/kg
OPPs	12	0	<PQL	0 above HIL D
OCPs	12	1	0.7 <sup>b</sup>	0 above HIL D

n number of samples

- No criteria available/used

NL Non limiting

a BaP TEQ was detected in the field duplicate of primary natural sample CWTP07 (0.3-0.4 mbgl). The BaP TEQ and BaP results of the primary sample were less than PQL.

b Chlordane and DDE was detected in natural soil sample CWTP08 (0.35-0.45 mbgl)

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In assessing the results, the Auditor makes the following observations:

- The soil analytical results for the fill and natural samples were below the health screening criteria.
- One ACM fragment (sample CWTB11-ASB01) within fill material in test pit CWTP11 tested positive for Chrysotile, Amosite and Crocidolite asbestos. The fill profile at this location extended to approximately 0.48 mbgl. ACM was not detected in the other sampling locations. Natural soil was not tested by DP for asbestos. The Auditor considers there to be a high likelihood of ACM fragments within fill material as a result of demolition of former school residential buildings prior to construction of the depot in the 1950s.
- Metals, heavy fraction TRH, individual VOCs and PAHs were detected in the fill samples at concentrations below the screening criteria. The fill appears to have been impacted by the historical activities undertaken on the Worksite Area (Section 4).
- Marginal detections of metals, TRH, B(a)P, Chlordane and DDE below the screening criteria were detected in some natural soil samples. The source of these contaminants can be attributed to the following:
  - B(a)P, Chlordane and DDE could be attributed to the overlying fill material or samples obtained very close to the boundary of fill and natural profiles. The sampling method used by DP (sampling from spiral augers) may have also resulted in cross contamination.
  - Metal concentrations are considered consistent with background concentrations.
  - The source of TRH in natural soil sample CWMW04 (4-4.95 mbgl) may be attributed to the TRH detected in groundwater at this location. The results of groundwater analysis are discussed in Section 9.

### 8.1 Auditor's Opinion

In the Auditor's opinion, the soil analytical results are consistent with the site history and field observations. The results indicate the fill to be locally impacted by ACM, however more widespread contamination from ACM is possible. Low level contamination of fill and underlying natural soil was identified, however at concentrations less than the assessment criteria.

Remediation of fill material containing ACM is required. Off-site disposal of impacted fill and natural soil will require careful management during remediation. The remedial strategy outlined in the RAP is reviewed and summarised in Section 10.

## 9. EVALUATION OF GROUNDWATER ANALYTICAL RESULTS

Groundwater samples were collected from monitoring wells CWMW04, CWMW05 and CWMW06 by DP as part of the DSI. The analytical results are summarised below in Table 9.1. Sampling locations are presented in Attachment 2.

<b>Table 9.1: Evaluation of Groundwater Analytical Results – Summary Table (µg/L)</b>					
<b>Analyte</b>	<b>n</b>	<b>Detections</b>	<b>Maximum</b>	<b>n &gt; ANZECC Fresh (2000)</b>	<b>n &gt; ADWG/RSL</b>
Arsenic	3	0	<PQL	0 above criterion of 24 µg/L	0 above criterion of 10 µg/L

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<b>Table 9.1: Evaluation of Groundwater Analytical Results – Summary Table (µg/L)</b>					
<b>Analyte</b>	<b>n</b>	<b>Detections</b>	<b>Maximum</b>	<b>n &gt; ANZECC Fresh (2000)</b>	<b>n &gt; ADWG/RSL</b>
Cadmium	3	0	<PQL	0 above criterion of 0.06 µg/L	0 above criterion of 2 µg/L
Total Chromium	3	0	<PQL	0 above criterion of 1 µg/L	0 above criterion of 50 µg/L
Copper	3	0	<PQL	0 above criterion of 1.4 µg/L	0 above criterion of 2,000 µg/L
Lead	3	0	<PQL	0 above criterion of 3.4 µg/L	0 above criterion of 10 µg/L
Mercury	3	0	<PQL	0 above criterion of 0.06 µg/L	0 above criterion of 1 µg/L
Nickel	3	1	3	0 above criterion of 8 µg/L	0 above criterion of 20 µg/L
Zinc	3	3	<b>41</b>	<b>3 above criterion of 8 µg/L</b>	-
Total Cyanide	3	0	<PQL	0 above criterion of 7 µg/L	0 above criterion of 80 µg/L
TRH (C <sub>6</sub> -C <sub>10</sub> minus BTEX)	3	2	240	-	0 above criterion of 15,000 µg/L <sup>a</sup>
TRH (>C <sub>10</sub> -C <sub>16</sub> minus naphthalene)	3	0	<PQL	-	-
TRH (>C <sub>16</sub> -C <sub>34</sub> )	3	0	<PQL	-	-
TRH (>C <sub>34</sub> -C <sub>40</sub> )	3	0	<PQL	-	-
1,1-Dichloroethene	3	1	670	0 above criterion of 700 µg/L	-
1,2-Dichloroethane	3	1	5	0 above criterion of 1,900 µg/L	-
Bromodichloromethane	3	2	4	-	0 above criterion of 250 µg/L
Chlorodibromomethane	3	1	1	-	0 above criterion of 8.7 µg/L
Chloroform	3	2	15	0 above criterion of 370 µg/L	-
Tetrachloroethene (PCE)	3	1	<b>150</b>	<b>1 above criterion of 70 µg/L</b>	<b>1 above ADWG criterion of 50 µg/L</b> 0 above RSL criterion of 650 µg/L



