REPORT TO

SWELL TRADING PTY LTD

ON

REMEDIATION ACTION PLAN (RAP)

FOR

PROPOSED MOTOR VEHICLE DISPLAY/SALES SHOWROOM AND SERVICING WAREHOUSE DEVELOPMENT

AT

8 GROSVENOR PLACE, BROOKVALE, NSW

Date: 10 December 2021
Ref: E34430BTrpt2

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Executive Summary

Swell Trading Pty Ltd ('the client') commissioned JK Environments (JKE) to prepare a remediation Action Plan (RAP) for the proposed motor vehicle display/sales showroom and servicing warehouse development at 8 Grosvenor Place, Brookvale, NSW. The site location and boundary as applies to the RAP is shown on Figure 1 and 2 in Appendix A.

This report has been prepared to support the lodgement of a Development Application (DA) to Northern Beaches Council, with regards to State Environmental Planning Policy No.55 – Remediation of Land (1998). A Preliminary Site Investigation (PSI) was undertaken previously at the site by Arcadis (report ref: 30090774_R01_0, dated 1 September 2021) and JKE have undertaken a Groundwater Contamination Screening (report ref: E34430BTrptRev1, dated 10 December 2021). A summary of this information has been included in Section 2 and 3 of this report.

The PSI/GCS identified an underground storage tank (UST) in the central north of the site and heavy metals (chromium, copper and nickel) and benzo(a)pyrene in soil above the ecological acceptance criteria. Risks associated with contamination were assessed to be low, however a RAP was recommended to outline the methodology for removal of the UST.

It is understood the proposed development includes demolition of the existing site structures and construction of a new motor vehicle display/sales showroom and servicing warehouse. It is understood excavation of up to 4mBGL is required for installation of a water tank for the sprinkler system, the lift pit and the inground hoist. Other localised excavations are likely to be required for the installation of shallow underground services. Selected development plans provided to JKE are attached in the appendices.

The goal of the remediation is to manage potential contamination-related risks to human health and the environment. The primary aims of the remediation are to address potential contamination risks associated with the UST during the proposed development works.

The primary objectives of the RAP are to:

- Summarise previous investigations and historical contamination data;
- Provide a methodology to remediate and validate the site;
- Provide a contingency plan and unexpected finds protocol for the remediation works; and
- Outline site management procedures to be implemented during remediation.

The UST and associate infrastructure located in the central north fo the site were considered to be a potential source of localised contamination. The CoPC in soil associated with the UST include petroleum hydrocarbons, assessed as TRHs, and benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN). For completeness, heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), polycyclic aromatic hydrocarbons (PAHs), OCPs and asbestos will also be considered as CoPC in any backfill materials around the UST/infrastructure. Copies of the groundwater data summary tables from the JKE GCS are attached in Appendix C.

The Arcadis PSI also identified heavy metals (chromium, copper and nickel) in fill and natural soil above the ecological SAC across the site and benzo(a)pyrene in soil above the ecological SAC in BH02. Copies of the soil data summary tables from the Arcadis PSI are attached in Appendix C.

For the purpose of the RAP, the extent of remediation (horizontal and vertical) associated with the UST and associated infrastructure will be guided by the validation. It is anticipated that the tank pit could be approximately 2-3m deep. However, it is acknowledged that the remediation extent may change depending on the outcome of the post demolition validation as described in Section 4 and it is possible that the extent of remediation may be reduced.

The preferred soil remediation approach is Option 4 which includes excavation and off-site disposal of the UST and the associated infrastructure including any backfill.

The RAP includes a methodology to remediate and validate the site. A contingency plan for remediation is included together with site management procedures and an unexpected find protocol (UFP) to be implemented during remediation.

A site validation report is to be prepared on completion of remediation activities and submitted to the consent authority to demonstrate that the site is suitable for the proposed development and submitted to the consent authority for review.

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Abbreviations

Asbestos Fines/Fibrous Asbestos	**AF/FA**
Ambient Background Concentrations	**ABC**
Added Contaminant Limits	**ACL**
Asbestos Containing Material	**ACM**
Australian Drinking Water Guidelines	**ADWG**
Area of Environmental Concern	**AEC**
Australian Height Datum	**AHD**
Acid Sulfate Soil	**ASS**
Above-Ground Storage Tank	**AST**
Below Ground Level	**BGL**
Benzo(a)pyrene Toxicity Equivalent Factor	**BaP TEQ**
Bureau of Meteorology	**BOM**
Benzene, Toluene, Ethylbenzene, Xylene	**BTEX**
Cation Exchange Capacity	**CEC**
Contaminated Land Management	**CLM**
Contaminant(s) of Potential Concern	**CoPC**
Chain of Custody	**COC**
Conceptual Site Model	**CSM**
Development Application	**DA**
Dial Before You Dig	**DBYD**
Data Quality Indicator	**DQI**
Data Quality Objective	**DQO**
Detailed Site Investigation	**DSI**
Ecological Investigation Level	**EIL**
Ecological Screening Level	**ESL**
Environmental Management Plan	**EMP**
Excavated Natural Material	**ENM**
Environment Protection Authority	**EPA**
Environmental Site Assessment	**ESA**
Fibre Cement Fragment(s)	**FCF**
General Approval of Immobilisation	**GAI**
Health Investigation Level	**HILs**
Health Screening Level	**HSL**
Health Screening Level-Site Specific Assessment	**HSL-SSA**
International Organisation of Standardisation	**ISO**
JK Environments	**JKE**
Lab Control Spike	**LCS**
Light Non-Aqueous Phase Liquid	**LNAPL**
Map Grid of Australia	**MGA**
National Association of Testing Authorities	**NATA**
National Environmental Protection Measure	**NEPM**
Organochlorine Pesticides	**OCP**
Organophosphate Pesticides	**OPP**
Polycyclic Aromatic Hydrocarbons	**PAH**
Potential ASS	**PASS**
Polychlorinated Biphenyls	**PCBs**
Per-and Polyfluoroalkyl Substances	**PFAS**
Photo-ionisation Detector	**PID**
Protection of the Environment Operations	**POEO**
Practical Quantitation Limit	**PQL**
Quality Assurance	**QA**
Quality Control	**QC**
Remediation Action Plan	**RAP**

Relative Percentage Difference	**RPD**
Site Assessment Criteria	**SAC**
Sampling, Analysis and Quality Plan	**SAQP**
Site Audit Statement	**SAS**
Site Audit Report	**SAR**
Site Specific Assessment	**SSA**
Source, Pathway, Receptor	**SPR**
Specific Contamination Concentration	**SCC**
Standard Penetration Test	**SPT**
Standing Water Level	**SWL**
Trip Blank	**TB**
Toxicity Characteristic Leaching Procedure	**TCLP**
Total Recoverable Hydrocarbons	**TRH**
Trip Spike	**TS**
Upper Confidence Limit	**UCL**
United States Environmental Protection Agency	**USEPA**
Underground Storage Tank	**UST**
Virgin Excavated Natural Material	**VENM**
Volatile Organic Compounds	**VOC**
World Health Organisation	**WHO**
Work Health and Safety	**WHS**

Units

Litres	**L**
Metres BGL	**mBGL**
Metres	**m**
Millivolts	**mV**
Millilitres	**ml or mL**
Milliequivalents	**meq**
micro Siemens per Centimetre	**µS/cm**
Micrograms per Litre	**µg/L**
Milligrams per Kilogram	**mg/kg**
Milligrams per Litre	**mg/L**
Parts Per Million	**ppm**
Percentage	**%**
Percentage weight for weight	**%w/w**

1 INTRODUCTION

Swell Trading Pty Ltd ('the client') commissioned JK Environments (JKE) to prepare a Remediation Action Plan (RAP) for the proposed motor vehicle display/sales showroom and servicing warehouse development at 8 Grosvenor Place, Brookvale, NSW. The site location and boundary as applies to the RAP is shown on Figure 1 and 2 in Appendix A attached in the appendices.

This report has been prepared to support the lodgement of a Development Application (DA) to Northern Beaches Council, with regards to State Environmental Planning Policy No.55 – Remediation of Land (1998)[1].

A Preliminary Site Investigation (PSI) was undertaken previously at the site by Arcadis (report ref: 30090774_R01_0, dated 1 September 2021)[2] and JKE have undertaken a Groundwater Contamination Screening (report ref: E34430BTrptRev1, dated 10 December 2021)[3]. A summary of this information has been included in Section 2 and 3 of this report. The RAP should be read in conjunction with the above reports.

The PSI/GCS identified an underground storage tank (UST) in the central north of the site and heavy metals (chromium, copper and nickel) and benzo(a)pyrene in soil above the ecological site acceptance criteria (SAC). Risks associated with contamination were assessed to be low, however a RAP was recommended to address some of the data gaps and outline the methodology for removal of the UST.

1.1 Proposed Development Details

It is understood the proposed development includes demolition of the existing site structures and construction of a new motor vehicle display/sales showroom and servicing warehouse. It is understood excavation of up to 4m below ground level (BGL) is required for installation of a water tank for the sprinkler system, the lift pit and the inground hoist. Other localised excavations are likely to be required for the installation of shallow underground services.

Selected development plans provided to JKE are attached in the appendices.

1.2 Remedial Goal, Aims and Objectives

The goal of the remediation is to manage potential contamination-related risks to human health and the environment. The primary aims of the remediation are to address potential contamination risks associated with the UST removal during the proposed development works.

The primary objectives of the RAP are to:

- Summarise previous investigations and historical contamination data;
- Provide a methodology to remediate and validate the site;
- Provide a contingency plan and unexpected finds protocol for the remediation works; and
- Outline site management procedures to be implemented during remediation.

[1] *State Environmental Planning Policy No. 55 – Remediation of Land 1998* (NSW). (referred to as SEPP55)

[2] Arcadis, (2021). *Preliminary Site Investigation, 8 Grosvenor Place, Brookvale, NSW to Swell Trading Pty Ltd.* (report ref: 30090774_R01_0, dated 1 September 2021) (referred to as PSI report)

[3] JKE, (2021a). *Report to Swell Trading Pty Ltd on Groundwater Contamination Screening for Proposed Motor Vehicle Display/Sales Showroom and Servicing Warehouse Development at 8 Grosvenor Place, Brookvale, NSW.* Ref: E34430BTrptRev1, dated 10 December 2021 (referred to as the GCS)

1.3 Scope of Work

The RAP was prepared generally in accordance with a JKE proposal (Ref: EP54821BT) of 18 August 2021 and written acceptance from the client of 25 August 2021. The scope of work included consultation with the client, a review of previous reports and Conceptual Site Model (CSM), and preparation of the RAP.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[4], other guidelines made under or with regards to the CLM Act 1997 and SEPP55. A list of reference documents/guidelines is included in the appendices.

[4] National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)

2 SITE INFORMATION

2.1 Background Information

2.1.1 PSI (Arcadis, 2021)

In June 2021, Arcadis undertook a Preliminary Site Investigation (PSI) at the site. The PSI included a site walkover inspection, site information and site history review and limited soil sampling from four boreholes (BH01 to BH04) shown on the attached Figure 2.

The findings of the PSI are summarised as follows:

- The Site was being used as a cement batching facility, designating the land use as Commercial/Industrial. The proposed private car storage facility development was not considered likely to change the land use;
- A disused petrol underground storage tank (UST) (and former location of fuel bowser) was identified in the northern portion of the Site during the site inspection walkover. The status of the UST was unknown, however it may have been backfilled with sand. This remained a data gap in the assessment as the potential for the UST to have led to contamination of surrounding fill and/or underlying groundwater was not assessed;
- No visual evidence of contamination was observed in the soil profile at the site at the time of the intrusive investigation. A mild diesel odour was observed at BH02 (between 0.5 and 1.5mbgl). However, analysis of soil samples from this location did not identify total recoverable hydrocarbon (TRH) impacts in the soil profile this area (or anywhere else on the site);
- There were no identified exceedances of the adopted Tier 1 human health criteria, indicating that soils at the site are unlikely to pose a risk to human health (site users);
- There were a number of identified exceedances of the adopted Tier 1 ecological criteria for metals and benzo(a)pyrene. However, there is limited opportunity for ecological receptors to be exposed to contaminated fill materials because the site is currently covered in concrete hardstand;
- Analysis of potential acid sulfate soils (PASS) indicators identified that soils at the site have the potential to become acidic upon exposure to ambient air, indicating that soils at the site are ASS. As the tested soils had an average pH_{FOX} value of 2.66, the ASSMAC 1998 classifies the environmental risk as high;
- The CSM assessment identified:
    - Exposure of ecological receptors to contaminated fill material was considered to be unlikely given the predominating hardcover at the Site and the proposed future use as a private car storage facility;
    - The status of the UST and potential residual contamination is unknown as currently no groundwater assessment has been undertaken at the site. There is a possibility that the UST may have impacted the fill or groundwater and further investigation is recommended;
    - The presence of confirmed acid sulfate soils (ASS) at the site is likely to pose future risk to construction costs if any subsurface concrete structures or mass excavation is undertaken, unless an Acid Sulphate Soils Management Plan (ASSMP) is implemented throughout development; and
- Overall, based on the preliminary CSM, the potential for human health exposure to site contamination was considered low to moderate based on the soil results (moderate risk arsing predominantly from the fact that the UST has not been fully assessed and the known presence of ASS).

The report recommended the following:

- Any soils excavated from the Site requiring off-site disposal/management as part of the proposed development works will require waste classification in accordance with the NSW EPA, *Waste Classification Guidelines – Part 1: Classifying Waste*, 2014 and NSW EPA, *Addendum to the Waste Classification Guidelines (2014) - Part 1: classifying waste, 2016 guidelines*, 2016;
- Should future re-development of the Site include the excavation of soils below 1mBGL, an Acid Sulphate Management Plan (ASSMP) will be required to manage any spoil due to the high risk of oxidisation and generation of sulphuric acid leachate. As a conservative measure (and where possible/practicable) ground disturbance below 0.5mbgl should be minimised for any future development at the Site (e.g. for services, etc.);
- Due to the likely production of sulfuric acid upon oxidation of on-site soils, neutralisation will be necessary during earthworks to reduce the risk of damage to concrete and steel structures. The results from this PSI indicate that excavated soils can be treated with lime at a rate of 15.38 kg per tonne of disturbed soil, including a safety factor of 1.5 kg of lime per tonne as recommended by the liming dosage recommended in ASSMAC 1998. However, testing should be conducted during earthworks to verify the liming dosage rate is suitable. Following the sample density from this report, all soil is expected to contain ASS and will require proper management and treatment during earthworks;
- Should the land use of the Site be changed to a more sensitive land use (i.e. not commercial/industrial), the results of this PSI should be reassessed in accordance with relevant assessment criteria appropriate for the revised land use (e.g. if land use changes to residential);
- It is recommended that a further investigation should be completed to assess potential risks to soils and groundwater posed by the disused UST, prior to the development of the site. This investigation should include assessing soil close to and all around the UST and the installation of up to three groundwater monitoring wells; and
- The UST should be removed, appropriately decommissioned and/or managed in accordance with *NSW EPA UPSS Technical Note: Decommissioning, Abandonment and Removal of UPSS*, prior to the development of the Site.

2.1.2 GCS (JKE, 2021)

In September 2021, JKE were engaged to undertake a Groundwater Contamination Screening (GCS) at the site. The GCS included a review of the Arcadis PSI, a site walkover inspection and groundwater sampling from three monitoring wells installed in the vicinity of the UST.

Based on the GCS Tier 1 assessment, localised contamination beneath the UST/bowser or in the backfill material around the UST may exist and these risks should be further assessed during remediation of the UST/bowser.

The GCS indicated that the site could be made suitable for the proposed development subject to development and implementation of a RAP, taking into account and addressing the identified data gaps (namely extent of buried UST infrastructure and confirmation of waste classification).

In additional to the above, it was recommended that a Hazardous Materials Assessment (Hazmat) be undertaken for the existing buildings prior to the commencement of demolition work (and preferably prior

to slab removal) and an Acid Sulfate Soil Management Plan (ASSMP) be prepared for management of any soils to be disturbed or spoil generated from 1mBGL during the proposed development.

2.2 Site Identification

Table 2-1: Site Identification

Current Site Owner (certificate of title):	Mediglass Pty Ltd (as at July 2021)
Site Address:	8 Grosvenor Place, Brookvale, NSW
Lot & Deposited Plan:	Lot 1 in DP599064
Current Land Use:	Commercial/industrial (cement batching plant)
Proposed Land Use:	Commercial/industrial (private car storage facility)
Local Government Authority:	Northern Beaches Council
Current Zoning:	IN1 – General Industrial
Site Area (m^2) (approx.):	1,060
RL (AHD in m) (approx.):	10-12
Geographical Location (decimal degrees) (approx.):	Latitude: -33.7685671 Longitude: 151.2693331
Site Plans:	Appendix A

2.3 Site Location and Regional Setting

The site is located in a mixed-use area of Brookvale and is bound by Grosvenor Place to the west. The site is located approximately 320m to the east of Brookvale Creek.

2.4 Topography

The regional topography is characterised by a gently undulating topography with a localised north-east facing hillside. The site itself is relatively flat with the exception of the driveway and western portion of the site, which slopes down to the west at approximately 1-2°. Parts of the site appear to have been levelled to account for the slope and accommodate the existing development.

2.5 Site Inspection

A walkover inspection of the site was undertaken by JKE on 5 October 2021. The inspection was limited to accessible areas of the site and immediate surrounds. An internal inspection of buildings was not undertaken. A summary of the inspection findings is summarised below and generally aligns with the Arcadis PSI observations:

- The site was currently utilised as the Brookvale Mini-Crete cement batching facility;
- The site was entirely hardstand (asphaltic concrete/concrete) paved with two storey brick and block site office located in the south-west of the site, and a maintenance shed was located in the north-west of the site. Other cement mixing infrastructure, including concrete bunded sediment pond, batching plant and silo and storage bays were also located around the site and generally along the north, east and south boundaries keeping the central section open for vehicle access;
- The site was entirely fenced with vehicular and pedestrian access from Grosvenor Place;
- The diesel UST was identified in the central north of the site during the site walkover (refer to Figure 2);
- Wastes and chemicals (including machinery oil and cement retardant) were observed to be stored within the maintenance shed;
- The majority of surface water on site appeared to be captured and pumped through a series of unlined cement bunded sedimentation ponds then utilised in the cement mixtures. Surface water flows in the western section of the site were captured by a sediment trap prior to exiting the site onto Grosvenor Place as stormwater;
- Sensitive environments such as wetlands, ponds, creeks or extensive areas of natural vegetation were not identified on site or in the immediate surrounds; and
- The site was generally surrounded by commercial properties including motor vehicle repair businesses to the south-east and west of the site. The vehicle repair businesses are included in the CSM.

2.6 Surrounding Land Use

The site was generally surrounded by commercial properties including several motor mechanics/vehicle repairers. Residential properties were located approximately 35m to the south and south-west beyond the commercial properties and William Street.

2.7 Summary of Site History Information

A time line summary of the historical land uses and activities is presented in the table below. The information presented in the table is based on a weight of evidence assessment of the site history documentation and observations made by JKE during the GCS and a review of the Arcadis PSI.

Table 2-2: Summary of Historical Land Uses / Activities

Year(s)	On-site - Potential Land Use / Activities
1930-1965	• Vacant vegetated land; and • Mix of vacant vegetated land and residential.
1965-1975	• Clearing and development of the site for commercial/industrial land use; • Potential filling of the site for the existing development; • Potential use of hazardous building materials within site structures; • Potential installation of diesel UST • Ongoing residential development and some commercial/industrial development in surrounding areas.
1975 to present	• Ongoing commercial/industrial land use; and • Continued mixed-use (residential and commercial/industrial).

2.8 Summary of Geology and Hydrogeology

2.8.1 Regional Geology and On-site Subsurface Conditions

A review of the regional geological map of Sydney (1983)[5] indicated that the site is underlain by Quaternary aged deposits of silty to peaty quartz sand, silt and clay. Ferruginous and humic cementation in places, and common shell layers.

Subsurface conditions encountered at the site during the previous investigations consisted of imported fill comprising silty sandy clay underlain by moderate to high permeability (alluvial) clayey soils. Natural silty clay and clayey sand alluvial soils were encountered at depths of 1.4-2.6mBGL.

2.8.2 Acid Sulfate Soil (ASS) Risk and Planning

A review of the acid sulfate soil (ASS) risk map prepared by Department of Land and Water Conservation (1997)[6] indicated that the site is located in an area classed as having a 'low risk' of ASS occurrence at depths of greater than 3m below ground level (mBGL).

ASS information presented in the Arcadis PSI indicated that the site is located within a Class 4 ASS risk area. Works in a Class 4 risk area that could pose an environmental risk in terms of ASS include works at depths beyond 2m below existing ground level or works by which the water table is likely to be lowered beyond 2m below existing ground level.

During the Arcadis PSI, selected soils at the site were indicated to be ASS based on observations and laboratory results. Organic odours were noted from depths of approximately 2mBGL during the JKE GCS. Management of any disturbance to soils and/or generation of spoil from below 1m BGL at the site during the proposed development is required under an ASSMP.

2.8.3 Hydrogeology

Hydrogeological information presented in the Arcadis PSI indicated that saturated soils were observed at a depth of approximately 1.0mBGL. Arcadis considered this to be shallow or perched groundwater beneath the concrete slab in disturbed or reclaimed ground based on anecdotal information that indicated that the site may be located in an area which was formerly a lagoon.

The information reviewed for the GCS indicates that the subsurface conditions at the site are expected to consist of moderate to high permeability (alluvial) soils overlying relatively deep bedrock. Abstraction and use of groundwater at the site or in the immediate surrounds may be viable under these conditions, however the use of groundwater is not proposed as part of the development. There is a reticulated water supply in the area and consumption of groundwater is not expected to occur.

The Arcadis PSI identified four registered groundwater bores within 500m of the site. All four bores were registered for monitoring purposes.

[5] Department of Mineral Resources, (1983). *1:100,000 Geological Map of Sydney (Series 9130)*

[6] Department of Land and Water Conservation, (1997). *1:25,000 Acid Sulfate Soil Risk Map (Series 9130N3, Ed 2)*

Standing water levels (SWL) measured in the monitoring wells installed at the site for the GCS were between 1.1m and 1.39m at the time of sampling. The SWL broadly correlate with a water table at approximately RL 9.19-9.67m AHD. Groundwater field measurements recorded during the GCS were approximately as follows:

- pH ranged from 4.91 to 6.11;
- Electrical conductivity (EC) ranged from 164.6µS/cm to 649µS/cm. This indicated that the water was relatively fresh and supports the conclusion that groundwater is flowing towards the Creek;
- Redox potential (Eh) ranged from -8.9mV to 75mV; and
- Dissolved oxygen (DO) ranged from 0.7mg/L to 1.5mg/L.