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<b>Analyte</b>	<b>n</b>	<b>Detections</b>	<b>Maximum</b>	<b>n &gt; ANZECC Fresh (2000)</b>	<b>n &gt; ADWG/RSL</b>
BTEX	3	0	<PQL	0 above criteria	0 above criteria
Fluoranthene (PAH)	3	1	0.04	0 above criterion of 1 µg/L	-
Phenanthrene (PAH)	3	1	0.09	0 above criterion of 0.6 µg/L	-
Total OCPs	3	0	<PQL	-	-
Total OPPs	3	0	<PQL	-	-
Total PCBs	3	0	<PQL	-	-
Total Phenols	3	0	<PQL	0 above criterion of 320 µg/L	-

n number of samples

- No criteria available/used

a WHO (2008) assessment criteria for TPH aliphatic fraction adjusted by x10 in accordance with NHMRC (2008) recommendations for incidental ingestion of groundwater.

In assessing the results, the Auditor makes the following observations:

- The groundwater analytical results for the majority of the analytes were below the health and ecological screening criteria.
- Elevated zinc concentrations were detected in the groundwater samples. The DSI concluded that the zinc can be attributed to diffuse urban-sourced background levels and is not from a site specific source.
- An elevated concentration of PCE was detected in groundwater sample CWMW04 above the ecological and ADWG human health screening criteria. The source of PCE is likely to be from historical activities within the greater Worksite Area, however the source location is not known. Groundwater at CWMW04 also contained elevated concentrations of breakdown products 1,1-dichloroethene and 1,2-dichloroethane. Other breakdown products (1,2-dichloroethene and vinyl chloride) were not detected. The DSI reported that the PCE concentration was below the WA Department of Water and Environmental Regulation (DWER) Assessment and Management of Contaminated Sites (2014) non-potable criteria of 500 µg/L which are more applicable for the site than the ADWG (this is the same value as the ADWG criteria for incidental direct contact). The DSI also stated that considering the end-use of the site is a dive structure open to ambient air, the potential for human receptors to be exposed to vapours was considered to be very low. The Auditor notes that the reported PCE concentration is also less than the USEPA RSL for dermal contact (650 µg/L).
- The identification of volatile TRH F1 fraction in groundwater sample CWMW04 is considered to be representative of VOCs detected in the sample. Considering the depth of excavation, excavation workers will likely come in contact with contaminated groundwater. The WHO (2008) criteria were adopted to assess risk of exposure by direct contact. The TRH F1 concentration was below the assessment criteria.

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## 9.1 Auditor's Opinion

In the Auditor's opinion, the analytical results indicate that groundwater at the site has been impacted from on-site and/or off-site up gradient sources consistent with the historical land use. The PCE concentration detected is considered unlikely to present a risk based to construction workers based the concentrations reported and the proposed development of the site as an open rail dive structure. Other contaminants detected in groundwater are not considered to be present at concentrations presenting a risk to site receptors.

# 10. EVALUATION OF PROPOSED REMEDIATION

## 10.1 Conceptual Site Model

A conceptual site model (CSM) is a representation of the source, pathway and receptor linkages at a site. DP has developed a CSM based on the PSI and DSI. Table 10.1 provides the Auditors review of the CSM used by DP to inform remediation of the site.

<b>Table 10.1: Review of the Conceptual Site Model</b>		
<b>Element of CSM</b>	<b>Consultant</b>	<b>Auditor Opinion</b>
Contaminant source and mechanism	Contaminated fill material containing fragments of ACM impacted by demolition of former buildings or imported to the site from unknown sources.  Detections of TRH, VOCs and PAHs in groundwater from former on-site or off-site land use.  Unexpected contamination finds during excavation.	The source and mechanism for soil is considered appropriate.  The source of VOCs in groundwater was not identified, however is likely to be from within the larger Worksite Area. The low concentrations identified on the site are not considered to present a potential risk to human health or the environment.
Affected media	Fill material and groundwater	Fill material is considered to be the primary affected media. Low level contamination was also reported in natural soil.  Groundwater contamination was identified, however concentrations were less than the primary human health screening criteria and is therefore not considered affected media for the purposes of remedial planning.
Receptor identification	Future maintenance workers in the rail corridor, construction workers, adjacent land users, surface water receptors, and groundwater.	The receptors have been adequately identified.

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<b>Table 10.1: Review of the Conceptual Site Model</b>		
<b>Element of CSM</b>	<b>Consultant</b>	<b>Auditor Opinion</b>
	The contaminants are not considered to pose a risk to in-ground built structures.	
Exposure pathways	Inhalation of dust and vapours, ingestion and/or dermal contact, surface water runoff, lateral migration of groundwater, and extraction for dewatering and disposal.	The CSM identified all potential exposure pathways. Complete exposure pathways are considered to be inhalation, direct contact and incidental ingestion during construction.  No complete pathways are considered likely to be present following construction of the dive structure.
Presence of preferential pathways for contaminant movement	Not discussed	Not considered relevant for fill material removed during remediation.  Preferential pathways for groundwater and vapour migration are likely to be present on the site, however are not considered relevant as contamination representing a risk to human health has not been identified.
Evaluation of data gaps	The RAP proposes review of groundwater test results during dewatering to assess if the contaminants pose a risk to site receptors.	No potentially significant data gaps were identified during review of the PSI, DSI and RAP.

In the Auditor's opinion, the CSM developed is considered an adequate basis for assessing remedial requirements.

## 10.2 Remediation Required

The Auditor has assessed the RAP by comparison with the checklist included in OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites*. The RAP was found to address the required information, as detailed in Table 10.2, below.

<b>Table 10.2: Evaluation of Remedial Action Plan</b>	
<b>Remedial Action Plan</b>	<b>Auditor Comments</b>
<p><b>Remedial Goal</b></p> <p>The RAP stated four remediation goals as outlined below: '<i>render the site suitable for the proposed land use; maintain records of the remediation and earthworks undertaken including validation as required; mitigate adverse impacts on surrounding land and waterways during the remediation by the management of dust,</i></p>	In the Auditor's opinion, the goals are appropriate considering the proposed redevelopment of the site.

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<b>Table 10.2: Evaluation of Remedial Action Plan</b>	
<b>Remedial Action Plan</b>	<b>Auditor Comments</b>
<i>water and noise emissions; and maximise the protection of workers involved with remediation and earthworks'.</i>	
<p><b>Discussion of the extent of remediation required</b></p> <p>DP identified the entire excavation footprint (Attachment 2) as the lateral remediation extent and the vertical extent to be the depth of contaminated soil or the base of the excavation.</p> <p>Due to the nature of the development, bulk excavation will require removal of site soil to the desired levels. The base and walls of the excavation will be validated to demonstrate removal of fill material.</p>	The proposed extent of remediation is considered adequate. Further excavation would be undertaken in the event of validation failure.
<p><b>Remedial Options</b></p> <p>The RAP stated that due to the bulk excavation requirement for the proposed development, excavation and off-site disposal was the only viable option.</p>	Acceptable.
<p><b>Selected Preferred Option</b></p> <p>Excavation and off-site disposal of contaminated fill.</p> <p>Capture, treatment and disposal of groundwater during construction.</p>	Acceptable. The RAP does not specify the treatment process for groundwater disposal, but outlines that it will be undertaken under an Environmental Protection License (EPL).
<p><b>Rationale</b></p> <p>Development of the site will involve bulk excavation from the surface to a depth of up to 21.6 mbgl. The majority of the impacted soil will be excavated and disposed off-site.</p>	Acceptable.
<p><b>Waste Characterisation and Disposal</b></p> <p>The DSI has identified the following waste streams based on <i>in situ</i> testing of fill material (Attachment 3): special waste – asbestos – general solid waste; general solid waste (GSW); and VENM. DP are to provide documented waste classifications based on an inspection of the material and available analytical data. Further <i>ex situ</i> waste characterisation will be undertaken if considered necessary.</p> <p>Waste material is to be removed by a licensed contractor. Each load will be documented, including weighbridge slips, trip tickets and consignment disposal confirmation. Waste will be disposed of at a facility legally able to accept the material.</p>	Acceptable.
<p><b>Containment</b></p> <p>No requirement at this stage.</p>	Acceptable.
<p><b>Proposed Validation Testing</b></p> <p>Validation samples are to be collected following removal of waste with different classifications and fill material, as well as the footprint of stockpile areas.</p> <p><i>Excavations (base &lt;500 m<sup>2</sup>):</i></p> <p>Base – one sample per 25-50 m<sup>2</sup>. With a minimum of 3 samples.</p>	The Auditor considers the validation sampling densities acceptable. The primary contaminant of concern for validation of fill material removal is asbestos. Testing for waste classification