Considering the local topography and surrounding land features, groundwater is anticipated to flow towards the south-west.

2.8.4 Receiving Water Bodies

The closest surface water body is Brookvale Creek located approximately 320m to the west of the site. This is cross to down-gradient from site and is not considered to be a potential receptor.

3 CONCEPTUAL SITE MODEL / SITE CHARACTERISATION

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is presented in the following sub-sections and is based on the previous investigation data, site history and site information presented in Section 2.

3.1 Summary of Contamination (Site Characterisation)

The UST and associate infrastructure located in the central north of the site were considered to be a potential source of localised contamination. The CoPC in soil associated with the UST include petroleum hydrocarbons, assessed as TRHs, and benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN). For completeness, heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), polycyclic aromatic hydrocarbons (PAHs), OCPs and asbestos will also be considered as CoPC in any backfill materials around the UST/infrastructure. Copies of the groundwater data summary tables from the JKE GCS are attached in Appendix C.

The Arcadis PSI also identified heavy metals (chromium, copper and nickel) in fill and natural soil above the ecological SAC across the site and benzo(a)pyrene in soil above the ecological SAC in BH02. Copies of the soil data summary tables from the Arcadis PSI are attached in Appendix C.

3.2 CSM

The table below includes a review of the CSM which has been used to design the remediation strategy. The CSM will require further review if additional site data becomes available.

Table 3-1: CSM

Contaminant source(s) and contaminants of concern	Contamination sources: USTs and associated infrastructure. Contaminants of concern for the RAP include: Heavy metals, TRH, BTEX, PAHs, OCPs and asbestos. Other CoPC identified in the PSI will be considered within the building footprints from a waste disposal perspective as these areas have not yet been sampled.
Affected media	Affected media for remediation: localised soil and groundwater in the vicinity of the UST.
Receptor identification	Human receptors include construction workers, intrusive maintenance workers and future site occupants/users (adults in a commercial/industrial setting). However, post remediation, the likelihood of risks to future site users is considered to be low. Considering the proposal development will include earthworks for construction, following development the risks posed by soil contamination to ecological receptors is considered to be low.
Exposure pathways and mechanisms	Potential exposure pathways (relevant to the receptors) include dermal absorption and inhalation of dust (all contaminants), and vapour inhalation (TRH only). The potential for exposure would typically be associated with the construction and excavation works, and future use of the site. The risk of TRH/BTEX to future site

	users (including accumulating in confined spaces and buildings) should be addressed in relation to the proposed development.
Evaluation of data gaps	The GCS identified the potential for localised contamination within the UST pit backfill soil/groundwater and within material around any buried infrastructure. This data gap has been adequately considered and will be addressed via validation sampling outlined in Section 7.3. Sampling was limited to approximately 66% of the minimum sampling density recommended in the EPA Sampling Design Guidelines 1995 – this will be addressed via the post-demolition investigation (see Section 4). The post demolition investigation will include additional soil sampling to confirm the existing waste classification as recommended in Section 2.1.

3.3 Remediation Extent

For the purpose of the RAP, the extent of remediation (horizontal and vertical) associated with the UST and associated infrastructure will be guided by the validation. It is anticipated that the tank pit could be approximately 2-3m deep. However, it is acknowledged that the remediation extent may change depending on the outcome of the post demolition validation as described in Section 4 and it is possible that the extent of remediation may be reduced.

4 POST DEMOLITION INVESTIGATION

Post-demolition investigation will occur in order to provide additional data from the areas beneath the former structures (i.e. where sampling did not occur during the Arcadis PSI) and to increase the general sample density. This is to occur following demolition and removal of the building slabs, and prior to any excavation/off-site disposal of the fill.

4.1 Objectives

The objectives of the post-demolition investigation are:

- Further characterise the fill/soil contamination conditions, with a focus on the areas of excavation and/or areas previously not investigated (i.e. beneath each of the former structures);
- Finalise the waste classification for the fill soil disposal;
- Assess whether any of the CoPC occur at concentrations that require further remediation and/or variation to the validation plan outlined in the RAP;
- Document/confirm the extent of remediation and the validation plan; and
- Facilitate the preparation of a Remedial Works Plan (RWP) in the event that additional or alternative remediation/validation strategies are required.

4.2 Additional Sampling

- Soil/fill samples are to be collected from six test pits after completion of demolition. The proposed locations are shown on Figure 3 in Appendix A;
- Sampling is to occur using an excavator. Samples are to be collected from each fill profile and from the top (~ 0.5m) of the natural soil beneath the fill. One sample per fill profile at each location will be collected for analysis;
- Asbestos quantification of bulk fill samples is required in accordance with the NEPM 2013; and
- All samples will be screened using a photo-ionisation detector (PID).

4.3 Decontamination and Sample Preservation

Any re-usable equipment should be decontaminated using a scrubbing brush and potable water and Decon 90 solution (phosphate free detergent) followed by rinsing with potable water.

Samples will be preserved by immediate storage in an insulated sample container with ice. Any additional sample preservation requirements for specific analytes should also be adopted as required. On completion of the fieldwork, the samples should be delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody (COC) procedures.

One sample per fill profile at each location will be submitted for analysis of the CoPC identified for fill (see Table 2-2). Leachate testing (TCLP) will also be undertaken for waste classification purposes. Additional analysis should also be scheduled as required based on any observations of odours, staining and/or elevated PID results.

4.4 Quality Assurance/Quality Control (QA/QC)

Inter and intra-laboratory duplicates will be collected and analysed for the soil assessment at a rate of 5% for inter-laboratory and 5% for intra-laboratory analysis. A trip spike and trip blank will also be submitted and analysed with each batch of samples.

4.5 Data Assessment

The soil data for the site should be assessed using the validation assessment criteria (VAC) outlined in Section 7.2 which are based on a 'commercial/industrial' land use exposure setting.

For waste classification purposes, the soil data should be assessed against the NSW Waste Classification Guidelines, Part 1: Classifying Waste (2014)[7].

4.6 Reporting

On completion of the post-demolition investigation, a report should be completed presenting the results of the investigation. The report is to document/confirm the extent of remediation and the validation plan.

In the event that additional contamination is encountered that requires remedial measures to be implemented outside the scope of this RAP, a Remedial Works Plan (RWP) must be prepared. The client and validation consultant are to discuss whether the RWP needs to be submitted to the consent authority (this will depend on how substantial the changes are to the scope of remediation) and the client is to take steps to notify council and other relevant authorities as required.

[7] NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* (referred to as Waste Classification Guidelines 2014)

5 EXTENT OF REMEDIATION AND REMEDIATION OPTIONS

5.1 Soil Remediation

The NSW EPA follows the hierarchy set out in NEPM 2013 for the remediation of contaminated sites. The preferred order for soil remediation and management is as follows:

1. On-site treatment of soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-site treatment of excavated material so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site;

Or if the above are not practicable:

3. Consolidation and isolation of the soil by on-site containment within a properly designed barrier; and
4. Removal of contaminated material to an approved site or facility, followed where necessary by replacement with clean material; or
5. Where the assessment indicates that remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

For simplicity herein, the above hierarchy are respectively referred to as Option 1, Option 2, Option 3 etc.

The NEPM 2013 and Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009)[8] prefer the following asbestos remediation hierarchy:

1. Minimisation of public risk;
2. Minimisation of contaminated soil disturbance; and
3. Minimisation of contaminated material/soil moved to landfill.

The NSW EPA Contaminated Land Management Guidelines for the NSW Site Auditor Scheme (3rd Edition) (2017)[9] provides the following additional requirements to be taken into consideration:

- Remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed; and
- Where there are large quantities of soil with low levels of contamination, alternative strategies should be considered or developed.

The table below discusses and assesses a range of soil remediation options:

[8] Western Australian (WA) Department of Health (DoH), (2009). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia. (referred to as WA DoH 2009)

[9] NSW EPA, (2017). *Contaminated land Management, Guidelines for the NSW Site Auditor Scheme (3rd ed.).* (referred to as Site Auditor Guidelines 2017)

Table 5-1: Consideration of Soil Remediation Options

Option	Discussion	Assessment/Applicability
Option 1 **On-site treatment of contaminated soil**	On-site treatment can provide a mechanism to reuse the processed material, and in some instances, avoid the need for large scale earthworks. Treatment options are contaminant-specific and can include bio-remediation, soil washing, air sparging and soil vapour extraction, thermal desorption and physical removal of bonded ACM fragments. Depending on the treatment option, licences may be necessary for specific individual waste streams due to the potential for air pollution and the formation of harmful by-products during incineration processes. Licences for re-use of treated material/waste may also be required.	Potentially applicable for the TRH impacts associated with the USTs. However, treatment is unlikely to be viable on such a small scale and would not be the preferred option due to the extent of earthworks proposed.
Option 2 **Off-site treatment of contaminated soil**	Contaminated soils are excavated, transported to an approved/licensed treatment facility, treated to remove/stabilise the contaminants then returned to the subject site, transported to an alternative site or disposed to an approved landfill facility. This option is also contaminant-specific. The cost per tonne for transport to and from the site and for treatment is considered to be relatively high. The material would also have to be assessed in terms of suitability for reuse as part of the proposed development works under the waste and resource recovery regulatory framework.	Not applicable for the project as noted above.
Option 3 **Consolidation and isolation of impacted soil by cap and containment**	This would include the consolidation of ACM-impacted and/or hydrocarbon impacted soil within an appropriately designed cell, followed by the placement of an appropriate barrier over the material to reduce the potential for future disturbance. The capping and/or containment must be appropriate for the specific contaminants of concern. Depending on the concentrations of contaminants being encapsulated, an ongoing environmental management plan (EMP) will be required and will need to be publicly notified and made to be legally enforceable (e.g. via listings in the Section 10.7 planning certificate and on the land title).	Not applicable for the project given the extent of excavation required.
Option 4 **Removal of contaminated material to an appropriate facility and reinstatement with clean material**	Contaminated soils would be classified in accordance with NSW EPA guidelines for waste disposal, excavated and disposed of off-site to a licensed landfill. The material would have to meet the requirements for landfill disposal. Landfill gate fees (which may be significant) would apply in addition to transport costs.	This option is the most applicable for the remediation of the impacted fill/soil and USTs/infrastructure as it: aligns with the construction work (i.e. excavation is required for the sprinkler water tank in the vicinity of the UST); is technically feasible; and economically viable.

Option	Discussion	Assessment/Applicability
<u>Option 5</u> Implementation of management strategy	Contaminated soils would be managed in such a way to reduce risks to the receptors and monitor the conditions over time so that there is an on-going minimisation of risk. This may occur via the implementation of monitoring programs.	Not applicable given the extent of the proposed development.

5.2 Rationale for the Preferred Option for Remediation

The preferred soil remediation approach is Option 4 which includes excavation and off-site disposal of the UST and the associated infrastructure including any backfill.

The preferred options for remediation are considered to be appropriate on the basis that:

- Excavation is required in the vicinity of the UST for installation of the sprinkler water tank and this will remove the UST any associated infrastructure and backfill soils from the site by default;
- The potential hydrocarbon impacts associated with the UST and associated infrastructure are anticipated to be localised;
- The UST and associated infrastructure will be removed from site, removing a potential source of hydrocarbon impacts; and
- The strategies are sustainable, economically viable, commensurate with the level of risk posed by the contaminants and technically achievable to implement concurrently with the proposed development works.

6 REMEDIATION DETAILS

6.1 Roles and Responsibilities

Table 6-1: Roles and Responsibilities

Role	Responsibility
Client / Developer	Swell Trading Pty Ltd Contact: Guirong Zhang The client/developer is required to appoint the project team for the remediation and must provide all investigation reports including this RAP to the project manager, remediation contractor, consent authority and any other relevant parties involved in the project.
Project Manager	Chenchow Little Architects Pty Ltd Contact: Adam Hoh The project manager is required to review all documents prepared for the project and manage the implementation of the procedures outlined in this RAP. The project manager is to take reasonable steps so that the remediation contractor and others have understood the RAP and will implement it in its totality. The project manager will review the RAP and other documents and will update the parties involved of any changes to the development or remediation sequence (in consultation with the validation consultant).
Remediation Contractor	To be appointed. The remediation contractor is required to review all documents prepared for the project, apply for any relevant removal licences or permits and implement the remediation requirements outlined in this RAP. The remediation contractor may also be the construction contractor. The remediation contractor is required to collect all necessary documentation associated with the remediation activities and forward this documentation onto the client, project manager and validation consultant as they become available. The remediation contractor is required to advise the validation consultant at key points in the remediation and validation program, and implement various aspects of the validation plan assigned to them.
Validation Consultant	JKE – Subject to formal engagement Contact: Katrina Taylor The validation consultant[10] provides consulting advice and validation services in relation to the remediation, and prepares the site validation report, and any other associated documentation. The validation is required to review any deviation to this RAP or in the event of unexpected finds if and when encountered during the site work. The validation consultant is required to liaise with the client, project manager and remediation contractor on all matters pertaining to the site contamination, remediation and validation, carry out the required site inspections during capping, and collect validation samples for imported materials.

[10] It is recommended that the consultant be a certified practitioner (specialising in site contamination), under one of the NSW EPA endorsed certification schemes

6.2 Pre-commencement

The project team is to have a pre-commencement meeting to discuss the sequence of remediation, and the remediation and validation tasks. The site management plan for remediation works (see Section 9) should be reviewed by the project manager and remediation contractor, and appropriate steps are to be taken to ensure the adequate implementation of the plan.

6.3 Remediation and Associated Tasks

The following general sequence of works is anticipated:

- Site establishment and demolition;
- Completion of the post-demolition investigation outlined in Section 4; and
- Decommissioning and removal of the USTs, backfill and associated infrastructure, followed by excavation and off-site disposal of soils associated with the tank pit and other impacted areas.

Validation of the works would occur progressively throughout the remediation program.

Details in relation to the above are outlined in the following subsections:

6.3.1 Site Establishment and Demolition

The remediation contractor is to establish on site as required to facilitate the remediation. Consideration must be given to the work sequence and extent of remediation so that the site establishment (e.g. site sheds, fencing, access points etc) does not inhibit the remediation works.

Prior to demolition, a hazardous building materials survey is to be undertaken. The buildings are to be demolished with regards to the findings of the hazardous building materials survey and in accordance with the relevant codes and standards. A clearance certificate is to be obtained by the demolition contractor following the removal of any hazardous materials from the building and structures (i.e. asbestos). The concrete slabs should be inspected for potential ACM post-demolition by an Asbestos Assessor.

All waste from the demolition is to be disposed to facilities that are licenced by the NSW EPA to accept the waste. The demolition contractor is to maintain adequate records and retain all documentation for such activities including:

- A summary register including details such as waste disposal dates, waste materials descriptions, disposal locations (i.e. facility details) and reconciliation of this information with waste disposal docket numbers;
- Waste tracking records and transport certificates (where waste is required to be tracked/transported in accordance with the regulations); and
- Disposal dockets for the waste. Legible dockets are to be provided for all waste materials so they can be reconciled with the register.

The above information is to be supplied to the validation consultant for assessment and inclusion in the site validation report.

6.3.2 UST Remediation

The UST/s and associated infrastructure (i.e. underground pipe work, vent pipes etc) are to be removed from the site in accordance with the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation (2019)[11], Guidelines for the Implementation of the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019 (2020)[12] and the Australian Standard for The Removal and Disposal of Underground Petroleum Storage Tanks (AS4976-2008)[13]. Reference is also to be made to the UPSS Technical Note: Decommissioning, Abandonment and Removal of UPSS (2010)[14] and the UPSS Technical Note: Site Validation Reporting (2010)[15].

It is noted that various guidelines are outdated and/or are currently being updated to reflect the UPSS Regulation 2019. The remediation is to occur in accordance with the current regulation and best practice guidelines available when the remediation commences.

Table 6-2: Remediation – UST and Associated Infrastructure

Step	Primary Role/ Responsibility	Procedure
1.	Remediation contractor	Address Stability Issues and Underground Services: Geotechnical advice should be sought regarding the stability of the adjacent structures and/or adjacent areas prior to commencing remediation (as required). Stability issues should be addressed to the satisfaction of a suitably qualified geotechnical engineer. This may require the installation of temporary shoring. All underground services are to be appropriately disconnected or rerouted to facilitate the works.
2.	Remediation contractor (or their nominated sub-contractor)	Initial Preparation: The pavement in the remediation area should be cut and removed with care using an excavator, or similar. An experienced contractor should be engaged for the removal of the UST/s. Liquid and/or sludge within the UST/s and associated pipe work should be pumped out and disposed of lawfully by a licensed liquid waste operator.
3.	Remediation contractor (or their nominated sub-contractor) and validation consultant	Removal of the USTs/infrastructure, impacted soils, followed by validation: The UST/s and associated infrastructure are to be removed by an appropriately licensed contractor in accordance with AS4976-2008 and with regards to the Work Health and Safety Regulation (2017)[16]. Following removal, remediation of the area will be undertaken as follows: • The backfill soils (most likely to be sandy fill) surrounding the USTs should be excavated and stockpiled separately. All stockpiles should be placed on the adjacent hardstand with appropriate silt control. This material is to be validated by the validation consultant (for waste classification purposes) as outlined in Section 7.1; • Submit an application to dispose of the backfill soil (in accordance with the assigned waste classification) to a facility that is appropriately licensed to receive the waste, and obtain authorisation to dispose; • Load the backfill soil onto trucks and dispose in accordance with the assigned waste classification;

[11] *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019* (NSW). (referred to as UPSS Regulation 2019)
[12] NSW EPA, (2020). *Guidelines for the Implementation of the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019.* (referred to as UPSS Guidelines 2020)
[13] Standards Australia, (2008). *The Removal and Disposal of Underground Petroleum Storage Tanks.* (referred to as AS4976-2008)
[14] NSW DECCW, (2010). *UPSS Technical Note: Decommissioning, Abandonment and Removal of UPSS*
[15] NSW DECCW, (2010). *UPSS Technical Note: Site Validation Reporting*
[16] *Work Health and Safety Regulation 2017* (NSW). (Referred to as WHS regulation 2017)

Step	Primary Role/ Responsibility	Procedure
		• Depending on the contamination status of the backfill, excavation of additional material at the base and walls of the tank pits may be required. This should initially involve excavation of material to extend the pits (say 0.5m initially) in the direction of the suspected impact. The validation consultant should be present during the excavation to provide advice on the potential extent of contamination based on visual and olfactory indicators, and PID screening results; • Stockpile the excavated material separately (to the backfill that was initially excavated) and undertake a waste classification outlined above, then load the soil onto trucks and dispose in accordance with the assigned waste classification; • The validation consultant is to obtain validation samples from the walls and base of the excavation (see the Validation Plan in Section 7). Based on the findings of the GCS, groundwater may be encountered at the base of the remedial excavation; • The groundwater seepage should be sampled and tested for contaminants (see Section 7). A liquid waste contractor should be engaged to pump out the seepage from the tank pit; • Soil below 1mBGL is potential ASS and should be managed in accordance with the ASSMP; and • Subject to successful validation, backfill or (preferably) isolate the remedial excavation. All documents including landfill disposal dockets, UST disposal/destruction dockets, liquid waste disposal etc. should be retained by the remediation contractor and forwarded to the client and validation consultant. This documentation forms a key part of the validation process and is to be included in the validation report.
5.	Validation consultant	Validation sampling of the tank pit, waste classification sampling of stockpiled backfill and any groundwater seepage as outlined in Section 7. Review of documentation issued by the remediation contractor and inclusion into validation report.

The detailed validation plan relevant to the above items is provided in Section 7.

6.4 Remediation Documentation

The remediation contractor must retain all documentation associated with the remediation, including but not limited to:

- Waste register (see below);
- USTs destruction certificates;
- Photographs of remediation works;
- Waste tracking documentation (where applicable); and
- Imported materials documentation from suppliers, including any routine analysis reports, product specifications and dockets for imported materials.

Copies of these documents must be forwarded to the project manager and the validation consultant on completion of the remediation for inclusion in the validation report.

6.4.1 Waste Register

All waste removed from the site is to be appropriately tracked and managed in accordance with the relevant regulations. The remediation contractor (and/or their nominated construction contractor) is to maintain adequate records and retain all documentation for waste disposal activities including:

- A summary register including details such as waste disposal dates, waste materials descriptions, disposal locations (i.e. facility details) and reconciliation of this information with waste disposal docket numbers; and
- Waste tracking records and transport certificates (where waste is required to be tracked/transported in accordance with the regulations); and
- Disposal dockets for the waste. Legible dockets are to be provided for all waste materials so they can be reconciled with the register.

Any soil waste classification documentation is to be prepared in accordance with the reporting requirements specified by the NSW EPA. Reports are to include:

- The full name, address, Australian Company Number (ACN) or Australian Business Number (ABN) of the organisation and person(s) providing the waste classification;
- Location of the site where the waste was generated, including the source site address;
- History of the material and the processes and activities that have taken place to produce the waste;
- Potential contaminating activities that may have occurred at the site where the waste was generated;
- Description of the waste, including photographs, visible signs of contamination, such as discolouration, staining, odours, etc;
- Quantity of the waste;
- Number of samples collected and analysed;
- Sampling method including pattern, depth, locations, sampling devices, procedures, and photos of the sample locations and samples;
- Contaminants tested;
- Laboratory documentation – chain-of-custody (COC), sample receipt, laboratory report;
- All results regardless of whether they are not used in the classification process;
- Results of sample mean, sample standard deviation and the 95% upper confidence limit (UCL) where relevant;
- Brief summary of findings including discussion of results; and
- A clear statement of the classification of the waste as at the time of the report.

A soil volume analysis should be undertaken on completion of remediation and reconciled with the quantities shown on the soil disposal dockets. This information is to be reviewed by the validation consultant on completion of the works and an assessment of the quantities of soil disposed off-site (e.g. comparison with the estimated and actual volumes) is to be included in the validation report. A review of the disposal facility's licence issued under the Protection of the Environment Operations (POEO) Act (1997)[17] should also be undertaken to assess whether the facility is appropriately licensed to receive the waste.

[17]NSW Government, (1997)). *Protection of Environment Operations Act.* (referred to as POEO Act 1997)

6.4.2 Imported Materials Register

The remediation contractor (and/or their nominated construction contractor) is to maintain for the duration of the project an imported material register. This must include a register (preferably in Microsoft Excel format) with details of each imported material type, supplier details, summary record of where the imported materials were placed on site, and importation docket numbers and a tally of quantities (separated for each import stream). Legible dockets for imported materials are to be provided electronically so these can be reconciled with the register.

The above information is to be provided to the validation consultant for inclusion in the validation report. It is recommended that the register be set up at the beginning of the project and provided to the validation consultant regularly (say on a monthly or two-monthly basis) so the details can be checked and any rectification of the record keeping process can occur in a timely manner.

7 VALIDATION PLAN

Validation is necessary to demonstrate that remedial measures described in the RAP have been successful and that the site is suitable for the intended land use. The sampling program for the validation is outlined in Section 7.1. This is the minimum requirement based on the remedial strategies provided. Additional validation sampling may be required based on observations made during remediation or in the event of an unexpected find.

7.1 Validation Sampling and Documentation

The table below outlines the validation requirements for the site:

Table 7-1: Validation Requirements

Aspect	Sampling	Analysis	Observations and Documentation
UST, Associated Infrastructure and impacted Soils/Bedrock			
UST backfill (stockpile)	One sample per 25m^3, collected using hand equipment.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRHs, BTEX, PAHs and asbestos. TCLP testing may be required for waste classification.	Samples to be screened using photo-ionisation detection (PID) meter. Observations of staining and odour to be recorded. Photographs to be taken. Disposal dockets to be retained.
UST pit chase out spoil (if required)	One sample per 25m^3, collected using hand equipment.	As above. Other analytes to be considered based on remediation failures.	As above.
UST pit – excavation base UST pit – excavation walls	Minimum of two samples per UST to be collected using the excavator after removal of the tank. One sample per excavation wall and per vertical metre. Additional sampling is also to target obvious indicators of contamination and changes in soil profile.	Lead, TRH/BTEXN	Samples to be screened using PID. Observations of staining and odour to be recorded. Photographs to be taken.

Aspect	Sampling	Analysis	Observations and Documentation
Pipe trenches	One sample per 5m lineal, obtained from the base of the trench. Additional samples to target any areas of staining or odours.	As above.	As above.
UST Bowser Plinth	One sample from the base of the bowser plinth. Additional samples to target any areas of staining or odours.	As above.	As above.
Imported Materials – validation of imported materials is required for any materials imported onto the site during the remediation and to the point in time that the site validation report is prepared (e.g. general fill to raise the site levels or reinstate remedial excavations, imported materials to create piling platform, gravels for site preparation, material used for capping layers etc).			
Imported VENM backfill (if required)	Minimum of three samples per source	Heavy metals (as above), TRHs, BTEX, PAHs, OCPs, PCBs and asbestos (500ml). Additional analysis may be required depending on the site history of the source property.	**Remediation contractor** to supply existing VENM documentation/report (report to be prepared in accordance with the NSW EPA waste classification reporting requirements). A hold point remains until the **validation consultant** approves the material for importation or advises on the next steps.
Imported garden mix/topsoil and mulches	Minimum of three samples per source	Analysis for CoPC outlined above.	Material is to be inspected upon importation by the **validation consultant** and samples obtained for analysis. Material to be inspected during sampling to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Photographic documentation and an inspection log are to be maintained. Where check sampling occurs by the **validation consultant** due to deficiencies or irregularities in existing VENM documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the Validation Assessment Criteria (VAC).

Aspect	Sampling	Analysis	Observations and Documentation
Imported engineering materials such as recycled aggregate, road base etc or Excavated Natural Material (ENM)	Minimum of three samples per source/material type. Additional testing may be required for ENM to meet the specification within the ENM Order.	Heavy metals (as above), TRHs, BTEX, PAHs, OCPs, PCBs and asbestos (500ml quantification). Additional testing may be required for ENM (e.g. foreign materials, pH and electrical conductivity) depending on available documentation.	**Remediation contractor** to provide product specification and documentation to confirm the material has been classified with reference to a relevant Resource Recovery Order/Exemption. A hold point remains until the **validation consultant** approves the material for importation or advises on the next steps. Review of the facility's Environment Protection Licence (EPL). Material is to be inspected by the **validation consultant** upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Where check sampling occurs by the **validation consultant** due to deficiencies or irregularities in existing documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.
Imported engineering materials comprising only natural quarried products.	At the validation consultant's discretion based on robustness of supplier documentation.	At the validation consultant's discretion based on robustness of supplier documentation.	**Remediation contractor** to provide documentation from the supplier confirming the material is a product comprising only VENM (i.e. natural quarried product). A hold point remains until the **validation consultant** approves the material for importation or advises on the next steps. Review of the quarry's EPL. Material is to be inspected by the **validation consultant** upon importation to confirm it is free of anthropogenic materials, visible and olfactory indicators of contamination, and is consistent with documentation. Where check sampling occurs by the **validation consultant** due to deficiencies or irregularities in existing documentation, the following is required: - Date of sampling and description of material sampled;

Aspect	Sampling	Analysis	Observations and Documentation
			- An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.

7.2 Validation Assessment Criteria and Data Assessment

The VAC to be adopted for the validation assessment are outlined in the table below:

Table 7-2: VAC

Validation Aspect	VAC
Soil validation	<u>USTs, associated infrastructure and Fill removal</u> The soil validation criteria to be adopted for the proposed development at the site will be the health-based investigation/screening levels for land use type C (commercial/industrial landuse). The presence of odours or exceedances of the VAC may compromise the VENM classification. However, from a risk perspective in the context of the proposed land use, such traces are unlikely to result in an unacceptable risk to future site users. In the event that persistent traces of TRH/BTEXN are reported above the VAC, these concentrations can be assessed in the context of human health risks, in accordance with Schedule B1 of NEPM (2013) and an alternative classification (other than VENM) would need to be pursued for this material if it is to be disposed off-site.
Waste classification (backfill/chase out soils associated with remediation of USTs, and supplementary waste classification of fill	In accordance with the procedures and criteria outlined in Part 1 of the Waste Classification Guidelines 2014 and any other exemptions/approvals as required.
Imported materials	Material imported as general fill must only be VENM or ENM. VENM is defined in the POEO Act 1997 as material: • 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 sulfidic ores or 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 published in the NSW Government Gazette. ENM and recycled materials are to meet the criteria of the relevant exemption/order under which they are produced. Analytical results for VENM and other imported materials will need to be consistent with expectations for those materials. For VENM, it is expected that: - Heavy metal concentrations are to be less than the most conservative Added Contaminant Limit (ACL) concentrations for an urban residential and public open space (URPOS) exposure setting presented in Schedule B1 of the NEPM 2013; and - Organic compounds are to be less than the laboratory PQLs and asbestos to be absent. All materials imported onto the site must also be adequately assessed as being appropriate for the final use of the site, including ecological considerations. A risk-based assessment approach is to be adopted with regards to the tier 1 screening criteria presented in Schedule B1 of NEPM 2013. Aesthetics: all imported materials are to be free of staining and odours.

Data should initially be assessed as above or below the VAC. Statistical analysis may be applied if deemed appropriate by the validation consultant and undertaken in accordance with the NEPM 2013.

7.3 Validation Sampling, Analysis and Quality Plan (SAQP)

Appropriate QA/QC samples should be obtained during the validation (where applicable) and analysed for the same suite of contaminants as the primary samples. As a minimum, QA/QC sampling should include duplicates (5% inter-laboratory and 5% intra-laboratory), trip spikes and trip blanks. Rinsate samples should be obtained if re-usable sampling equipment is utilised.

Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) should be clearly outlined and assessed as part of the validation process. A framework for the DQO and DQI process is outlined below and should be reflected in the validation report.

DQOs have been broadly established for the validation with regards to the seven-step process outlined NEPM (2013). The seven steps include the following which are detailed further in the following subsections:

- State the problem;
- Identify the decisions/goal of the study;
- Identify information inputs;
- Define the study boundary;
- Develop the analytical approach/decision rule;
- Specify the performance/acceptance criteria; and
- Optimise the design for obtaining the data.

DQIs are to be assessed based on field and laboratory considerations for precision, accuracy, representativeness, completeness and comparability.

7.3.1 Step 1 – State the Problem

Validation data is required to demonstrate that the remediation is successful and that the site is suitable for the proposed land use described in Section 1.1.

7.3.2 Step 2 – Identify the Decisions of the Study

The remediation goal, aims and objectives are defined in Section1.2. The decisions to be made reflect these objectives and are as follows:

- Was the remediation undertaken in accordance with the RAP?
- If there were any deviations, what were these and how do they impact the outcome of the validation?
- Are any of the validation results above the VAC?
- Is the site suitable for the proposed development from a contamination viewpoint?

7.3.3 Step 3 – Identify Information Inputs

The primary information inputs required to address the decisions outlined in Step 2 include the following:

- Existing relevant data from previous reports;

- Site information, including site observations, inspections, survey information, as-built drawings, waste and imported materials registers;
- Validation sampling of imported materials; and
- Field and laboratory QA/QC data.

7.3.4 Step 4 – Define the Study Boundary

The remediation and validation will be confined to the UST and any associate buried infrastructure. The validation will guide the vertical extent of the USTs and fill/soil remediation, though remediation associated with the UST is anticipated to be approximately 2m to 3m deep.

The supplementary waste classification (as part of the post demolition validation) will be confined to the site boundaries as shown in Figure 2 in Appendix A and will be limited vertically to the base of the fill, anticipated to range from 1.4mBGL to 2.6mBGL.

7.3.5 Step 5 – Develop an Analytical Approach (or Decision Rule)

7.3.5.1 VAC

The validation data will be assessed in accordance with the requirements outlined in Section 7.2.

7.3.5.2 Field and Laboratory QA/QC

Field QA/QC is to include analysis of inter-laboratory duplicates (5% frequency), intra-laboratory duplicates (5% frequency), trip spike, trip blank and rinsate samples (one each for the assessment to demonstrate adequacy of standard sampling/handling procedures). Field QA/QC samples are to be analysed for the contaminants of concern, except asbestos. The trip spike will only be analysed for BTEX as BTEX will be considered a surrogate to assess potential loss of volatiles from TRH (F2).

DQIs for field and laboratory QA/QC samples are defined below:

Field Duplicates

Acceptable targets for precision of field duplicates will be 30% or less, consistent with NEPM (2013). RPD failures will be considered qualitatively on a case-by-case basis taking into account factors such as the concentrations used to calculate the RPD (i.e. RPD exceedance where concentrations are close to the PQL are typically not as significant as those where concentrations are reported at least five or 10 times the PQL), sample type, collection methods and the specific analyte where the RPD exceedance was reported.

Trip Blanks

Acceptable targets for trip blank samples will be less than the PQL for organic analytes. Metals will be considered on a case-by-case basis with regards to the reference material used as the blank medium.

Trip Spikes

Acceptable targets for trip spike samples will be 70% to 130%.

Laboratory QA/QC

The suitability of the laboratory data will be assessed against the laboratory QA/QC criteria. These criteria are developed and implemented in accordance with the laboratory's NATA accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

A summary of the typical limits is provided below:

RPDs

- Results that are <5 times the PQL, any RPD is acceptable; and
- Results >5 times the PQL, RPDs between 0-50% are acceptable.

Laboratory Control Samples (LCS) and Matrix Spikes

- 70-130% recovery acceptable for metals and inorganics; and
- 60-140% recovery acceptable for organics.

Surrogate Spikes

- 60-140% recovery acceptable for general organics.

Method Blanks

- All results less than PQL.

In the event that acceptable limits are not met by the laboratory analysis, other lines of evidence will be reviewed (e.g. field observations of samples, preservation, handling etc) and, where required, consultation with the laboratory is to be undertaken in an effort to establish the cause of the non-conformance. Where uncertainty exists, the validation consultant is to adopt the most conservative concentration reported.

7.3.5.3 Appropriateness of PQLs

The PQLs of the analytical methods are to be considered in relation to the VAC to confirm that the PQLs are less than the VAC. In cases where the PQLs are greater than the VAC, a discussion of this is to be provided.

7.3.6 Step 6 – Specify Limits on Decision Errors

To limit the potential for decision errors, a range of quality assurance processes are adopted. A quantitative assessment of the potential for false positives and false negatives in the analytical results is to be undertaken with reference to Schedule B(3) of NEPM (2013) using the data quality assurance information collected.

7.3.7 Step 7 - Optimise the Design for Obtaining Data

The design is to be optimised via the collection of validation data to demonstrate the success of the key aspects of the remediation. Data collection will be via various methods including inspections and sampling.

7.3.8 Sampling Plan

The proposed sampling plan for the validation of imported materials is described in Section 7.1.

7.4 Validation Report and LTEMP

As part of the site validation process, a validation report will be prepared by the validation consultant. The report will present the results of the validation assessment and will be prepared in accordance with the Consultants Reporting Guidelines.

8 CONTINGENCY PLAN

A review of the proposed remediation works has indicated that the greatest risks that may affect the success of the remediation include unexpected finds. A contingency plan for the remediation is provided below:

8.1 Unexpected Finds

Residual hazards that may exist at the site would generally be expected to be detectable through visual or olfactory means. The procedure to be followed in the event of an unexpected find is presented below:

- In the event of an unexpected find, all work in the immediate vicinity should cease and the remediation contractor should contact the validation consultant and the project manager;
- Temporary barricades should be erected to isolate the area from access to workers;
- The validation consultant is to attend the site, adequately characterise the contamination and provide advice in relation to site management and remediation. In the event that remediation differs from the procedures outlined in this RAP, an addendum RAP or RWP must be prepared in consultation with the project stakeholders and submitted to the consent authority; and
- Contamination should be remediated and validated in accordance with the advice provided, and the results should be included in the validation report.

8.2 Importation Failure for VENM or other Imported Materials

Where material to be imported onto the site does not meet the importation VAC detailed in Section 7.2, the material should not be imported. Alternative material must be sourced that meets the importation requirements.

8.3 Contingency for Failure of Remediation Strategy

8.3.1 Continual Validation Failure (after fill removal)

In the event of a soil validation failure when validating fill removal, the client should be advised then the excavation should be extended in the direction of the failure (in consultation with the validation consultant, client and other relevant stakeholders) and the area re-validated.

9 SITE MANAGEMENT PLAN FOR REMEDIATION WORKS

The information outlined in this section of the RAP is for the remediation work only. The client should make reference to the development consent for specific site management requirements for the overall development of the site.

9.1 Project Contacts

Emergency procedures and contact telephone numbers should be displayed in a prominent position at the site entrance gate and within the main site working areas. The available contact details are summarised in the following table:

Table 9-1: Project Contacts

Role	Company	Contact Details
Client/developer	Swell Trading Pty Ltd	Guirong Zhang **jackyc812@pm.me**
Project Manager	Chenchow Little Pty Ltd	Adam Hoh **adam@chenchow.com**
Remediation Contractor	To be appointed	-
Validation Consultant	JKE – subject to formal engagement	Katrina Taylor **ktaylor@jkenvironments.com.au**
Certifier	To be appointed	-
NSW EPA	Pollution Line	131 555
Emergency Services	Ambulance, Police, Fire	000

9.2 Security

Appropriate fencing should be installed as required to secure the site. Warning signs should be erected, which outline the personal protective equipment (PPE) required for remediation work.

9.3 Timing and Sequencing of Remediation Works

The anticipated sequence of remediation works is outlined in Section 6.3. Remediation will occur concurrently with the development works as the built form of the development.

9.4 Site Soil and Water Management Plan

The remediation contractor should prepare a detailed soil and water management plan prior to the commencement of site works. Silt fences should be used to control the surface water runoff at all appropriate locations of the site and appropriate measures are to be implemented to manage soil/water disturbance to

the satisfaction of the regulator/determining authority. Reference should be made to the consent conditions for further details.

All stockpiled materials should be placed within an erosion containment boundary with silt fences and sandbags employed to limit sediment movement. The containment area should be located away from drainage lines/low-points, gutters, stormwater pits and inlets and the site boundary. No liquid waste or runoff should be discharged to the stormwater or sewerage system without the approval of the appropriate authorities.

9.5 Noise and Vibration Control Plan

The guidelines for minimisation of noise on construction sites outlined in AS-2460 (2002)[18] should be adopted. Other measures specified in the consent conditions should also be complied with. Noise producing machinery and equipment should only be operated between the hours approved by the determining authority (refer to consent documents).

All practicable measures should be taken to reduce the generation of noise and vibration to within acceptable limits. In the event that short-term noisy operations are necessary, and where these are likely to affect residences, notifications should be provided to the relevant authorities and the residents by the project manager, specifying the expected duration of the noisy works.

9.6 Dust Control Plan

All practicable measures should be taken to reduce dust emanating from the site. Factors that contribute to dust production are:

- Wind over a cleared surface;
- Wind over stockpiled material; and
- Movement of machinery in unpaved areas.

Visible dust should not be present at the site boundary. Measures to minimise the potential for dust generation include:

- Use of water sprays on unsealed or exposed soil surfaces;
- Covering of stockpiled materials and excavation faces (particularly during periods of site inactivity and/or during windy conditions) or alternatively the erection of hessian fences around stockpiled soil or large exposed areas of soil;
- Establishment of dust screens consisting of a 2m high shade cloth or similar material secured to a chain wire fence;
- Maintenance of dust control measures to keep the facilities in good operating condition;
- Stopping work during strong winds;
- Loading or unloading of dry soil as close as possible to stockpiles to prevent spreading of loose material around the development area; and
- Geofabric/geotextile could be placed over exposed soils in the event that excavation is staged.

[18] Australian Standard, (2002). *AS2460: Acoustics - Measurement of the Reverberation Time in Rooms.*

If stockpiles are to remain on-site or soil remains exposed for a period of longer than several days, dust monitoring should be undertaken at the site. If excessive dust is generated all site activities should cease until either wind conditions are more acceptable or a revised method of excavation/remediation is developed.

Dust is also produced during the transfer of material to and from the site. All material should be covered during transport and should be properly disposed of on delivery. No material is to be left in an exposed, un-monitored condition.

All equipment and machinery should be brushed or washed down before leaving the site to limit dust and sediment movement off-site. In the event of prolonged rain and lack of paved areas all vehicles should be washed down prior to exit from the site, and any soil or dirt on the wheels of the vehicles removed. Water used to clean the vehicles should be collected and tested prior to appropriate disposal under the relevant waste classification guidelines.

9.7 Dewatering

Temporary dewatering may be required as part of the remediation works. Based on the information presented in the GCS, minor treatment of seepage water may be required during the development. The seepage water should be managed appropriately on site in accordance with the remediation contractor's soil and water management plan, and the validation plan in Section 7. This water should not be pumped to stormwater or sewer unless a prior application is made and this is approved by the relevant authorities.

9.8 Odour Control Plan

All activities undertaken at the site should be completed in a manner that minimises emissions of smoke, fumes and vapour into the atmosphere and any odours arising from the works or stockpiled material should be controlled. Control measures may include:

- Maintenance of construction equipment so that exhaust emissions comply with the Clean Air Regulations issued under the POEO Act 1997;
- Demolition materials and other combustible waste should not be burnt on site;
- The spraying of a suitable proprietary product to suppress any odours that may be generated by excavated materials; and
- Use of protective covers (e.g. builder's plastic).

All practicable measures should be taken to reduce fugitive emissions emanating from the site so that associated odours do not constitute a nuisance and that the ambient air quality is not adversely impacted.

The following odour management plan should be implemented to limit the exposure of site personnel and surrounding residents to unpleasant odours:

- Excavation and stockpiling of material should be scheduled during periods with low winds if possible;
- A suitable proprietary product could be sprayed on material during excavation and following stockpiling to reduce odours (subject to an appropriate assessment of the product by the validation consultant);

- All complaints from workers and neighbours should be logged and a response provided. Work should be rescheduled as necessary to minimise odour problems;
- The site foreman should consider the following odour control measures:
  - reduce the exposed surface of the odorous materials;
  - time excavation activities to reduce off-site nuisance (particularly during strong winds); and
  - cover exposed excavation faces overnight or during periods of low excavation activity.
- If continued complaints are received, alternative odour management strategies should be considered and implemented.

9.9 Work Health and Safety (WHS) Plan

A site specific WHS plan should be prepared by the remediation contractor for all work to be undertaken at the site. The WHS plan should meet all the requirements outlined in SafeWork NSW WHS regulations.

As a minimum requirement, personnel must wear appropriate protective clothing, including long sleeve shirts, long trousers, steel cap boots and hard hats. Washroom and lunchroom facilities should also be provided to allow workers to remove potential contamination from their hands and clothing prior to eating or drinking.

9.10 Waste Management

Prior to commencement of remedial works and excavation for the proposed development, the remediation contractor should develop a waste management or recycling plan to minimise the amount of waste produced by the site. Consideration should be given to re-use material wherever possible.

9.11 Incident Management Contingency

The validation consultant should be contacted if any unexpected conditions are encountered at the site. This should enable the scope of remedial/validation works to be adjusted as required. Similarly, if any incident occurs at the site, the validation consultant should be advised to assess potential impacts on contamination conditions and the remediation/validation timetable.

9.12 Hours of Operation

Hours of operation should be between those approved by the determining authority under the development approval process.

9.13 Community Consultation and Complaints

The remediation contractor should provide details for managing community consultation and complaints within their construction environment management plan (CEMP).

10 CONCLUSIONS

Previous investigations have identified a UST and associated infrastructure in the central north of the site shown on Figure 2. The remediation strategy for the site includes the removal of the UST and any associated infrastructure, and off-site disposal of the UST pit backfill soils and water.

The remediation methods outlined in the RAP are assessed to be sustainable, economically viable, commensurate with the level of risk posed by the contaminants and technically achievable to implement concurrently with the proposed development works. On this basis, JKE are of the opinion that the site can be made suitable for the proposed development provided this RAP (and any addendums or revisions) and any requirements under a RWP is implemented should a RWP be prepared.

A site validation report is to be prepared on completion of remediation activities and submitted to the determining authority to demonstrate that the site is suitable for the proposed development. Any LTEMP or GMP prepared for the site will require appropriate public notification.

The RAP has met the objectives outlined in Section1.2.