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<b>Table 10.2: Evaluation of Remedial Action Plan</b>	
<b>Remedial Action Plan</b>	<b>Auditor Comments</b>
<p>Walls – one sample per 10 m length exposed with additional samples collected at depths based on observations.</p> <p><i>Excavations (base <math>\geq 500 \text{ m}^2</math>):</i></p> <p>Base – grid based sampling to meet the density recommended in the NSW EPA <i>Sampling Design Guidelines</i> (minimum of 10 samples).</p> <p>Walls – one sample per 20 m length exposed with additional samples collected at depths based on observations.</p> <p><i>Stockpiles:</i></p> <p>In accordance with NEPM (2013).</p> <p>The RAP states that samples collected will be analysed for the contaminants of concern. However, it does not list the contaminants.</p> <p>Imported material is expected for temporary works such as construction of piling platforms. The RAP includes a material importation protocol and criteria for implementation. The protocol requires review and approval of documentation by the environmental consultant, inspection of the material at the source site, inspection during importation and additional testing (details not provided in the RAP).</p>	<p>purposes will include other contaminants of concern.</p> <p>The density of testing for imported material would need to be commensurate with the documentation provided, source, observations and the consistency of the results. VENM certificates based on the template available on the NSW EPA website should be provided.</p>
<p><b><i>Interim Site Management Plan (before remediation)</i></b></p> <p>The RAP recommends a surface clearance for asbestos by an asbestos assessor prior to remediation.</p>	<p>Acceptable. No other interim management is considered necessary given the site is sealed with concrete and asphalt, fenced and occupied by JHCPBG JV.</p>
<p><b><i>Unexpected Finds</i></b></p> <p>The RAP includes a contingency plan for unexpected finds, stopping work and assessment of the find by an occupation hygienist, asbestos consultant or environmental consultant. The RAP included a contingency plan for the removal of USTs if encountered during excavation work.</p> <p>The RAP includes contingency in the event contaminated groundwater and/or hazardous ground gas are detected during site works.</p> <p>Validation should be undertaken in accordance with the procedures in the RAP.</p>	<p>The unexpected finds procedure (UFP) is considered acceptable.</p>
<p><b><i>Site Management Plan (operation phase) including stormwater, soil, noise, dust, odour and OH&amp;S</i></b></p> <p>The RAP includes a site management plan for implementation during remediation and validation that covers specific requirements for asbestos (including air monitoring), specific requirements for chemical contaminants, fencing and signage, security and restriction of access, PPE, decontamination, disposal of water, clearance inspection and certificates.</p>	<p>The site management plan is considered acceptable for remedial planning.</p>