10.1 Regulatory Requirements

The regulatory requirements applicable for the remediation are discussed in the following table:

Table 10-1: Regulatory Requirement

Guideline / Legislation / Policy	Applicability
SEPP55	JKE has not identified any triggers for Category 1 remediation. The project planner must confirm this. Prior notice of Category 2 remediation work is to be provided in accordance with Clause 16 of SEPP55. Under Clause 17 of SEPP55, a notice of completion of remediation work is to be given to council within 30 days of completion of the work. The notice of completion of remediation works must be in accordance with Clause 18 of SEPP55.
POEO Act 1997	Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner. Appropriate waste tracking is required for all waste that is disposed off-site. Activities should be carried out in a manner which does not result in the pollution of waters.
POEO (Waste) Regulation 2014	Part 7 of the POEO Waste Regulation 2014 set outs the requirements for the transportation and management of asbestos waste and Clause 79 of the POEO Waste Regulation requires waste transporters to provide information to the NSW EPA regarding the movement of any load in NSW of more than 10 square meters of asbestos sheeting, or 100 kilograms of asbestos waste. To fulfil these legal obligations, asbestos waste transporters must use WasteLocate.

11 LIMITATIONS

The report limitations are outlined below:

- JKE accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the JKE proposal; and terms of contract between JKE and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, JKE has not undertaken any verification process, except where specifically stated in the report;
- JKE has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- JKE accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- JKE have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. JKE should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

Important Information About This Report

These notes have been prepared by JKE to assist with the assessment and interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors
This report has been prepared in response to specific project requirements as stated in the JKE proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

JKE will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the investigation. If the subject site is sold, ownership of the investigation report should be transferred by JKE to the new site owners who will be informed of the conditions and limitations under which the investigation was undertaken. No person should apply an investigation for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions
Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an investigation report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is based on Professional Interpretations of Factual Data
Site investigations identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an investigation indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Investigation Limitations
Although information provided by a site investigation can reduce exposure to the risk of the presence of contamination, no environmental site investigation can eliminate the risk. Even a rigorous professional investigation may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Site Investigations by Design Professionals

Costly problems can occur when other design professionals develop plans based on misinterpretation of an investigation report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Investigation Report

Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the investigation. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the investigation. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete investigation should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely

Because an environmental site investigation is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site investigation, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.

Appendix A: Report Figures

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

This plan should be read in conjunction with the Environmental report.

Title: **SITE LOCATION PLAN**

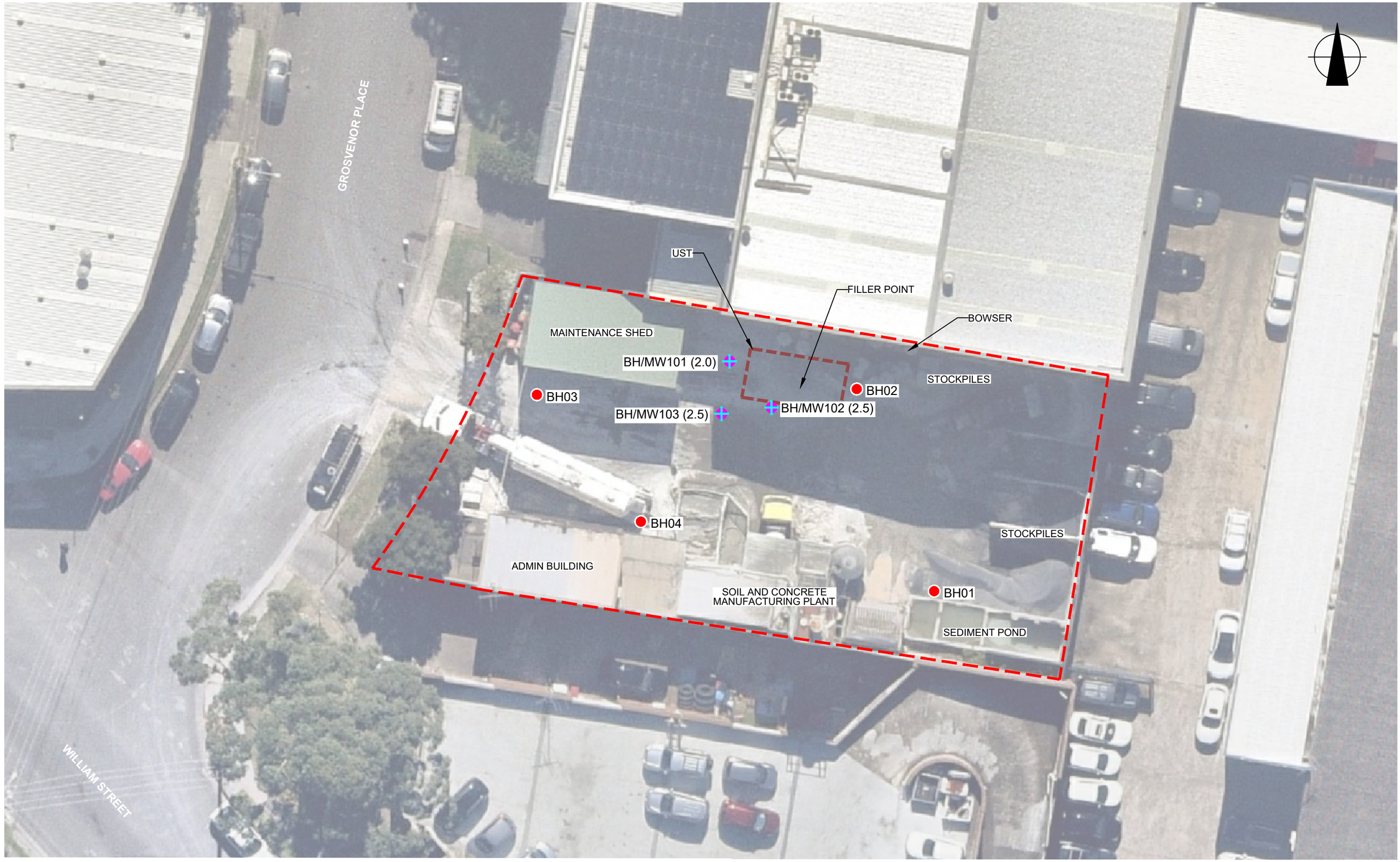
Location: 8 GROSVENOR PLACE, BROOKVALE, NSW

Project No: E34430BT

Figure No: 1

JKEnvironments

PLOT DATE: 20/09/2021 4:29:12 PM DWG FILE: Z:\5 EIS\5C EIS JOBS\34000'S\E34430BT BROOKVALE\CAD\E34430BT.DWG



LEGEND

APPROXIMATE SITE BOUNDARY	
BH	ARCADIS PSI 2021
BH/MW(Fill Depth)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 2.5 5 7.5 10 12.5

SCALE 1:250 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **SAMPLE LOCATION PLAN**

Location: 8 GROSVENOR PLACE, BROOKVALE, NSW

Project No: E34430BT

Figure No: 2

JKEnvironments

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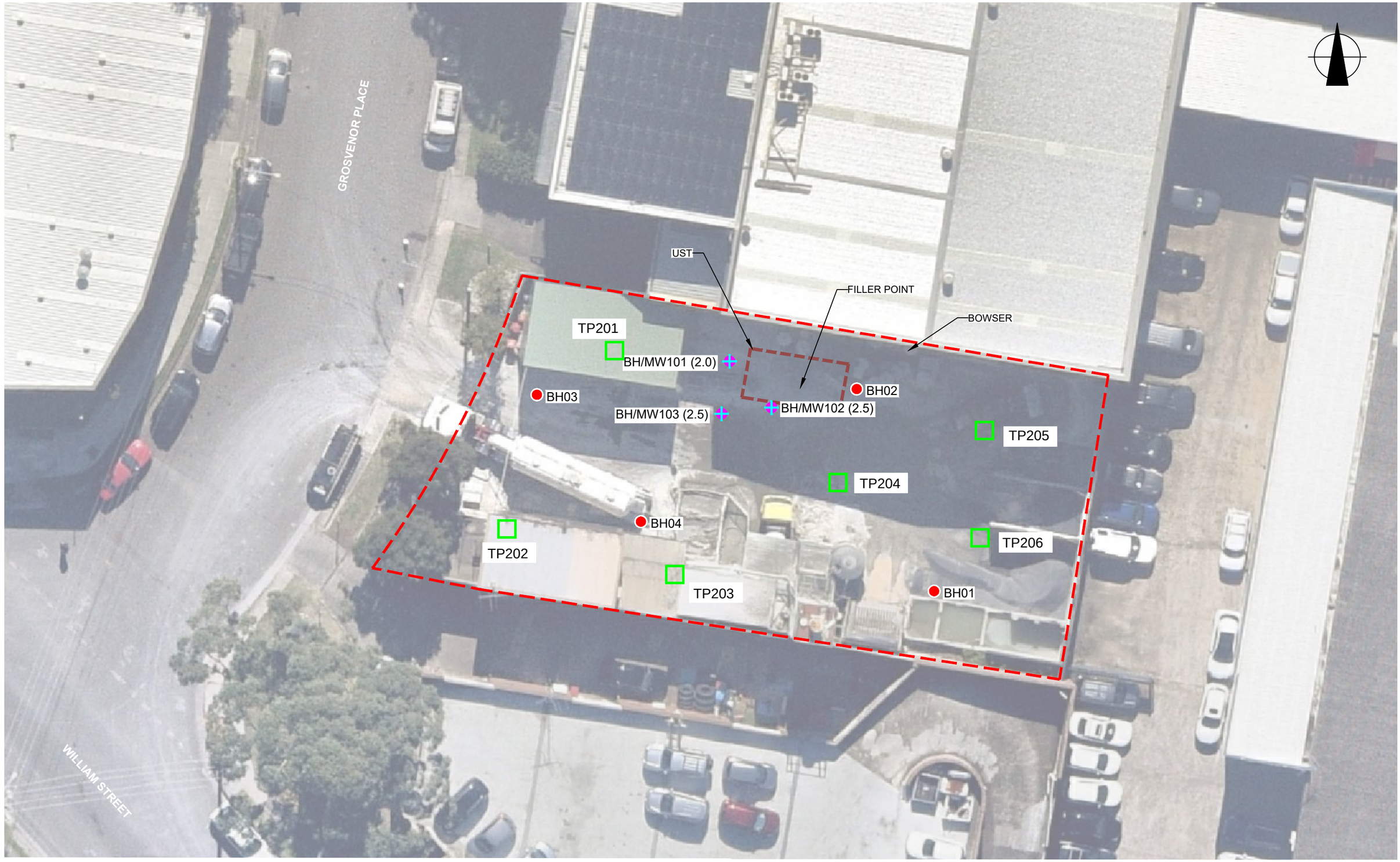

LEGEND

APPROXIMATE SITE BOUNDARY	
BH	ARCADIS PSI 2021
BH/MW(Fill Depth)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m), (JKE GCS 2021)
TP	PROPOSED TEST PIT LOCATION AND NUMBER FOR POST DEMOLITION VALIDATION

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 2.5 5 7.5 10 12.5

SCALE 1:250 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **PROPOSED SAMPLE LOCATION PLAN**

Location: 8 GROSVENOR PLACE, BROOKVALE, NSW

Project No: E34430BT

Figure No: 3

JKEnvironments

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Appendix B: Proposed Development Plans

PROPOSED WAREHOUSE DEVELOPMENT

FOR SWELL TRADING PTY LTD

8 GROSVENOR PLACE, BROOKVALE

DRAWING LIST

SUBSET NAME	LAYOUT NAME	LAYOUT ID	ISSUE
000 GENERAL			
	COVER PAGE	A-DA-000	E
100 SITE PLANS			
	SITE ANALYSIS	A-DA-101	B
	SITE PLAN	A-DA-102	A
	EXISTING / DEMOLITION PLAN	A-DA-103	B
	FILL AND EXCAVATION PLAN	A-DA-104	A
110 GA PLANS			
	GROUND FLOOR PLAN	A-DA-111	E
	LEVEL 01 FLOOR PLAN	A-DA-112	E
	ROOF LEVEL	A-DA-113	E
200 ELEVATIONS			
	NORTH ELEVATION	A-DA-201	D
	EAST ELEVATIONS	A-DA-202	D
	SOUTH ELEVATION	A-DA-203	D
	WEST ELEVATIONS	A-DA-204	D
300 SECTIONS			
	SECTIONS A-A	A-DA-301	D
	SECTIONS B-B	A-DA-302	D
	SECTIONS C-C	A-DA-303	D
	SECTIONS D-D	A-DA-304	D
400 ANALYSIS DIAGRAMS - DETAILS			
	SHADOW IMPACT DIAGRAMS	A-DA-401	B
	SCHEDULE OF COLOURS AND MATERIALS	A-DA-402	A

SECTION J COMMITMENTS

TO BE UPDATED

ABBREVIATIONS

A/C	AIR CONDITIONING	MSB	MAIN SWITCH BOARD
AL	ALUMINIUM	MSRY	MASONRY
AMDT	AMENDMENT	MAX	MAXIMUM
AP	ACCESS PANEL	MECH	MECHANICAL
APPROX	APPROXIMATE	MEL	MELAMINE
AVG	AVERAGE	MIN	MINIMUM
BHD	BULKHEAD	N	NORTH
BRS	BRASS	NOM	NOMINAL
BLDG	BUILDING	NTS	NOT TO SCALE
BLKT	BLANKET	OV	OVEN
BLK	BLOCKWORK	O/F	OVERFLOW
BLST	BALUSTRADE	O/H	OVERHEAD
BTH	BATH	OSD	ON SITE DETENTION
BV	BRICK VENEER	PB	PLASTERBOARD
BWK	BRICKWORK	PCF	POLISHED CONCRETE FLOOR
CK	COOKTOP	PCP	PRECAST CONCRETE PANEL
CAV	CAVITY	PCS	PRECAST CONCRETE STAIR
CF	CONCRETE FLOOR	PEB	PEBBLE ROOF
CJ	CONSTRUCTION JOINT	PU	POLYURETHANE
C/L	CENTRE LINE	REN	RENDER
COL	COLUMN	RF	REFRIGERATOR
CONC	CONCRETE	RL	REDUCED LEVEL
COS	CHECK ON SITE	RM	RENDERED MASONRY
CPD	CUPBOARD	RS	ROLLER SHUTTER
CPT	CARPET	RWH	RAINWATER HEAD
CT	CERAMIC TILE	RWO	RAINWATER OUTLET
D	DOOR	RWT	RAINWATER TANK
DG	DOUBLE GLAZING	SCD	PARAPET SCUPPER DRAIN
DIM	DIMENSION	SCR	SCREEN
DP	DOWN PIPE	SHR	SHOWER
DPC	DAMP-PROOF COURSE	SKL	SKYLIGHT
DRY	CLOTHES DRYER	SP	SET PLASTER
DW	DISHWASHER	SPEC	SPECIFIED
EJ	EXPANSION JOINT	SS	STAINLESS STEEL
EXST	EXISTING	SSL	STRUCTURAL SLAB LEVEL
EXT	EXTERNAL	SSM	SOLID SURFACE MATERIAL
F	FIXED	ST	STONE
FB	FACE BRICK	STL	STEEL
FC	FIBRE CEMENT	STP	STONE PAVING
FCL	FINISHED CEILING LEVEL	STW	STONE WALL
FE	FIRE EXTINGUISHER	SWBD	SWITCHBOARD
FFL	FINISHED FLOOR LEVEL	SWP	STORMWATER PIT
FG	FIXED GLAZING	TC	TIMBER CLADDING
FHR	FIRE HOSE REEL	TDK	TIMBER DECK
FIP	FIRE INDICATOR PANEL	TEL	TELEPHONE
FR	FIRE RESISTANT	TF	TIMBER FLOORBOARDS
FW	FLOOR WASTE	TIM	TIMBER
GA	GENERAL ARRANGEMENT	TL	TILE FINISH
GALV	GALVANISED	TOL	TOLERANCE
GAR	GARAGE	TP	TANGENT POINT
GL	GLASS	TRZO	TERRAZZO
GM	GAS METER	TV	TELEVISION
GPO	GENERAL PURPOSE OUTLET	TVNR	TIMBER VENEER
GR	GREEN ROOF	TYP	TYPICAL
GRC	GLASS-REINFORCED CONCRETE	U	URINAL
GU	GUTTER	U/G	UNDERGROUND
HDR	HANDRAIL	U/S	UNDERSIDE
HTR	HEATER	UNO	UNLESS NOTIFIED OTHERWISE
HWU	HOT WATER UNIT	VSF	VINYL/ SHEET FLOORING
HYD	HYDRANT	VB	VAPOUR BARRIER
INSUL	INSULATION	VER	VERANDAH
JU	JOINERY UNIT	VERT	VERTICAL
JT	JOINT	W	WINDOW
LDG	LANDING	WB	WEATHERBOARD
LNG	LINING	WC	WATER CLOSET
LVR	LOUVRE	WM	WASHING MACHINE
MC	METAL CLAD	WMR	WATER METER
MDR	METAL DECK ROOF	WPM	WATERPROOF MEMBRANE
MH	MANHOLE	W/O	WITHOUT
MS	MILD STEEL	ZN	ZINC CLADDING

CONSULTANT LIST

ARBORIST:

TREEIQ
PO BOX 146 SUMMER HILL 2130
PHONE: 0404 424 264
EMAIL: info@treeiQ.com.au
ATTN: ANNA HOPWOOD

BCA AND ACCESS CONSULTANT:

BCA LOGIC
SUITE 302, L3, 151 CASTLEREAGH STREET, SYDNEY NSW 2000
PHONE: 9411 5360
EMAIL: anewberry@bcalogic.com.au
ATTN: ALEX NEWBERRY

ENGINEER - CIVIL (STORMWATER):

TAYLOR CONSULTING
SUITE 7, 22-26 FISHER ROAD
DEE WHY NSW 2099
PHONE: 9982 7092
EMAIL: damien@taylorconsulting.net.au
ATTN: DAMIEN SCHAEFER

ENGINEER - ELECTRICAL:

DSC
57-59 HILL STREET
ROSEVILLE NSW 2069
PHONE: 9416 1177
EMAIL: Arthur.Gormly@dsc.com.au
ATTN: ARTHUR GORMLY

ENGINEER - ENVIRONMENTAL 1:

ARCADIS (CONTAMINATION REPORT)
LEVEL 16, 580 GEORGE STREET
SYDNEY NSW 2000
PHONE: 8281 2909
EMAIL: leila.bowe@arcadis.com
ATTN: LEILA BOWE

ENGINEER - ENVIRONMENTAL 2:

JK ENVIRONMENT (ACID SULPHATE AND REMEDIATION REPORT)
115 WICKS ROAD
MACQUARIE PARK NSW 2113
PHONE: 9888 5000
EMAIL: KTaylor@jkenvironments.com.au
ATTN: KATRINA TAYLOR

ENGINEER - FIRE:

SGA
SUITE 302, LEVEL 3, 151
CASTLEREAGH ST
SYDNEY NSW 2000
PHONE: 8484 4062
EMAIL: vyarchuk@rubits.com.au
ATTN: VIKTOR YARCHUCK

ENGINEER - FLOOD:

WMA WATER
LEVEL 2, 160 CLARENCE ST,
SYDNEY NSW 2000
PHONE: 9299 2855
EMAIL: rhys@wmawater.com.au
ATTN: RHYS HARDWICK JONES

ENGINEER - MECHANICAL:

DSC
57-59 HILL STREET
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ATTN: ROBERT SIGLEY

ENGINEER - GEOTECHNICAL:

FORTIFY GEOTECH
2/538 GARDENERS ROAD
ALEXANDRIA NSW 2015
PHONE: 9188 4033
EMAIL: info@fortifygeotech.com.au
ATTN: JEREMY MURRAY

ENGINEER - STRUCTURAL:

SDA STRUCTURES
STUDIO 2, 61 VICTORIA ROAD
ROZELLE NSW 2039
PHONE: 9810 6911
EMAIL: kevin@sdastructures.com.au
ATTN: KEVIN MONGEY

ESD (SECTION J):

ASPIRE SUSTAINABLE CONSULTING
9/36 ORIORDAN STREET
ALEXANDRIA NSW 2015
PHONE: 96620650
EMAIL: luke@aspiresc.com.au
ATTN: LUKE WILLIAMS

FIRE SERVICES:

DSC
57-59 HILL STREET
ROSEVILLE NSW 2069
PHONE: 9416 1177
EMAIL: David.Lonergan@dsc.com.au
ATTN: DAVID LONERGAN

LANDSCAPE ARCHITECT:

360°
LEVEL 1, 1 MARY'S PLACE
SURRY HILLS NSW 2010
PHONE: 9332 3601
EMAIL: clair@360.net.au
ATTN: CLAIR BERRIMAN

QUANTITY SURVEYOR:

KGCB
LEVEL 4, 22 ATCHISON STREET
ST LEONARDS NSW 2065
PHONE: 9906 5355
EMAIL: kchoo@kgcb.com.au
ATTN: KENG CHOO

SURVEYOR:

NORTON SURVEY PARTNERS
SUITE 1, 670 DARLING STREET
ROZELLE NSW 2039
PHONE: 955 2744
EMAIL: cnorton@nspartners.com.au
ATTN: CHRIS NORTON

TOWN PLANNER:

VAUGHAN MILLIGAN DEVELOPMENT CONSULTING PTY LTD
PO BOX 49 NEWPORT BEACH
NSW 2106
PHONE: 9999 4922
EMAIL: vmilliga@bigpond.net.au
ATTN: VAUGHAN MILLIGAN

TRAFFIC CONSULTANT:

PDC CONSULTANTS
LEVEL 14, 100 WILLIAM STREET
WOOLOOMOOLOO NSW 2011
PHONE: 7900 6514
EMAIL: jboncato@pdcconsultants.com.au
ATTN: JULIUS BONCATO

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ISSUE	AMENDMENT	DATE
E	ISSUED FOR COORDINATION	1/12/21
D	ISSUE FOR CLIENT REVIEW	26/11/21
C	ISSUED FOR COORDINATION	11/11/21
B	ISSUED FOR COORDINATION	2/11/21
A	ISSUED FOR COORDINATION	21/10/21

CHENCHOW LITTLE PTY LTD
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E-MAIL: mail@chenchowlittle.com
ARCHITECT'S REG. NO. 6123 (A. CHENCHOW)

DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION

2103 - BROOKVALE

WAREHOUSE FOR
SWELL TRADING PTY LTD
8 GROSVENOR PLACE BROOKVALE NSW 2100
LOT 1 DP599064

DRAWING TITLE:

COVER PAGE

DRAWING NUMBER:
A-DA-000 PRELIMINARY

DATE:	DRAWN BY:	CHECKED BY:
December 2021	**AH**	**TCC**

SCALE:	JOB NO:	NO. IN SET:	AMENDMENT:
	2103	**1**	**E**

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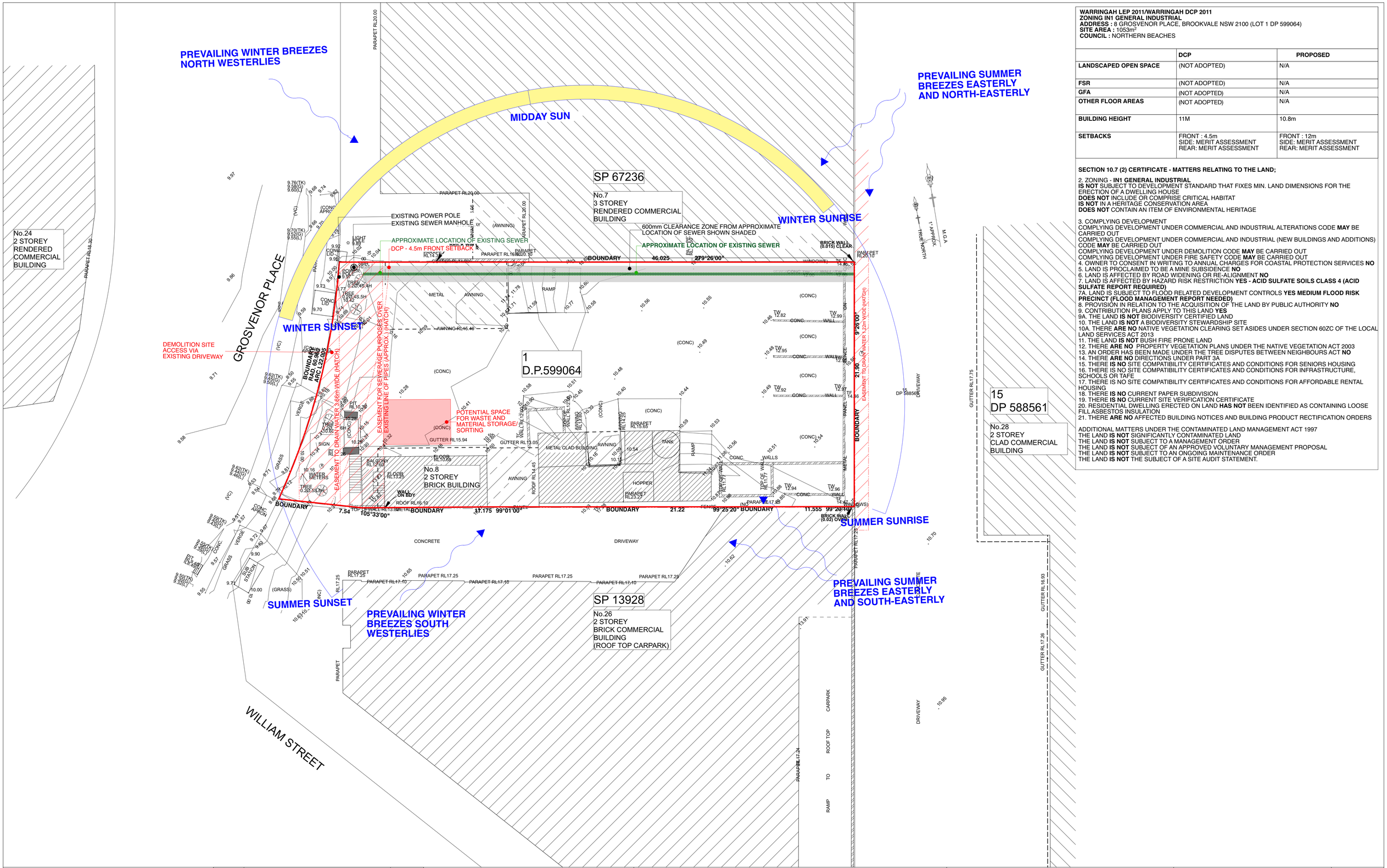
FULL SIZE ON ORIGINAL



WARRINGAH LEP 2011/WARRINGAH DCP 2011
ZONING IN1 GENERAL INDUSTRIAL
ADDRESS : 8 GROSVENOR PLACE, BROOKVALE NSW 2100 (LOT 1 DP 599064)
SITE AREA : 1053m²
COUNCIL : NORTHERN BEACHES

	DCP	PROPOSED
LANDSCAPED OPEN SPACE	(NOT ADOPTED)	N/A
FSR	(NOT ADOPTED)	N/A
GFA	(NOT ADOPTED)	N/A
OTHER FLOOR AREAS	(NOT ADOPTED)	N/A
BUILDING HEIGHT	11M	10.8m
SETBACKS	FRONT : 4.5m SIDE: MERIT ASSESSMENT REAR: MERIT ASSESSMENT	FRONT : 12m SIDE: MERIT ASSESSMENT REAR: MERIT ASSESSMENT

SECTION 10.7 (2) CERTIFICATE - MATTERS RELATING TO THE LAND;

2. ZONING - **IN1 GENERAL INDUSTRIAL**
IS NOT SUBJECT TO DEVELOPMENT STANDARD THAT FIXES MIN. LAND DIMENSIONS FOR THE ERECTION OF A DWELLING HOUSE
DOES NOT INCLUDE OR COMPRISE CRITICAL HABITAT
IS NOT IN A HERITAGE CONSERVATION AREA
DOES NOT CONTAIN AN ITEM OF ENVIRONMENTAL HERITAGE

3. COMPLYING DEVELOPMENT
COMPLYING DEVELOPMENT UNDER COMMERCIAL AND INDUSTRIAL ALTERATIONS CODE **MAY** BE CARRIED OUT
COMPLYING DEVELOPMENT UNDER COMMERCIAL AND INDUSTRIAL (NEW BUILDINGS AND ADDITIONS) CODE **MAY** BE CARRIED OUT
COMPLYING DEVELOPMENT UNDER DEMOLITION CODE **MAY** BE CARRIED OUT
COMPLYING DEVELOPMENT UNDER FIRE SAFETY CODE **MAY** BE CARRIED OUT
4. OWNER TO CONSENT IN WRITING TO ANNUAL CHARGES FOR COASTAL PROTECTION SERVICES **NO**
5. LAND IS PROCLAIMED TO BE A MINE SUBSIDENCE **NO**
6. LAND IS AFFECTED BY ROAD WIDENING OR RE-ALIGNMENT **NO**
7. LAND IS AFFECTED BY HAZARD RISK RESTRICTION **YES - ACID SULFATE SOILS CLASS 4 (ACID SULFATE REPORT REQUIRED)**
7A. LAND IS SUBJECT TO FLOOD RELATED DEVELOPMENT CONTROLS **YES MEDIUM FLOOD RISK PRECINCT (FLOOD MANAGEMENT REPORT NEEDED)**
8. PROVISION IN RELATION TO THE ACQUISITION OF THE LAND BY PUBLIC AUTHORITY **NO**
9. CONTRIBUTION PLANS APPLY TO THIS LAND **YES**
9A. THE LAND **IS NOT** BIODIVERSITY CERTIFIED LAND
10. THE LAND **IS NOT** A BIODIVERSITY STEWARDSHIP SITE
10A. THERE **ARE NO** NATIVE VEGETATION CLEARING SET ASIDES UNDER SECTION 60ZC OF THE LOCAL LAND SERVICES ACT 2013
11. THE LAND **IS NOT** BUSH FIRE PRONE LAND
12. THERE **ARE NO** PROPERTY VEGETATION PLANS UNDER THE NATIVE VEGETATION ACT 2003
13. AN ORDER HAS BEEN MADE UNDER THE TREE DISPUTES BETWEEN NEIGHBOURS ACT **NO**
14. THERE **ARE NO** DIRECTIONS UNDER PART 3A
15. THERE **IS NO** SITE COMPATIBILITY CERTIFICATES AND CONDITIONS FOR SENIORS HOUSING
16. THERE IS NO SITE COMPATIBILITY CERTIFICATES AND CONDITIONS FOR INFRASTRUCTURE, SCHOOLS OR TAFE
17. THERE IS NO SITE COMPATIBILITY CERTIFICATES AND CONDITIONS FOR AFFORDABLE RENTAL HOUSING
18. THERE **IS NO** CURRENT PAPER SUBDIVISION
19. THERE **IS NO** CURRENT SITE VERIFICATION CERTIFICATE
20. RESIDENTIAL DWELLING ERECTED ON LAND **HAS NOT** BEEN IDENTIFIED AS CONTAINING LOOSE FILL ASBESTOS INSULATION
21. THERE **ARE NO** AFFECTED BUILDING NOTICES AND BUILDING PRODUCT RECTIFICATION ORDERS

ADDITIONAL MATTERS UNDER THE CONTAMINATED LAND MANAGEMENT ACT 1997
THE LAND **IS NOT** SIGNIFICANTLY CONTAMINATED LAND
THE LAND **IS NOT** SUBJECT TO A MANAGEMENT ORDER
THE LAND **IS NOT** SUBJECT OF AN APPROVED VOLUNTARY MANAGEMENT PROPOSAL
THE LAND **IS NOT** SUBJECT TO AN ONGOING MAINTENANCE ORDER
THE LAND **IS NOT** THE SUBJECT OF A SITE AUDIT STATEMENT.

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ISSUE	AMENDMENT	DATE
B	ISSUED FOR COORDINATION	1/12/21
A	ISSUED FOR COORDINATION	21/10/21

CHENCHOW LITTLE PTY LTD
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ARCHITECT'S REG. NO. 6123 (A. CHENCHOW)

DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION

2103 - BROOKVALE

WAREHOUSE FOR
SWELL TRADING PTY LTD
8 GROSVENOR PLACE BROOKVALE NSW 2100
LOT 1 DP599064

DRAWING TITLE:
SITE ANALYSIS

DRAWING NUMBER:
A-DA-101 **PRELIMINARY**

DATE:	DRAWN BY:	CHECKED BY:	AMENDMENT:
December 2021	**AH**	**TCC**	**B**

SCALE: **1:150 @ A1** **1:300 @ A3**
JOB NO: **2103**
NO. IN SET: **2**

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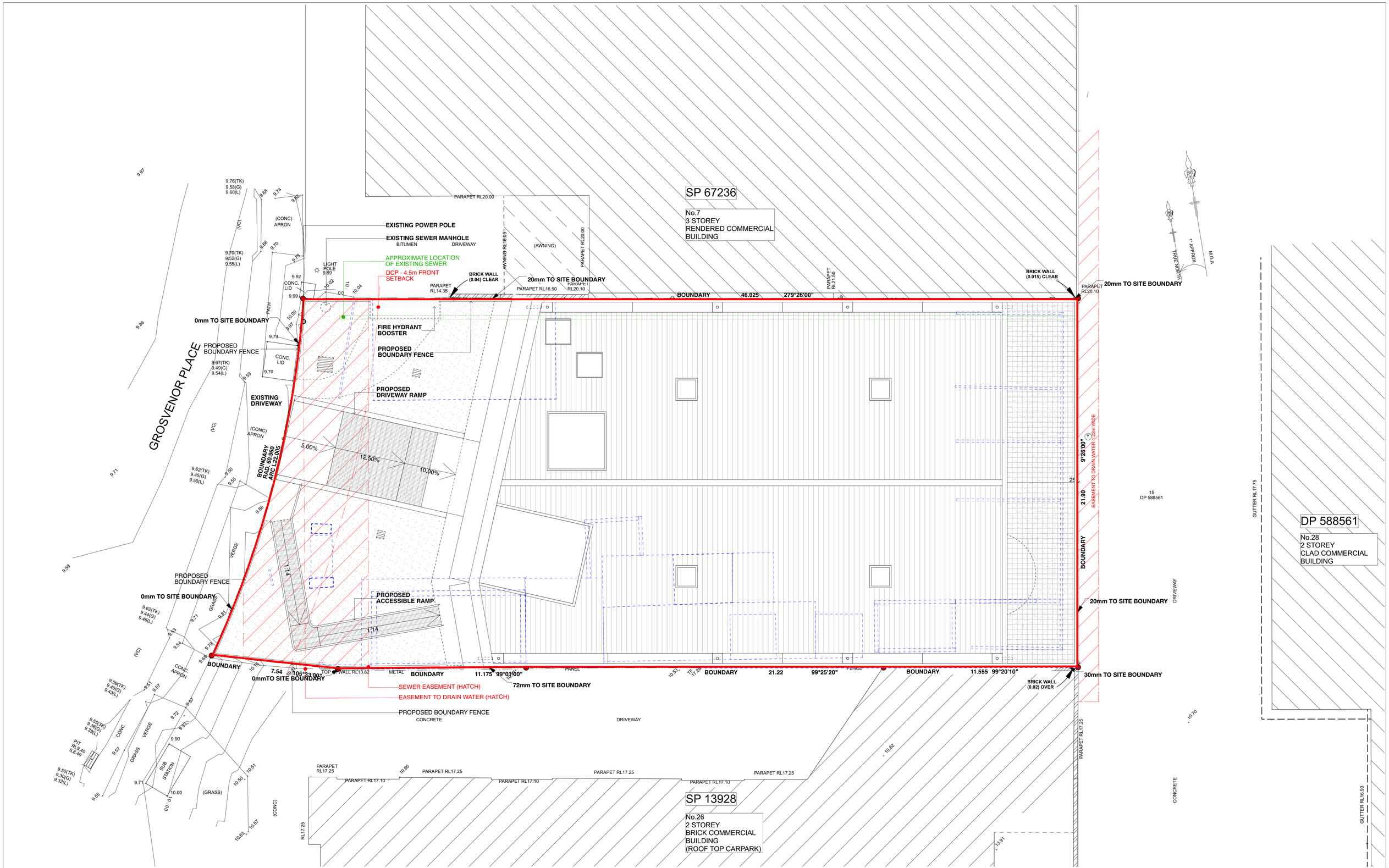

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ISSUE	AMENDMENT	DATE
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DEVELOPMENT APPLICATION
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2103 - BROOKVALE

WAREHOUSE FOR
SWELL TRADING PTY LTD
8 GROSVENOR PLACE BROOKVALE NSW 2100
LOT 1 DP599064

DRAWING TITLE:
SITE PLAN

DRAWING NUMBER:
A-DA-102 PRELIMINARY

DATE:	DRAWN BY:	CHECKED BY:
December 2021	**AH**	**TCC**

SCALE:	JOB NO:	NO. IN SET:	AMENDMENT:
1:100 @ A1 **1:200 @ A3**	**2103**	**3**	**A**

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ISSUE	AMENDMENT	DATE
B	ISSUED FOR COORDINATION	1/12/21
A	ISSUED FOR COORDINATION	21/10/21

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2103 - BROOKVALE

WAREHOUSE FOR
SWELL TRADING PTY LTD
8 GROSVENOR PLACE BROOKVALE NSW 2100
LOT 1 DP599064

DRAWING TITLE:
EXISTING / DEMOLITION PLAN

DRAWING NUMBER:
A-DA-103 PRELIMINARY

DATE:	DRAWN BY:	CHECKED BY:
December 2021	AH	TCC

SCALE:	JOB NO:	NO. IN SET:	AMENDMENT:
1:100 @ A1 1:200 @ A3	2103	4	B

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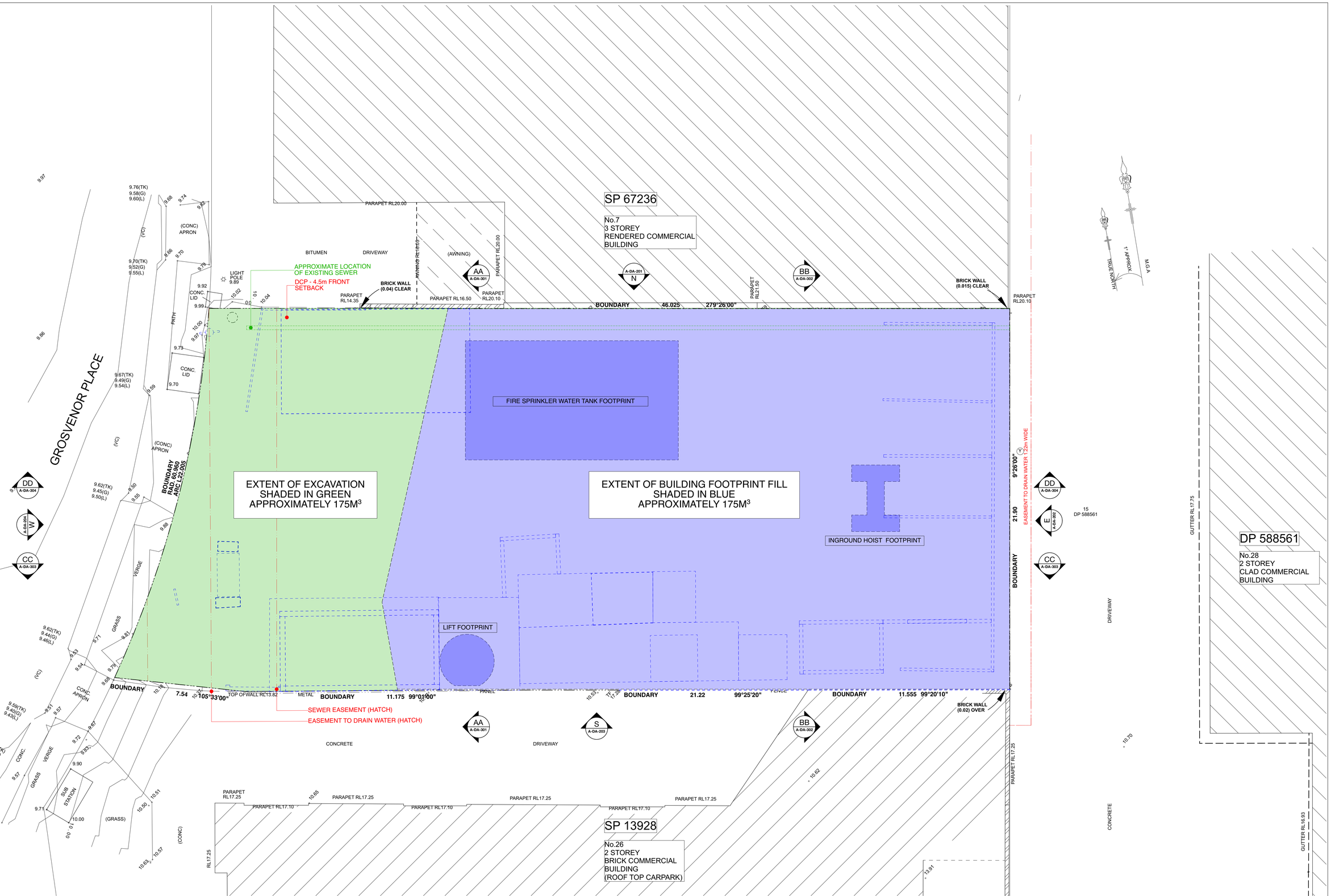
FULL SIZE ON ORIGINAL



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WAREHOUSE FOR
SWELL TRADING PTY LTD
8 GROSVENOR PLACE BROOKVALE NSW 2100
LOT 1 DP599064

DRAWING TITLE:
FILL AND EXCAVATION PLAN

DRAWING NUMBER:
A-DA-104 PRELIMINARY

DATE:	DRAWN BY:	CHECKED BY:
December 2021	**AH**	**TCC**

SCALE:	JOB NO:	NO. IN SET:	AMENDMENT:
1:100 @ A1 **1:200 @ A3**	**2103**	**5**	**A**

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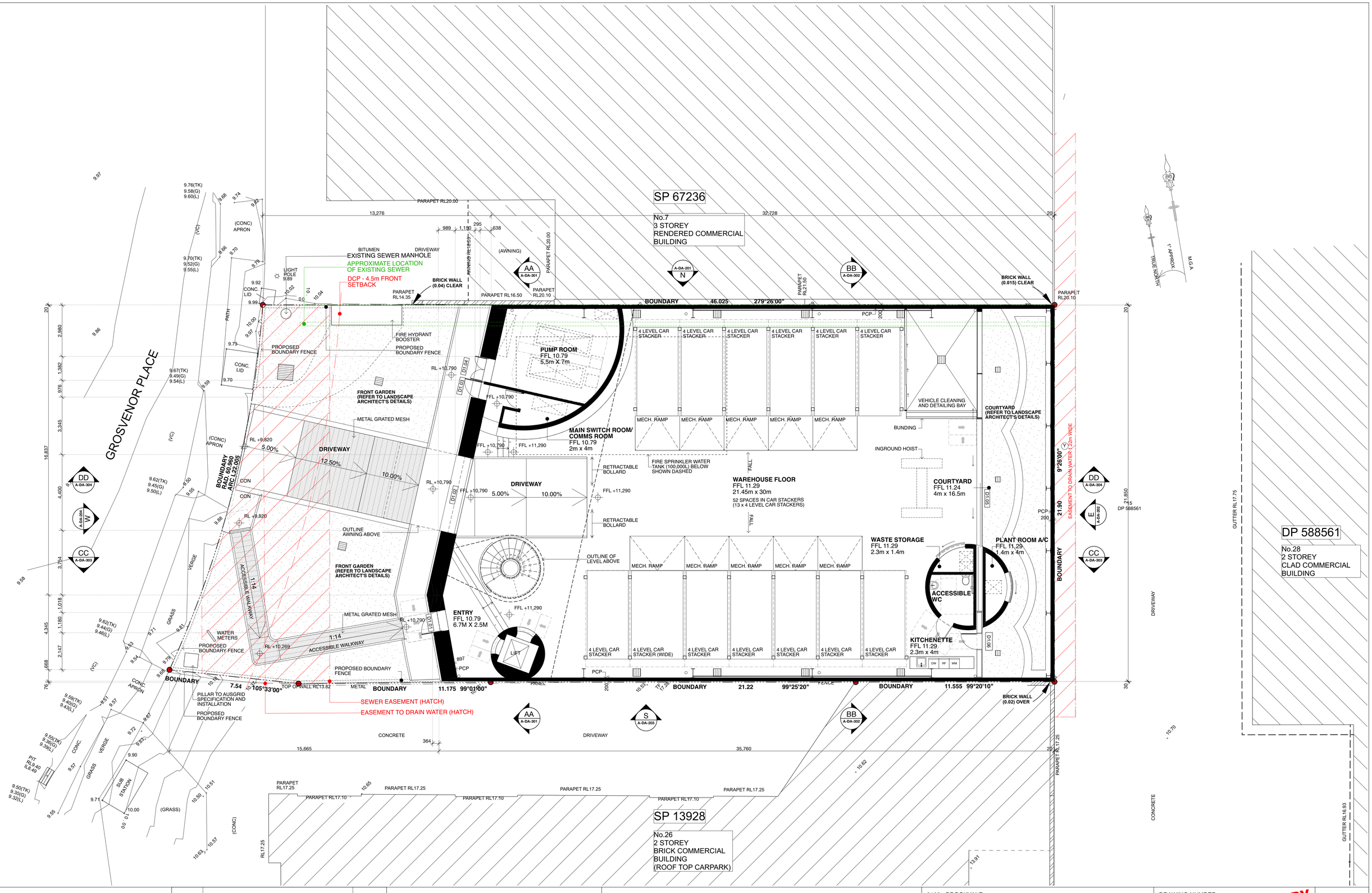
FULL SIZE ON ORIGINAL



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2103 - BROOKVALE

WAREHOUSE FOR
SWELL TRADING PTY LTD
8 GROSVENOR PLACE BROOKVALE NSW 2100
LOT 1 DP599064

DRAWING TITLE:
GROUND FLOOR PLAN

DRAWING NUMBER:
A-DA-111 **PRELIMINARY**

DATE:	DRAWN BY:	CHECKED BY:
December 2021	AH	TCC

SCALE:	JOB NO:	NO. IN SET:	AMENDMENT:
1:100 @ A1 1:200 @ A3	2103	6	E

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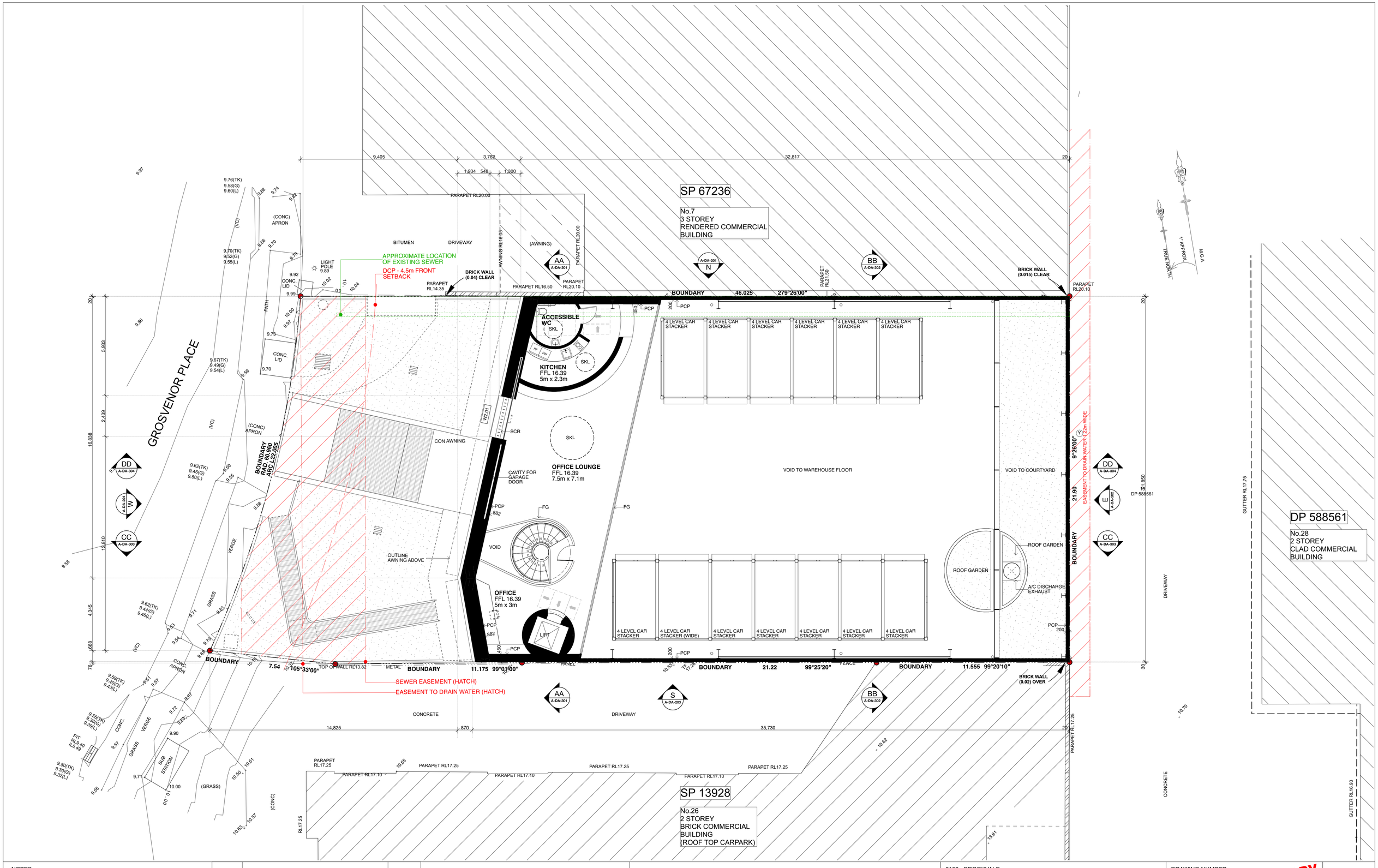

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ISSUE	AMENDMENT	DATE
E	ISSUED FOR COORDINATION	1/12/21
D	ISSUE FOR CLIENT REVIEW	26/11/21
C	ISSUED FOR COORDINATION	11/11/21
B	ISSUED FOR COORDINATION	2/11/21
A	ISSUED FOR COORDINATION	21/10/21

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ARCHITECT'S REG. NO. 6123 (A. CHENCHOW)

DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION

2103 - BROOKVALE

WAREHOUSE FOR
SWELL TRADING PTY LTD
8 GROSVENOR PLACE BROOKVALE NSW 2100
LOT 1 DP599064

DRAWING TITLE:
LEVEL 01 FLOOR PLAN

DRAWING NUMBER:
A-DA-112 **PRELIMINARY**

DATE:	DRAWN BY:	CHECKED BY:	AMENDMENT:
December 2021	**AH**	**TCC**	**E**

SCALE:	JOB NO:	NO. IN SET:
1:100 @ A1 **1:200 @ A3**	**2103**	**7**

0 10 20 30 40 50 60 70 80 90 100mm
FULL SIZE ON ORIGINAL

SP 67236

No.7
3 STOREY
RENDERED COMMERCIAL
BUILDING

DP 588561

No.28
2 STOREY
CLAD COMMERCIAL
BUILDING

SP 13928

No.26
2 STOREY
BRICK COMMERCIAL
BUILDING
(ROOF TOP CARPARK)

GROSVENOR PLACE

BOUNDARY 46.025 279°26'00"

BOUNDARY 31.313

BOUNDARY 21.90 9°26'00"

BOUNDARY 15.331

BOUNDARY 7.54 105°33'00"

BOUNDARY 11.175 99°01'00"

BOUNDARY 21.22 99°25'20"

BOUNDARY 11.555 99°20'10"

BOUNDARY RAD. 60.000 ARC L22.005

PARAPET RL20.00

PARAPET RL20.00

PARAPET RL16.50

PARAPET RL20.10

PARAPET RL14.35

PARAPET RL21.50

PARAPET RL20.10

BRICK WALL (0.04) CLEAR

BRICK WALL (0.015) CLEAR

BRICK WALL (0.02) OVER

AWNING RL16.05

(AWNING)

APPROXIMATE LOCATION OF EXISTING SEWER

DCP - 4.5m FRONT SETBACK

SEWER EASEMENT (HATCH)

EASEMENT TO DRAIN WATER (HATCH)

EASEMENT TO DRAIN WATER 1.22m WIDE

ROOF MOUNTED SMOKE EXHAUST FLUE SUBJECT TO FIRE ENGINEERING SOLUTIONS

BITUMEN

DRIVEWAY

CONCRETE

MDR

METAL MESH

PANEL

FENCE

TOP OF WALL RL13.82

LIGHT POLE 9.89

(CONC) APRON

CONC. LID

PATH

VERGE

GRASS

SUB STATION

PIT RL9.40

(GRASS)

(CONC)

O/F

FALL

SL01

SL02

SL03

SL04

PV

AA A-DA-301

BB A-DA-302

CC A-DA-303

DD A-DA-304

E A-DA-302

S A-DA-203

N A-DA-201

W A-DA-201

TRUE NORTH

1° APPROX.

M.G.A

GUTTER RL17.75

GUTTER RL16.93

DRIVEWAY

CONCRETE

PARAPET RL17.25

PARAPET RL17.10

PARAPET RL17.25

PARAPET RL17.10

PARAPET RL17.25

PARAPET RL17.10

PARAPET RL17.25

RL17.25

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DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION

2103 - BROOKVALE

WAREHOUSE FOR
SWELL TRADING PTY LTD
8 GROSVENOR PLACE BROOKVALE NSW 2100
LOT 1 DP599064

DRAWING TITLE:
ROOF LEVEL

DRAWING NUMBER:
A-DA-113 PRELIMINARY

DATE:	DRAWN BY:	CHECKED BY:
December 2021	**AH**	**TCC**

SCALE:	JOB NO:	NO. IN SET:	AMENDMENT:
1:100 @ A1 **1:200 @ A3**	**2103**	**8**	**E**

0 10 20 30 40 50 60 70 80 90 100mm
FULL SIZE ON ORIGINAL

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8 GROSVENOR PLACE BROOKVALE NSW 2100
LOT 1 DP599064

DRAWING TITLE:
NORTH ELEVATION

DRAWING NUMBER:
A-DA-201 PRELIMINARY

DATE:	DRAWN BY:	CHECKED BY:
December 2021	**AH**	**TCC**

SCALE:	JOB NO:	NO. IN SET:	AMENDMENT:
1:100 @ A1 **1:200 @ A3**	**2103**	**9**	**D**

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FULL SIZE ON ORIGINAL

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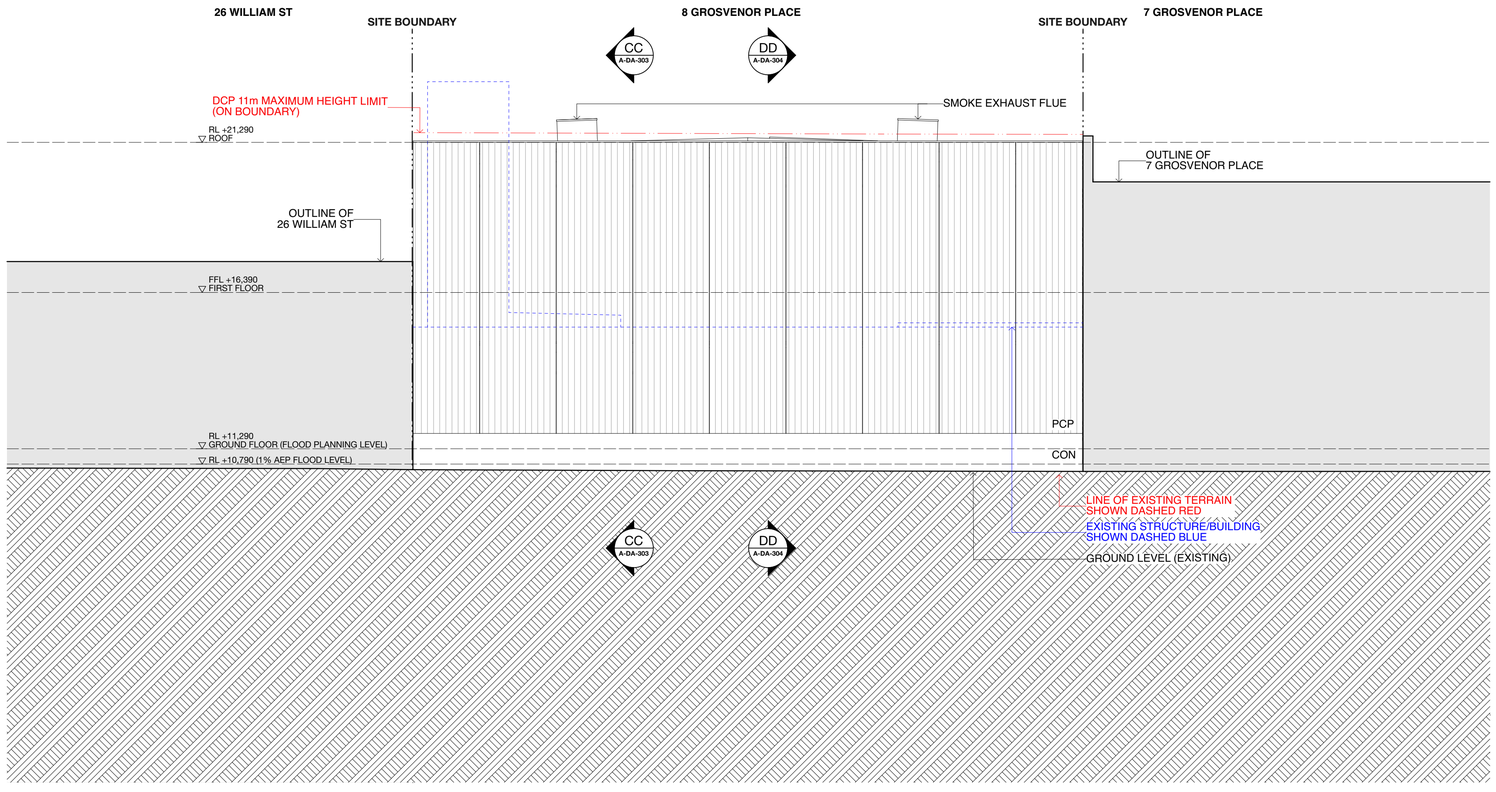

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LOT 1 DP599064

DRAWING TITLE:
EAST ELEVATIONS

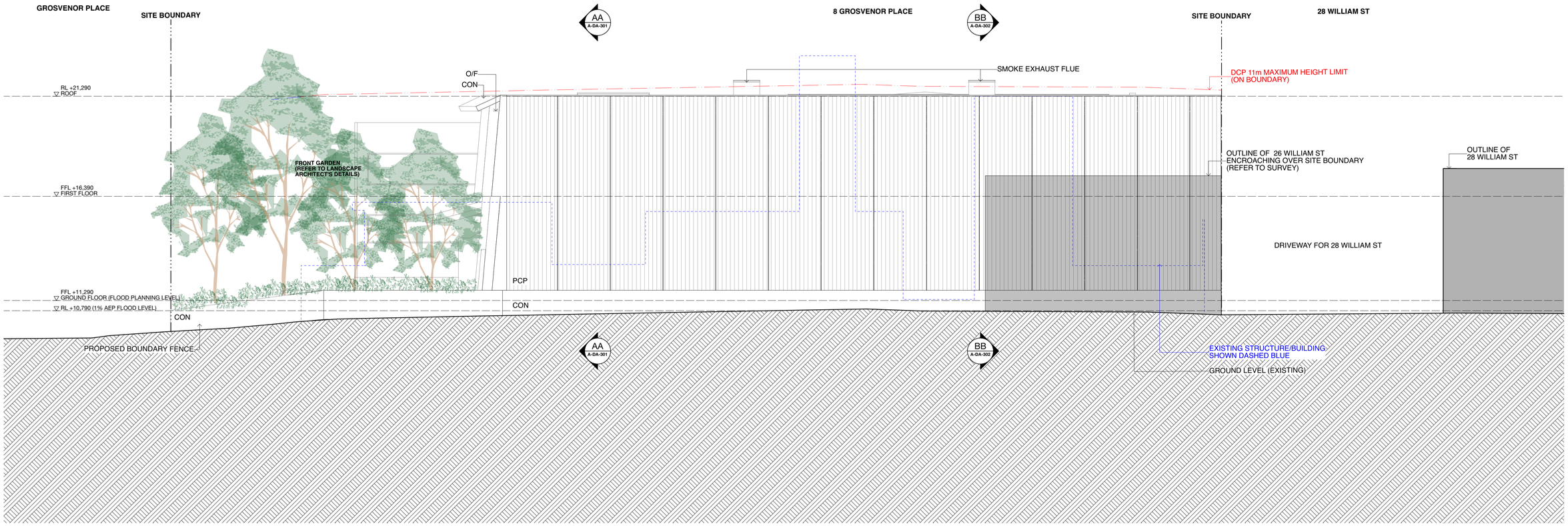
DRAWING NUMBER:
A-DA-202 PRELIMINARY

DATE:	DRAWN BY:	CHECKED BY:
December 2021	**AH**	**TCC**

SCALE:	JOB NO:	NO. IN SET:	AMENDMENT:
1:100 @ A1 **1:200 @ A3**	**2103**	**10**	**D**

0 10 20 30 40 50 60 70 80 90 100mm
FULL SIZE ON ORIGINAL

N



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8 GROSVENOR PLACE BROOKVALE NSW 2100
LOT 1 DP599064

DRAWING TITLE:
SOUTH ELEVATION

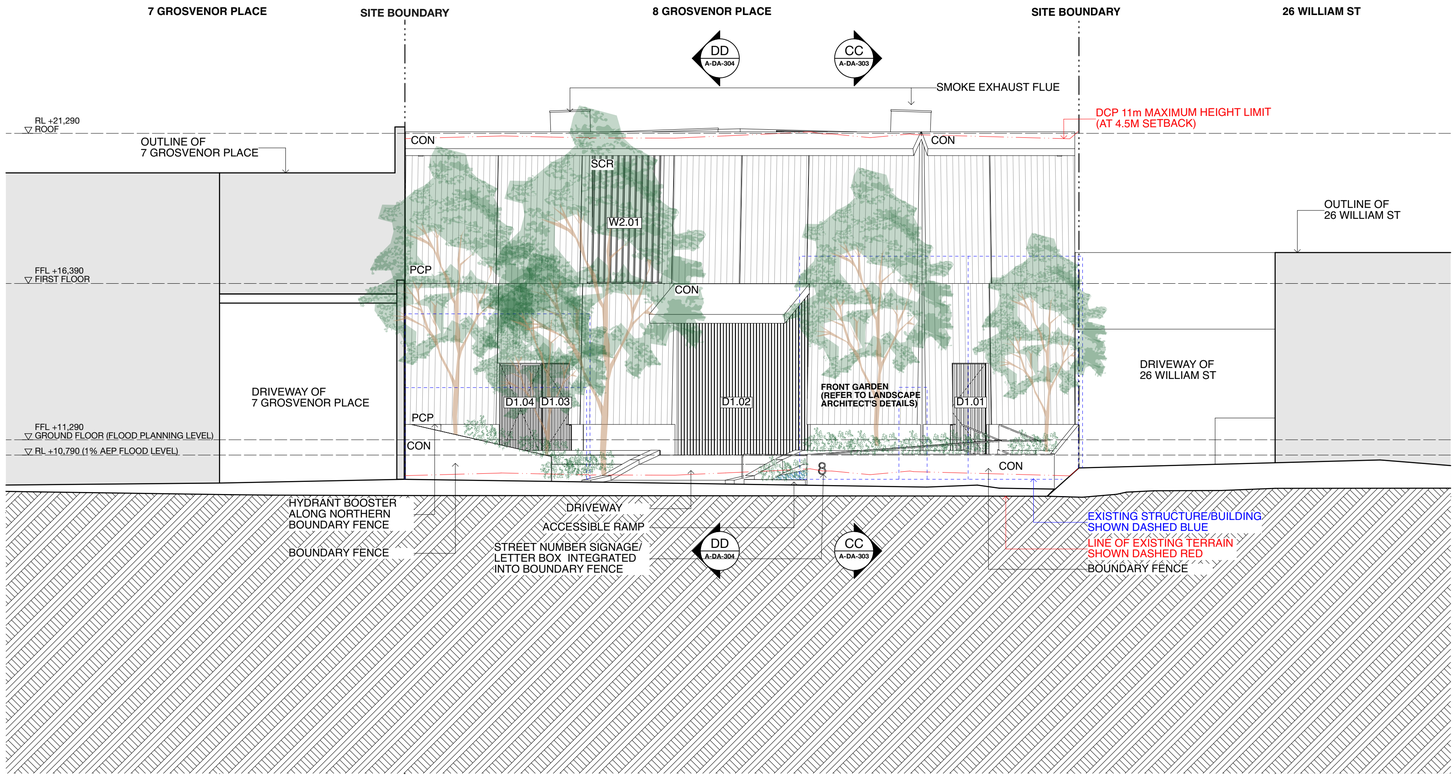
DRAWING NUMBER:
A-DA-203 PRELIMINARY

DATE:	DRAWN BY:	CHECKED BY:
December 2021	**AH**	**TCC**

SCALE:	JOB NO:	NO. IN SET:	AMENDMENT:
1:100 @ A1 **1:200 @ A3**	**2103**	**11**	**D**

0 10 20 30 40 50 60 70 80 90 100mm
FULL SIZE ON ORIGINAL

N



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LOT 1 DP599064

DRAWING TITLE:
WEST ELEVATIONS

DRAWING NUMBER:
A-DA-204 PRELIMINARY

DATE:	DRAWN BY:	CHECKED BY:
December 2021	**AH**	**TCC**

SCALE:	JOB NO:	NO. IN SET:	AMENDMENT:
1:100 @ A1 **1:200 @ A3**	**2103**	**12**	**D**

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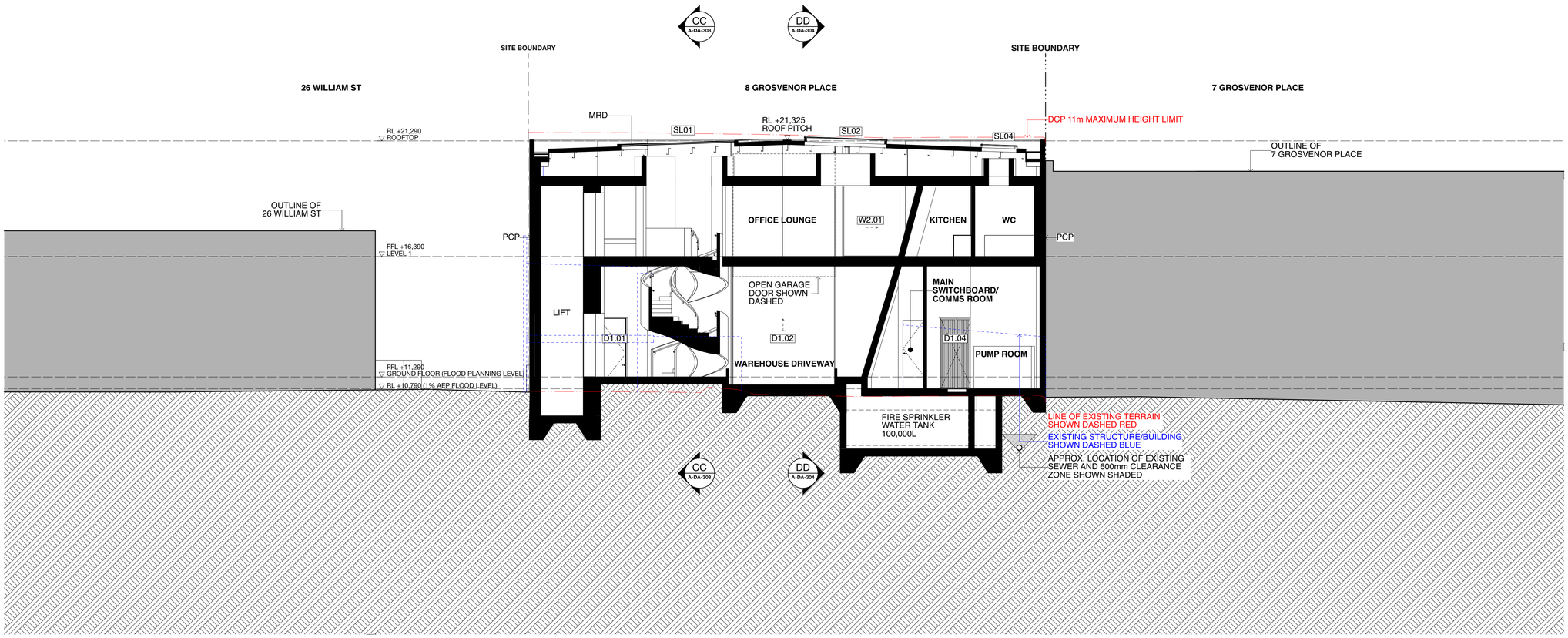
FULL SIZE ON ORIGINAL