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<b>Table 10.2: Evaluation of Remedial Action Plan</b>	
<b>Remedial Action Plan</b>	<b>Auditor Comments</b>
<p><b>Contingency Plan if Selected Remedial Strategy Fails</b></p> <p>The RAP states that in the event of validation failure, the remediation contractor will undertake further 'chase out' excavation and disposal, followed by validation sampling.</p>	The remedial strategy has a low risk of failure, as validation failure would lead to further excavation which is required for the dive structure.
<p><b>Contingency Plans to Respond to site Incidents</b></p> <p>The RAP includes a spoil contingency plan for the handling and disposal of material classified as hazardous waste.</p>	Acceptable.
<p><b>Remediation Schedule and Hours of Operation</b></p> <p>Not provided in the RAP.</p>	The hours of operation are to be governed by consent conditions.
<p><b>Licence and Approvals</b></p> <p>The RAP notes that the development is approved as critical State significant infrastructure under the <i>Environmental Planning and Assessment Act 1997</i> (EP&amp;A Act). SEPP55 does not apply to the development.</p> <p>Waste disposal is to be tracked, and the receiving facility is to be licensed to accept the material.</p> <p>Council approval will be required for disposal of groundwater in to the stormwater system if required during works. The RAP notes that an EPL will be in place for the disposal of water.</p> <p>Asbestos removal contractors are to be appropriately licensed. Air monitoring for asbestos to be conducted during remediation.</p>	Acceptable.
<p><b>Contacts/Community Relations</b></p> <p>Contacts were provided for the consultant and Auditor. The details of the project manager and remediation contractor are to be included following appointment. The emergency procedures and contact details are to be displayed at the site entrance.</p> <p>Direct community consultation is not proposed.</p>	Acceptable.
<p><b>Long-term environmental management plan</b></p> <p>No requirement at this stage.</p>	Acceptable.
<p><b>Validation Reporting</b></p> <p>The RAP included a validation plan which addresses the validation DQOs, QA/QC and DQIs in accordance with NEPM (2013). The validation requirements include: site inspections, sampling, documentation and reporting.</p>	Acceptable.

It is considered that the remediation approach recommended by DP is largely appropriate. Staged remediation of the different waste streams would be feasible and considered appropriate for this site.

### 10.3 Auditor's Opinion

In the Auditors' opinion, the proposed remediation works should ensure that the site is suitable for the proposed land use through: excavation and off-site disposal of contaminated fill material and natural soil; implementation of the UFP; and successful validation.

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## 11. CONCLUSIONS AND RECOMMENDATIONS

The RAP concluded "... that the site can be rendered suitable for the proposed development subject to implementation of this RAP".

Based on the information presented in the referenced reports and observations made on site, the Auditor concludes that the proposed remediation process is practical and that the site can be made suitable for the proposed land use if remediated in accordance with the following RAP:

*'Report on Remediation Action Plan, Sydney Metro City and SW - Tunnel and Station Excavation Works Package, Proposed Chatswood Dive, 339 Mowbray Road, Chatswood, prepared for John Holland CPB Ghella JV, Project 85608.02, April 2018', report reference: Revision 1, dated 12 April 2018, prepared by Douglas Partners.*

The RAP has been reviewed and endorsed by the Auditor in accordance with Clause 10.14A(b) (v) of the Sydney Metro City & Southwest Tunnel and Station Excavation Works Design and Construction Deed (Contract No: 00013/11200).

At the completion of remediation of the site, a Section A Site Audit Statement and supporting Site Audit Report certifying suitability for the proposed use should be prepared.

Remediation and reporting can be conducted in stages provided suitable provisions are made to avoid cross-contamination.

\* \* \*

Consistent with the NSW EPA requirement for staged 'signoff' of sites that are the subject of progressive assessment, remediation and validation, I advise that:

- This advice letter does not constitute a Site Audit Report or Site Audit Statement.
- At the completion of the remediation and validation I will provide a Site Audit Statement and supporting documentation.
- This interim advice will be documented in the Site Audit Report.