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2103 - BROOKVALE

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SWELL TRADING PTY LTD
8 GROSVENOR PLACE BROOKVALE NSW 2100
LOT 1 DP599064

DRAWING TITLE:

SECTIONS A-A

DRAWING NUMBER:
A-DA-301 PRELIMINARY

DATE:	DRAWN BY:	CHECKED BY:
December 2021	**AH**	**TCC**

SCALE:	JOB NO:	NO. IN SET:	AMENDMENT:
1:100 @ A1 **1:200 @ A3**	**2103**	**13**	**D**

0 10 20 30 40 50 60 70 80 90 100mm
FULL SIZE ON ORIGINAL

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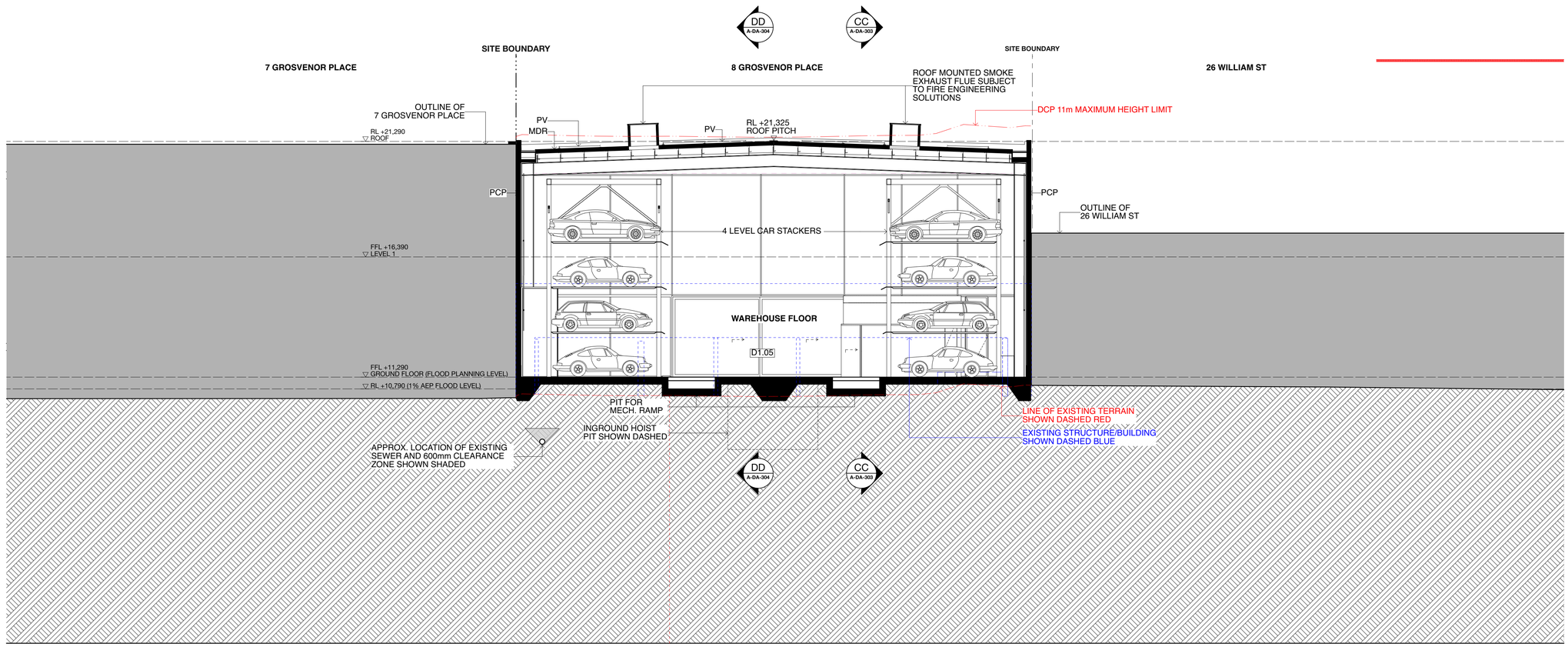

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DEVELOPMENT APPLICATION
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2103 - BROOKVALE

WAREHOUSE FOR
SWELL TRADING PTY LTD
8 GROSVENOR PLACE BROOKVALE NSW 2100
LOT 1 DP599064

DRAWING TITLE:
SECTIONS B-B

DRAWING NUMBER:
A-DA-302 PRELIMINARY

DATE:	DRAWN BY:	CHECKED BY:
December 2021	**AH**	**TCC**

SCALE:	JOB NO:	NO. IN SET:	AMENDMENT:
1:100 @ A1 **1:200 @ A3**	**2103**	**14**	**D**

0 10 20 30 40 50 60 70 80 90 100mm
FULL SIZE ON ORIGINAL

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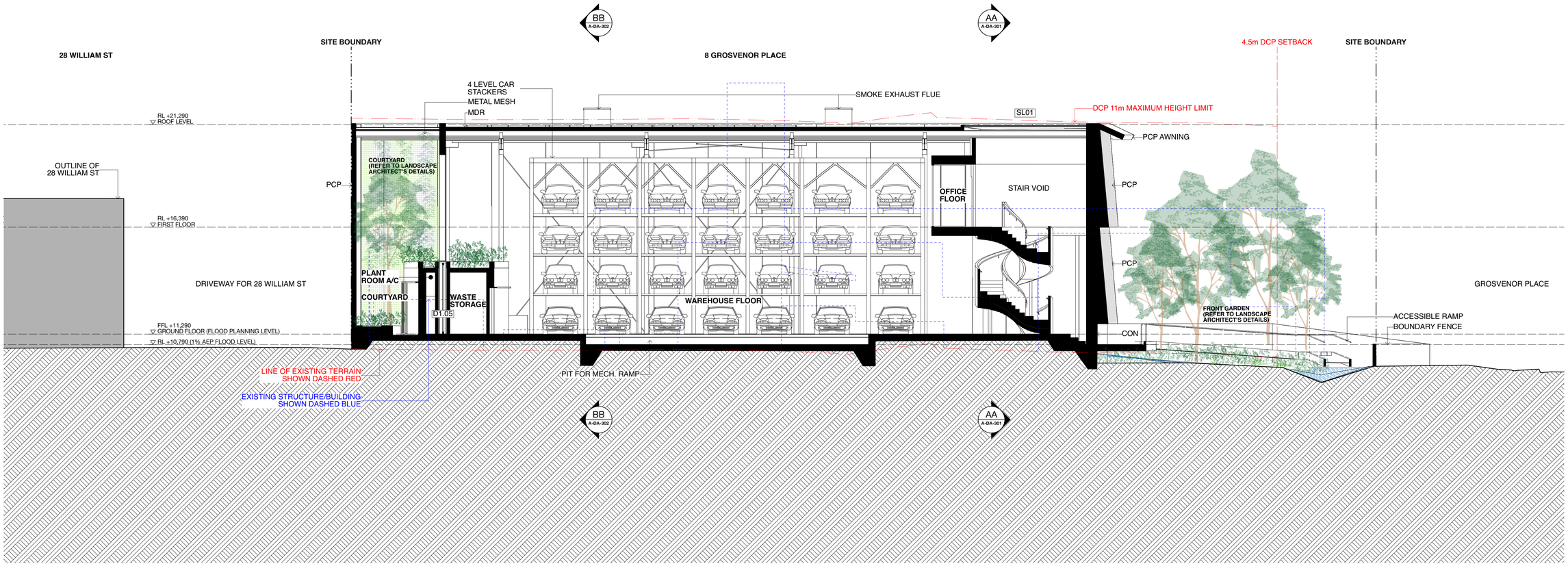

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LOT 1 DP599064

DRAWING TITLE:
SECTIONS C-C

DRAWING NUMBER:
A-DA-303 PRELIMINARY

DATE:	DRAWN BY:	CHECKED BY:
December 2021	**AH**	**TCC**

SCALE:	JOB NO:	NO. IN SET:	AMENDMENT:
1:100 @ A1 **1:200 @ A3**	**2103**	**15**	**D**

0 10 20 30 40 50 60 70 80 90 100mm
FULL SIZE ON ORIGINAL

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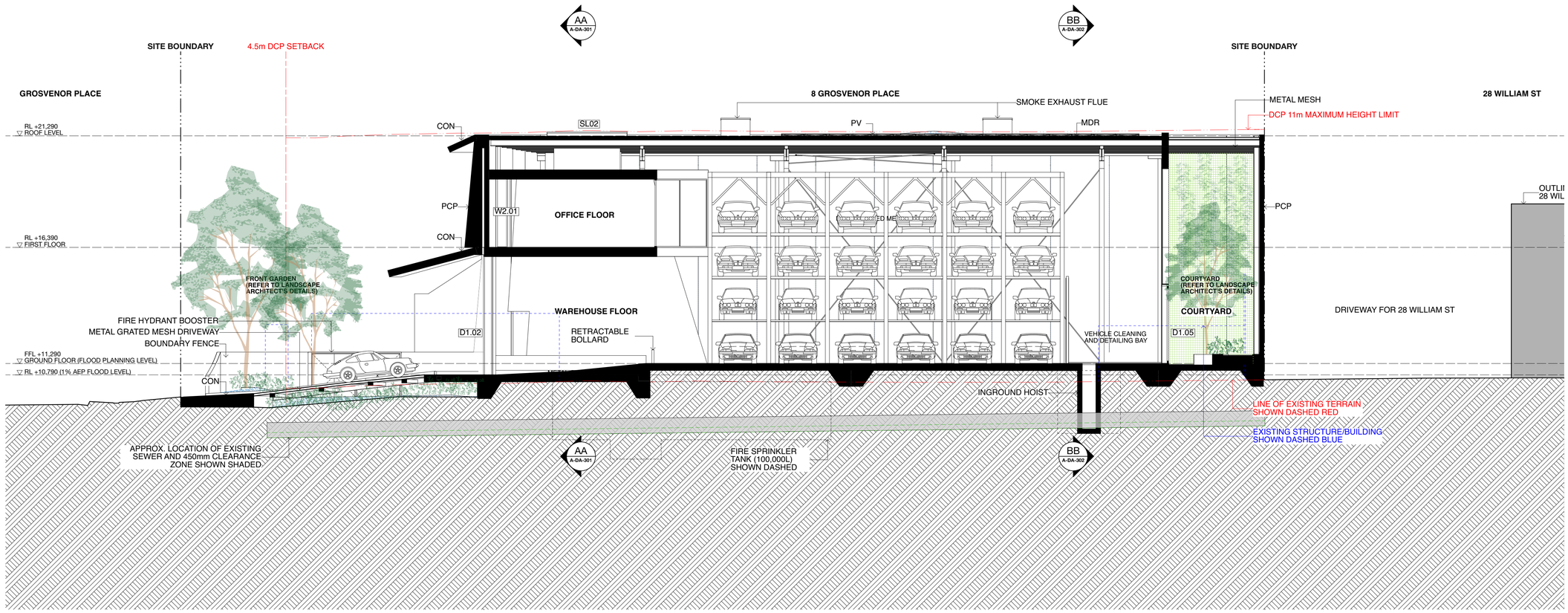

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LOT 1 DP599064

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1:100 @ A1 **1:200 @ A3**	**2103**	**16**	**D**

0 10 20 30 40 50 60 70 80 90 100mm
FULL SIZE ON ORIGINAL

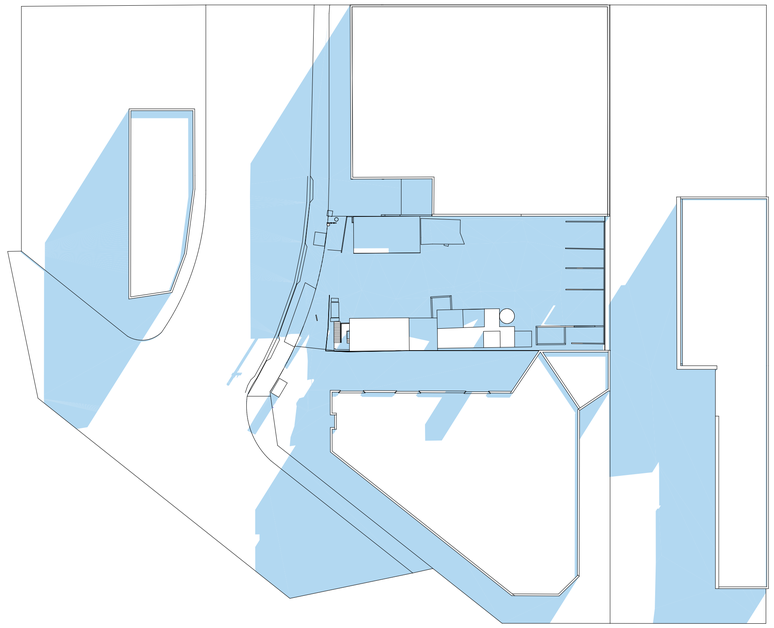
N

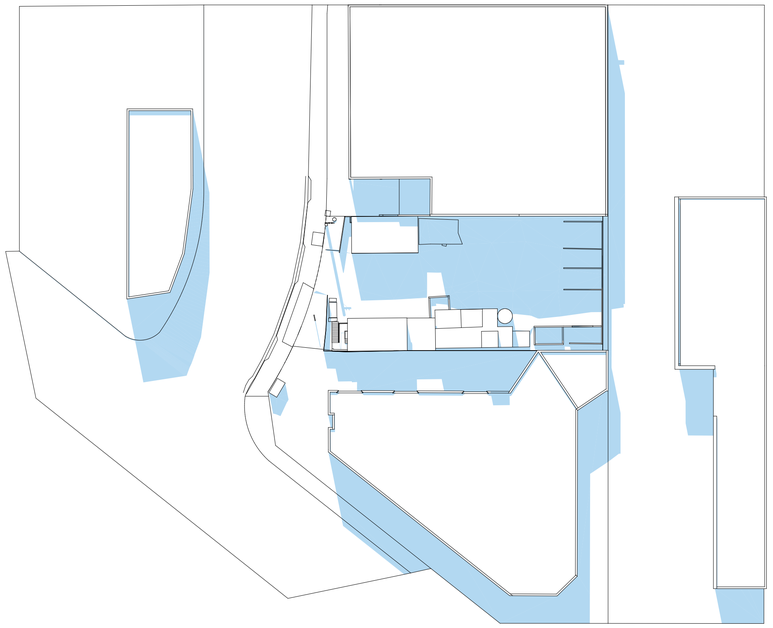
JUNE 21ST
9:00AM

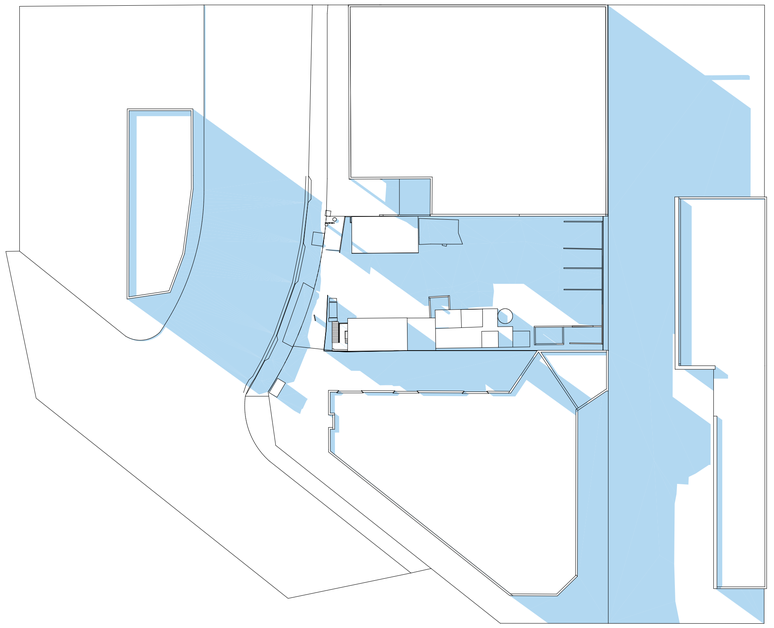
JUNE 21ST
12:00PM

JUNE 21ST
12:00PM

EXISTING







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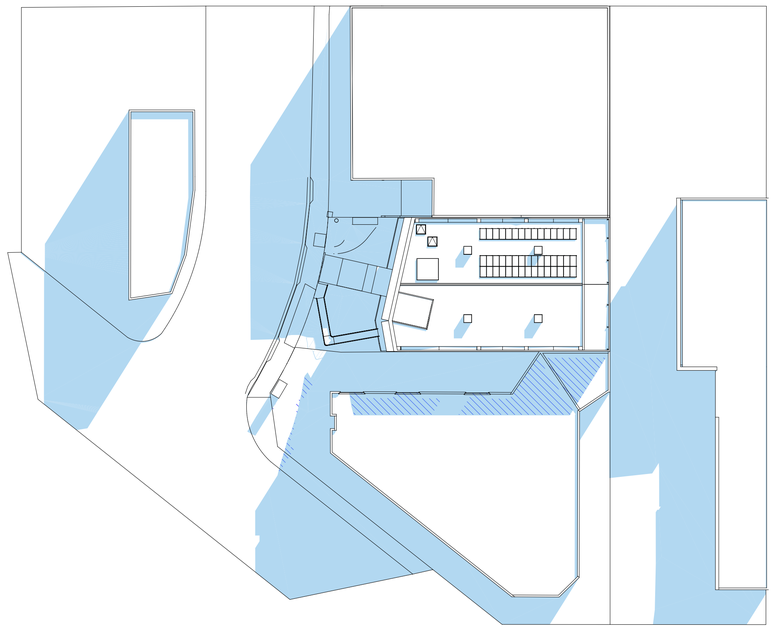

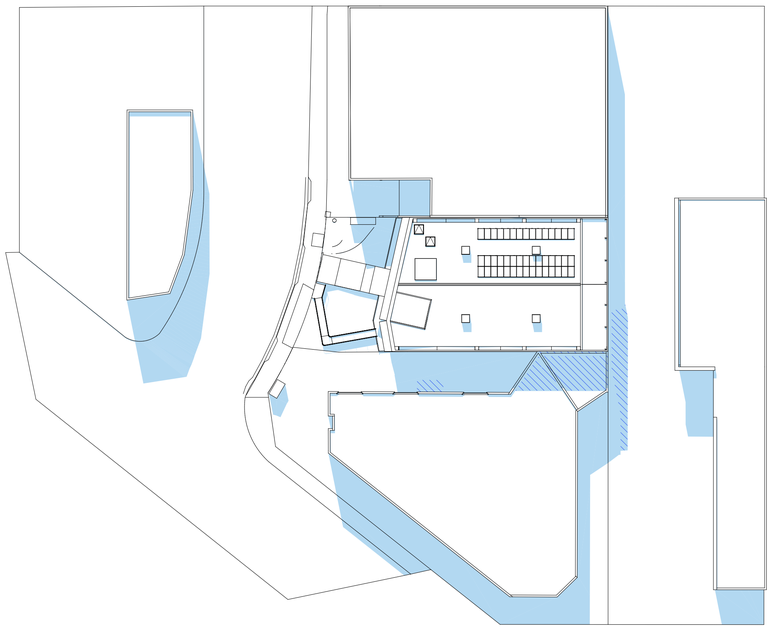

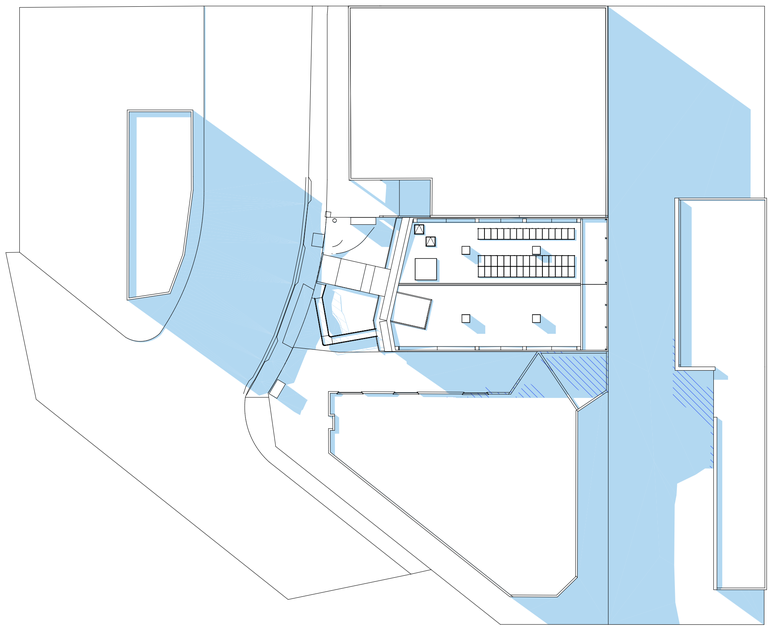

ADDITIONAL SHADOW
CAST ON JUNE 22
FROM PROPOSAL

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8 GROSVENOR PLACE BROOKVALE NSW 2100
LOT 1 DP599064