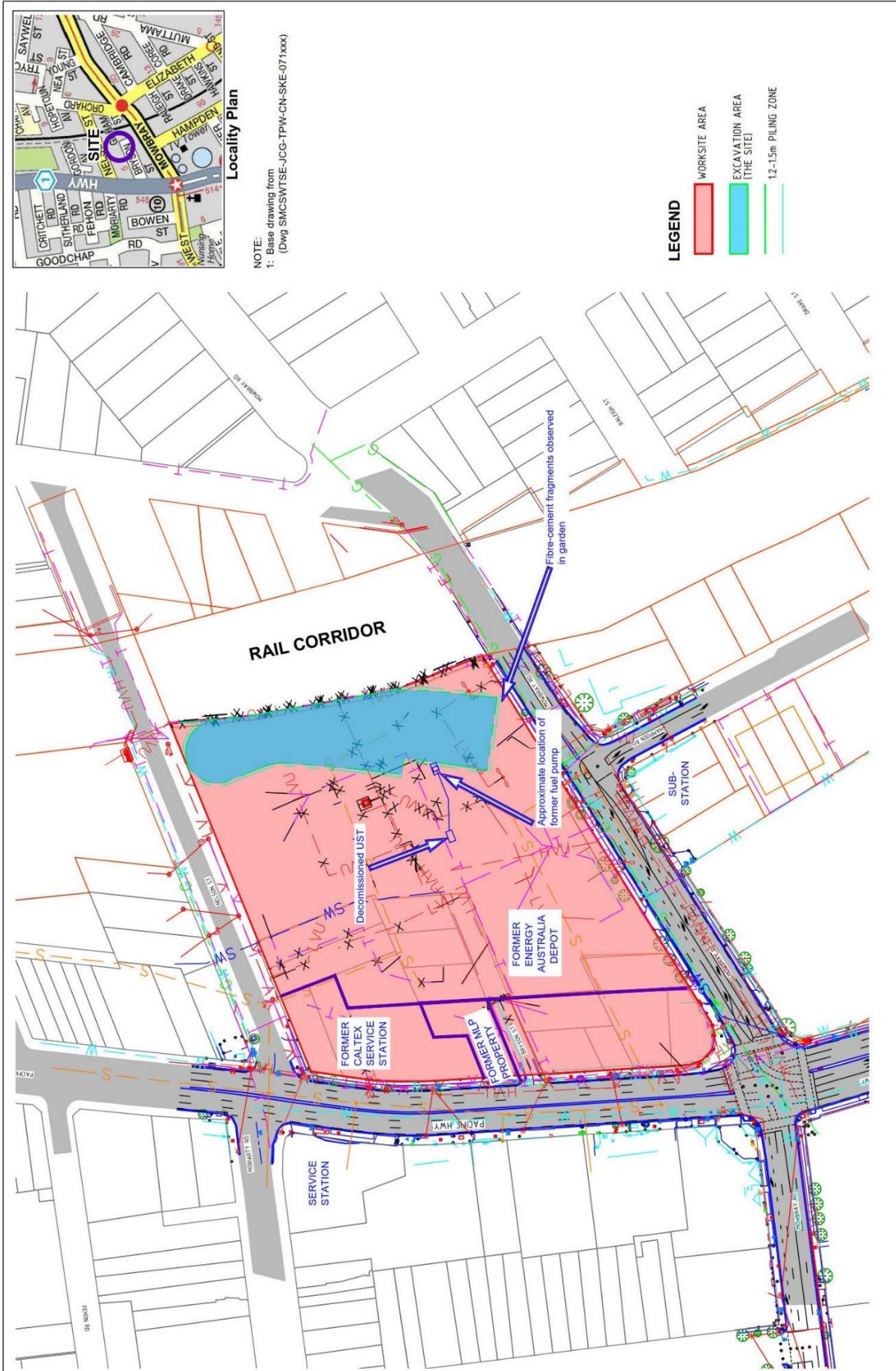
Yours faithfully  
Ramboll Australia Pty Ltd



Tom Onus  
EPA Accredited Site Auditor 1505

Attachments: 1 Site Locality  
2 The DSI Sampling Location Plan  
3 Waste Classification and Soil Disposal Plan





NOTE:  
1: Base drawing from  
(Dwg SMCSWTSE-JCG-TPW-CN-SKE-071xxx)

**LEGEND**

- WORKSITE AREA
- EXCAVATION AREA (THE SITE)
- 1.2-1.5m PLUGGING ZONE

PROJECT No:	85608.02
DRAWING No:	1
REVISION:	0

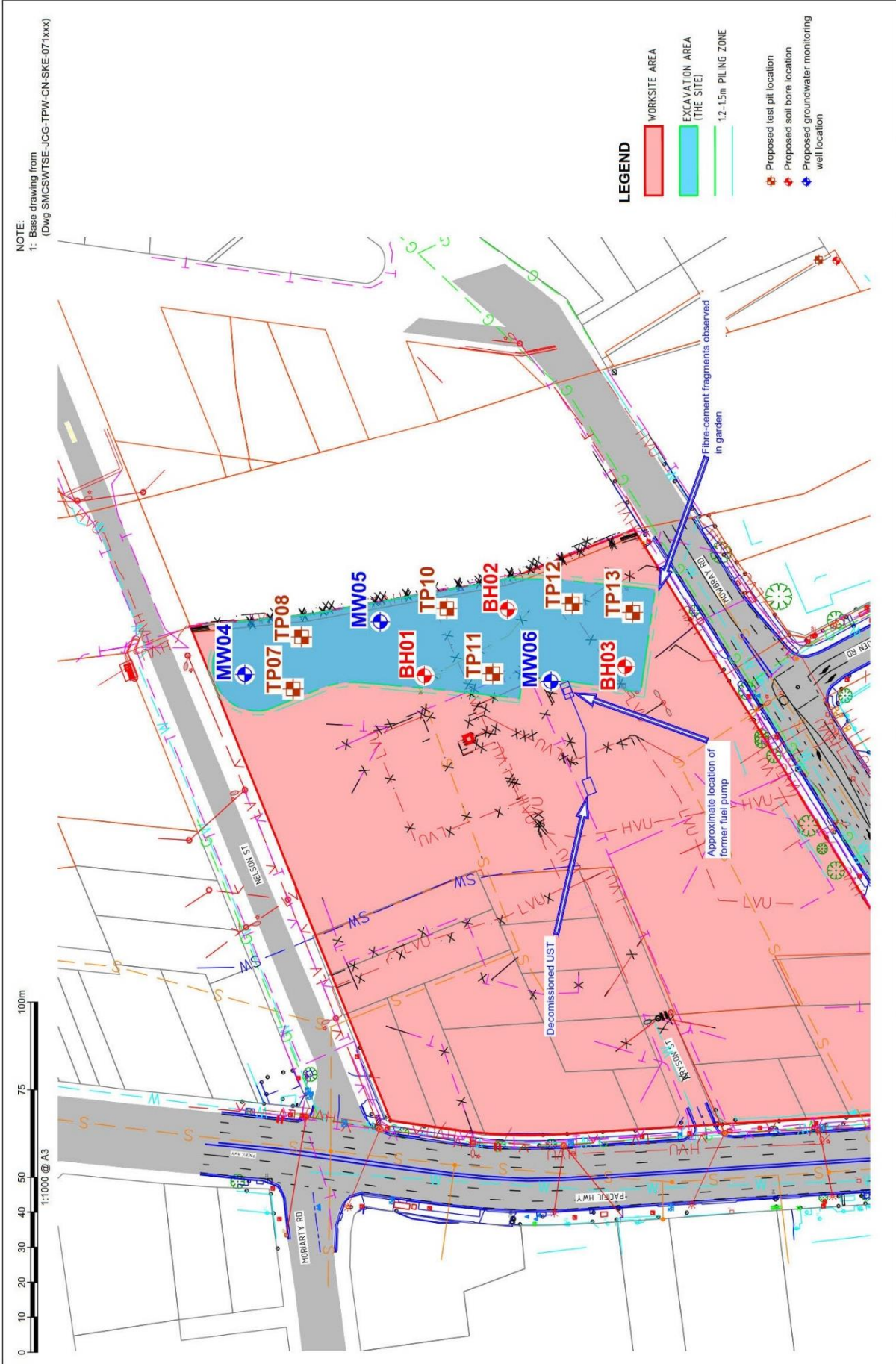


**TITLE: Site Location and Features**  
**Sydney Metro City & South West, Tunnel and Station Works**  
**Package, Proposed Chatswood Dive, Mowbray Rd, CHATSWOOD**

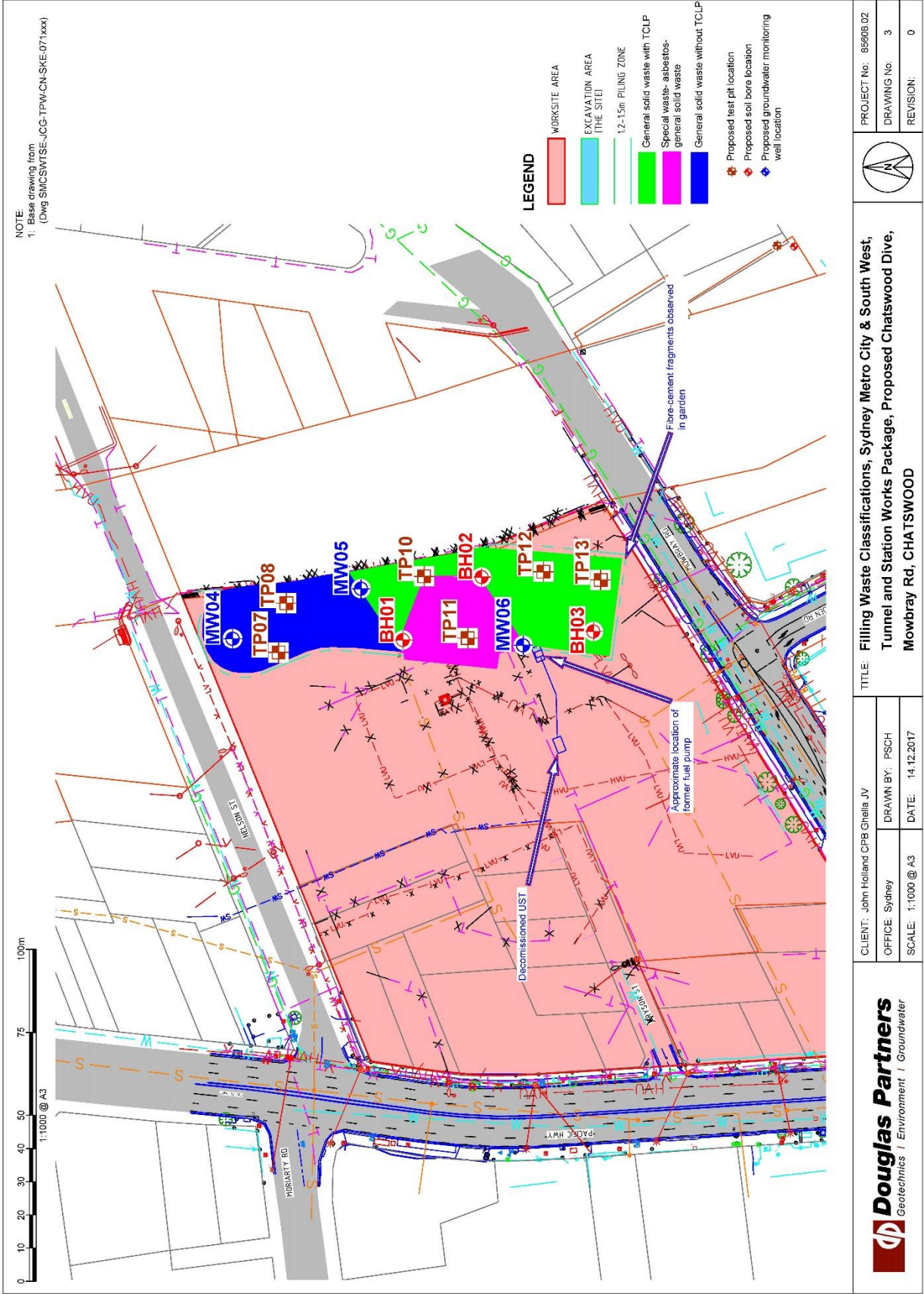
CLIENT:	John Holland CPB Ghella JV
OFFICE:	Sydney
SCALE:	1:1500 @ A3
DRAWN BY:	PSCH
DATE:	21.9.2017

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	PROJECT No: 85608.02
	DRAWING No: 2
<b>Proposed Test Locations</b> <b>Sydney Metro City &amp; South West, Tunnel and Station Works</b> <b>Package, Proposed Chatswood Dive, Mowbray Rd, CHATSWOOD</b>	REVISION: 0
CLIENT: John Holland CPB Ghella JV	DRAWN BY: PSCH
OFFICE: Sydney	DATE: 21.9.2017
SCALE: 1:1000 @ A3	
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PROJECT No:	85506.02
DRAWING No:	3
REVISION:	0



**TITLE:** Filling Waste Classifications, Sydney Metro City & South West, Tunnel and Station Works Package, Proposed Chatswood Drive, Mowbray Rd, CHATSWOOD

CLIENT:	John Holland CPB Ghella JV
OFFICE:	Sydney
SCALE:	1:1000 @ A3
DRAWN BY:	PSCH
DATE:	14.12.2017

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Ramboll Australia Pty Ltd  
Level 3, 100 Pacific Highway  
PO Box 560  
North Sydney NSW 2060

T +61 2 9954 8100

[www.ramboll.com](http://www.ramboll.com)