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SHADOW IMPACT DIAGRAMS

DRAWING NUMBER:
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PRELIMINARY

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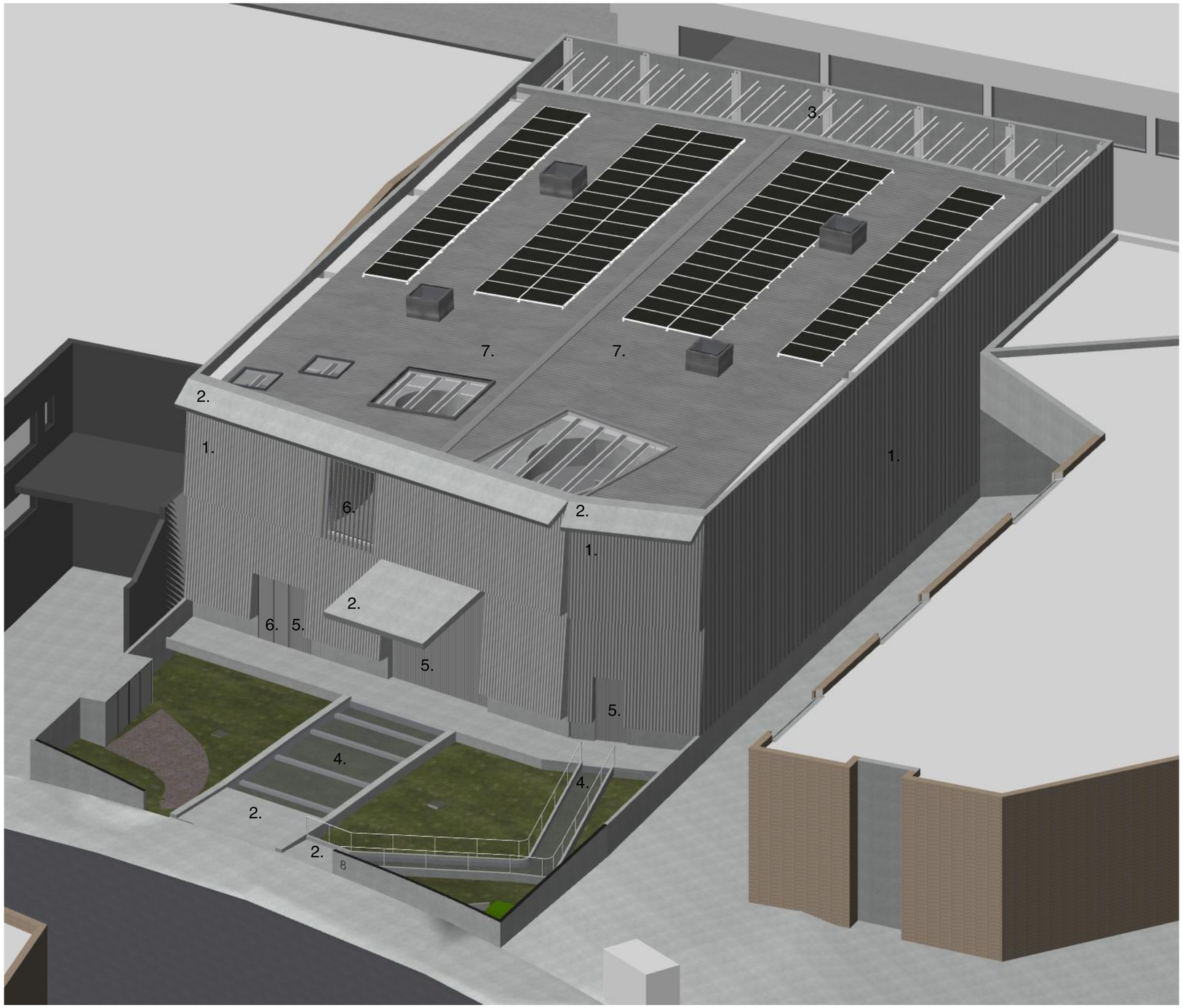
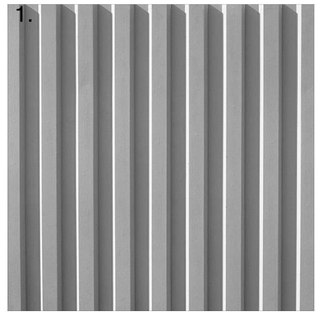
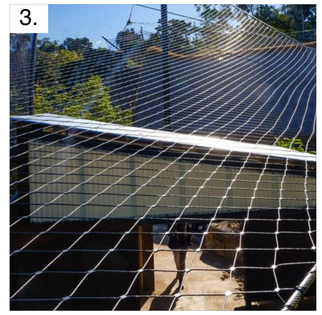
FULL SIZE ON ORIGINAL

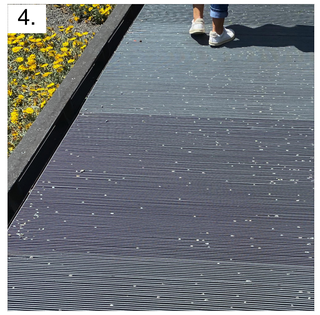


SCHEDULE OF COLOURS AND MATERIALS

1.	PRE-CAST CONCRETE PANELS (PCP)
2.	CONCRETE (CON)
3.	METAL MESH
4.	METAL GRATED MESH
5.	GARAGE DOOR/DOOR - METAL VERTICAL BATTEN
6.	VERTICAL BATTEN SCREEN (SCR)
7.	METAL DECK ROOF (MDR)







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DRAWING TITLE:
SCHEDULE OF COLOURS AND MATERIALS

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0 10 20 30 40 50 60 70 80 90 100mm
FULL SIZE ON ORIGINAL

N

Appendix C: JKE GCS Data Summary Tables and Borehole Logs

JKE GCS Data Summary Tables

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ADWG: AustralianDrinking Water Guidelines
ANZG Australian and New Zealand Guidelines
B(a)P: Benzo(a)pyrene
CRC: Cooperative Research Centre
ESLs: Ecological Screening Levels
GIL: Groundwater Investigation Levels
HILs: Health Investigation Levels
HSLs: Health Screening Levels
HSL-SSA: Health Screening Level-SiteSpecific Assessment
NA: Not Analysed
NC: Not Calculated
NEPM: National Environmental Protection Measure
NHMRC: National Health and Medical Research Council
NL: Not Limiting
NSL: No Set Limit
OCP: Organochlorine Pesticides
OPP: Organophosphorus Pesticides
PAHs: Polycyclic Aromatic Hydrocarbons
ppm: Parts per million
PCBs: Polychlorinated Biphenyls
PCE: Perchloroethylene (Tetrachloroethylene or Tetrachloroethene)
PQL: Practical Quantitation Limit
RS: Rinsate Sample
RSL: Regional Screening Levels
SAC: Site Assessment Criteria
SSA: Site Specific Assessment
SSHSLs Site Specific Health Screening Levels
TB: Trip Blank
TCA: 1,1,1 Trichloroethane (methyl chloroform)
TCE: Trichloroethylene (Trichloroethene)
TS: Trip Spike
TRH: Total Recoverable Hydrocarbons
UCL: Upper Level Confidence Limit on Mean Value
USEPA United States Environmental Protection Agency
VOCC: Volatile Organic Chlorinated Compounds
WHO: World Health Organisation

TABLE G1
SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO ECOLOGICAL GILs SAC
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	ANZG 2018 Fresh Waters	SAMPLES						
			MW101	MW101 LAB DUP	MW102	MW102 LAB DUP	MW103	WDUP1	WDUP2
Inorganic Compounds and Parameters									
pH		6.5 - 8.5	5.7	NA	6	NA	6.8	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	**200**	NA	**430**	NA	**790**	NA	NA
Metals and Metalloids									
Arsenic (As III)	1	24	<1	<1	<1	NA	**4**	**4**	<1
Cadmium	0.1	0.2	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Chromium (SAC for Cr III adopted)	1	3.3	**3**	**3**	<1	NA	<1	<1	<1
Copper	1	1.4	<1	<1	<1	NA	<1	<1	<1
Lead	1	3.4	<1	<1	<1	NA	<1	<1	<1
Total Mercury (inorganic)	0.05	0.06	<0.05	<0.05	<0.05	NA	<0.05	<0.05	<0.05
Nickel	1	11	<1	<1	<1	NA	<1	<1	<1
Zinc	1	8	**8**	**8**	**7**	NA	**5**	**5**	**8**
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)									
Benzene	1	950	<1	NA	<1	<1	<1	<1	<1
Toluene	1	180	<1	NA	**1**	**1**	<1	<1	**1**
Ethylbenzene	1	80	<1	NA	**2**	**2**	<1	<1	**1**
m+p-xylene	2	75	<2	NA	**2**	<2	<2	<2	<2
o-xylene	1	350	<1	NA	<1	<1	<1	<1	<1
Total xylenes	2	NSL	<2	NA	**2**	<2	<2	<2	<2
Volatile Organic Compounds (VOCs), including chlorinated VOCs									
Dichlorodifluoromethane	10	NSL	<10	NA	<10	<10	<10	<10	<10
Chloromethane	10	NSL	<10	NA	<10	<10	<10	<10	<10
Vinyl Chloride	10	100	<10	NA	<10	<10	<10	<10	<10
Bromomethane	10	NSL	<10	NA	<10	<10	<10	<10	<10
Chloroethane	10	NSL	<10	NA	<10	<10	<10	<10	<10
Trichlorofluoromethane	10	NSL	<10	NA	<10	<10	<10	<10	<10
1,1-Dichloroethene	1	700	<1	NA	<1	<1	<1	<1	<1
Trans-1,2-dichloroethene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,1-dichloroethane	1	90	<1	NA	<1	<1	<1	<1	<1
Cis-1,2-dichloroethene	1	NSL	<1	NA	<1	<1	<1	<1	<1
Bromochloromethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
Chloroform	1	370	<1	NA	<1	<1	1	1	<1
2,2-dichloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2-dichloroethane	1	1900	<1	NA	<1	<1	<1	<1	<1
1,1,1-trichloroethane	1	270	<1	NA	<1	<1	<1	<1	<1
1,1-dichloropropene	1	NSL	<1	NA	<1	<1	<1	<1	<1
Cyclohexane	1	NSL	<1	NA	<1	<1	<1	<1	<1
Carbon tetrachloride	1	240	<1	NA	<1	<1	<1	<1	<1
Benzene	1	950	<1	NA	<1	<1	<1	<1	<1
Dibromomethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2-dichloropropane	1	900	<1	NA	<1	<1	<1	<1	<1
Trichloroethene	1	330	<1	NA	<1	<1	<1	<1	<1
Bromodichloromethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
trans-1,3-dichloropropene	1	NSL	<1	NA	<1	<1	<1	<1	<1
cis-1,3-dichloropropene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,1,2-trichloroethane	1	6500	<1	NA	<1	<1	<1	<1	<1
Toluene	1	180	<1	NA	**1**	**1**	<1	<1	<1
1,3-dichloropropane	1	1100	<1	NA	<1	<1	<1	<1	<1
Dibromochloromethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2-dibromoethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
Tetrachloroethene	1	70	<1	NA	<1	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
Chlorobenzene	1	55	<1	NA	<1	<1	<1	<1	<1
Ethylbenzene	1	80	<1	NA	**2**	**2**	<1	<1	**1**
Bromoform	1	NSL	<1	NA	<1	<1	<1	<1	<1
m+p-xylene	2	75	<2	NA	**2**	<2	<2	<2	<2
Styrene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	1	400	<1	NA	<1	<1	<1	<1	<1
o-xylene	1	350	<1	NA	<1	<1	<1	<1	<1
1,2,3-trichloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1
Isopropylbenzene	1	30	<1	NA	<1	<1	<1	<1	<1
Bromobenzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
n-propyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
2-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	<1	<1
4-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,3,5-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
Tert-butyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2,4-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,3-dichlorobenzene	1	260	<1	NA	<1	<1	<1	<1	<1
Sec-butyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,4-dichlorobenzene	1	60	<1	NA	<1	<1	<1	<1	<1
4-isopropyl toluene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2-dichlorobenzene	1	160	<1	NA	<1	<1	<1	<1	<1
n-butyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2,4-trichlorobenzene	1	85	<1	NA	<1	<1	<1	<1	<1
Hexachlorobutadiene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2,3-trichlorobenzene	1	3	<1	NA	<1	<1	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)									
Naphthalene	0.2	16	<0.2	<0.2	<0.2	NA	<0.2	<0.2	**0.1**
Acenaphthylene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Phenanthrene	0.1	0.6	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Anthracene	0.1	0.01	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Fluoranthene	0.1	1	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Pyrene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	**0.1**
Benzo(a)anthracene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2	<0.2	<0.2	NA	<0.2	<0.2	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**
GIL >PQL	Red

TABLE G2
SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO HUMAN CONTACT GILs
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	Recreational (10 x NHMRC ADWG)	SAMPLES						
			MW101	MW101 LAB DUP	MW102	MW102 LAB DUP	MW103	WDUP1	WDUP2
Inorganic Compounds and Parameters									
pH		6.5 - 8.5	5.7	NA	6	NA	6.8	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	**200**	NA	**430**	NA	**790**	NA	NA
Metals and Metalloids									
Arsenic (As III)	1	100	<1	<1	<1	NA	**4**	**4**	<1
Cadmium	0.1	20	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Chromium (total)	1	500	**3**	**3**	<1	NA	<1	<1	<1
Copper	1	20000	<1	<1	<1	NA	<1	<1	<1
Lead	1	100	<1	<1	<1	NA	<1	<1	<1
Total Mercury (inorganic)	0.05	10	<0.05	<0.05	<0.05	NA	<0.05	<0.05	<0.05
Nickel	1	200	<1	<1	<1	NA	<1	<1	<1
Zinc	1	30000	**8**	**8**	**7**	NA	**5**	**5**	**8**
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)									
Benzene	1	10	<1	NA	<1	<1	<1	<1	<1
Toluene	1	8000	<1	NA	**1**	**1**	<1	<1	**1**
Ethylbenzene	1	3000	<1	NA	**2**	**2**	<1	<1	**1**
m+p-xylene	2	NSL	<2	NA	**2**	<2	<2	<2	<2
o-xylene	1	NSL	<1	NA	<1	<1	<1	<1	<1
Total xylenes	2	6000	<2	NA	**2**	<2	<2	<2	<2
Volatile Organic Compounds (VOCs), including chlorinated VOCs									
Dichlorodifluoromethane	10	NSL	<10	NA	<10	<10	<10	<10	<10
Chloromethane	10	NSL	<10	NA	<10	<10	<10	<10	<10
Vinyl Chloride	10	3	<10	NA	<10	<10	<10	<10	<10
Bromomethane	10	NSL	<10	NA	<10	<10	<10	<10	<10
Chloroethane	10	NSL	<10	NA	<10	<10	<10	<10	<10
Trichlorofluoromethane	10	NSL	<10	NA	<10	<10	<10	<10	<10
1,1-Dichloroethene	1	300	<1	NA	<1	<1	<1	<1	<1
Trans-1,2-dichloroethene	1	600	<1	NA	<1	<1	<1	<1	<1
1,1-dichloroethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
Cis-1,2-dichloroethene	1	600	<1	NA	<1	<1	<1	<1	<1
Bromochloromethane	1	2500	<1	NA	<1	<1	<1	<1	<1
Chloroform	1		<1	NA	<1	<1	1	1	<1
2,2-dichloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2-dichloroethane	1	30	<1	NA	<1	<1	<1	<1	<1
1,1,1-trichloroethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,1-dichloropropene	1	NSL	<1	NA	<1	<1	<1	<1	<1
Cyclohexane	1	NSL	<1	NA	<1	<1	<1	<1	<1
Carbon tetrachloride	1	30	<1	NA	<1	<1	<1	<1	<1
Benzene	1	10	<1	NA	<1	<1	<1	<1	<1
Dibromomethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2-dichloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1
Trichloroethene	1	NSL	<1	NA	<1	<1	<1	<1	<1
Bromodichloromethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
trans-1,3-dichloropropene	1	1000	<1	NA	<1	<1	<1	<1	<1
cis-1,3-dichloropropene	1	1000	<1	NA	<1	<1	<1	<1	<1
1,1,2-trichloroethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
Toluene	1	8000	<1	NA	**1**	**1**	<1	<1	<1
1,3-dichloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1
Dibromochloromethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2-dibromoethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
Tetrachloroethene	1	500	<1	NA	<1	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
Chlorobenzene	1	3000	<1	NA	<1	<1	<1	<1	<1
Ethylbenzene	1	3000	<1	NA	**2**	**2**	<1	<1	**1**
Bromoform	1	NSL	<1	NA	<1	<1	<1	<1	<1
m+p-xylene	2	NSL	<2	NA	**2**	<2	<2	<2	<2
Styrene	1	300	<1	NA	<1	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	1	NSL	<1	NA	<1	<1	<1	<1	<1
o-xylene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2,3-trichloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1
Isopropylbenzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
Bromobenzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
n-propyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
2-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	<1	<1
4-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,3,5-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
Tert-butyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2,4-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,3-dichlorobenzene	1	200	<1	NA	<1	<1	<1	<1	<1
Sec-butyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,4-dichlorobenzene	1	400	<1	NA	<1	<1	<1	<1	<1
4-isopropyl toluene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2-dichlorobenzene	1	15000	<1	NA	<1	<1	<1	<1	<1
n-butyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1
1,2,4-trichlorobenzene	1	300	<1	NA	<1	<1	<1	<1	<1
1,2,3-trichlorobenzene	1		<1	NA	<1	<1	<1	<1	<1
Hexachlorobutadiene	1	7	<1	NA	<1	<1	<1	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)									
Naphthalene	0.2	NSL	<0.2	<0.2	<0.2	NA	<0.2	<0.2	**0.1**
Acenaphthylene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Phenanthrene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Anthracene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Fluoranthene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Pyrene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	**0.1**
Benzo(a)anthracene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2	<0.2	<0.2	NA	<0.2	<0.2	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**
GIL >PQL	Red

TABLE G3
GROUNDWATER LABORATORY RESULTS COMPARED TO SITE SPECIFIC HSLs - RISK ASSESSMENT
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	NHMRC ADWG 2011	WHO 2008	USEPA RSL Tapwater 2017	SAMPLES						
					MW101	MW101 LAB DUP	MW102	MW102 LAB DUP	MW103	WDUP1	WDUP2
Total Recoverable Hydrocarbons (TRH)											
C_6-C_9 Aliphatics (assessed using F1)	10	-	15000	-	<10	NA	<10	<10	<10	<10	**12**
>C_9-C_{14} Aliphatics (assessed using F2)	50	-	100	-	<50	[NT]	<50	NA	<50	<50	<50
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)											
Benzene	1	1	-	-	<1	NA	<1	<1	<1	<1	<1
Toluene	1	800	-	-	<1	NA	**1**	**1**	<1	<1	**1**
Ethylbenzene	1	300	-	-	<1	NA	**2**	**2**	<1	<1	**1**
Total xylenes	2	600	-	-	<2	NA	**2**	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons (PAHs)											
Naphthalene	1	-	-	6.1	<1	NA	<1	<1	<1	<1	<1
Volatile Organic Compounds (VOCs), including chlorinated VOCs											
Dichlorodifluoromethane	10	-	-	-	<10	NA	<10	<10	<10	<10	<10
Chloromethane	10	-	-	-	<10	NA	<10	<10	<10	<10	<10
Vinyl Chloride	10	0.3	-	-	<10	NA	<10	<10	<10	<10	<10
Bromomethane	10	-	-	-	<10	NA	<10	<10	<10	<10	<10
Chloroethane	10	-	-	-	<10	NA	<10	<10	<10	<10	<10
Trichlorofluoromethane	10	-	-	-	<10	NA	<10	<10	<10	<10	<10
1,1-Dichloroethene	1	30	-	-	<1	NA	<1	<1	<1	<1	<1
Trans-1,2-dichloroethene	1	60	-	-	<1	NA	<1	<1	<1	<1	<1
1,1-dichloroethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
Cis-1,2-dichloroethene	1	60	-	-	<1	NA	<1	<1	<1	<1	<1
Bromochloromethane	1	250	-	-	<1	NA	<1	<1	<1	<1	<1
Chloroform	1		-	-	<1	NA	<1	<1	**1**	**1**	<1
2,2-dichloropropane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
1,2-dichloroethane	1	3	-	-	<1	NA	<1	<1	<1	<1	<1
1,1,1-trichloroethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
1,1-dichloropropene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
Cyclohexane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
Carbon tetrachloride	1	3	-	-	<1	NA	<1	<1	<1	<1	<1
Benzene	1	1	-	-	<1	NA	<1	<1	<1	<1	<1
Dibromomethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
1,2-dichloropropane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
Trichloroethene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
Bromodichloromethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
trans-1,3-dichloropropene	1	100	-	-	<1	NA	<1	<1	<1	<1	<1
cis-1,3-dichloropropene	1	100	-	-	<1	NA	<1	<1	<1	<1	<1
1,1,2-trichloroethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
Toluene	1	800	-	-	<1	NA	**1**	**1**	<1	<1	<1
1,3-dichloropropane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
Dibromochloromethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
1,2-dibromoethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
Tetrachloroethene	1	50	-	-	<1	NA	<1	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
Chlorobenzene	1	300	-	-	<1	NA	<1	<1	<1	<1	<1
Ethylbenzene	1	300	-	-	<1	NA	**2**	**2**	<1	<1	**1**
Bromoform	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
m+p-xylene	2	-	-	-	<2	NA	**2**	<2	<2	<2	<2
Styrene	1	30	-	-	<1	NA	<1	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
o-xylene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
1,2,3-trichloropropane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
Isopropylbenzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
Bromobenzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
n-propyl benzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
2-chlorotoluene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
4-chlorotoluene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
1,3,5-trimethyl benzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
Tert-butyl benzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
1,2,4-trimethyl benzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
1,3-dichlorobenzene	1	20	-	-	<1	NA	<1	<1	<1	<1	<1
Sec-butyl benzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
1,4-dichlorobenzene	1	40	-	-	<1	NA	<1	<1	<1	<1	<1
4-isopropyl toluene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
1,2-dichlorobenzene	1	1500	-	-	<1	NA	<1	<1	<1	<1	<1
n-butyl benzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1
1,2,4-trichlorobenzene	1	30	-	-	<1	NA	<1	<1	<1	<1	<1
1,2,3-trichlorobenzene	1		-	-	<1	NA	<1	<1	<1	<1	<1
Hexachlorobutadiene	1	7	-	-	<1	NA	<1	<1	<1	<1	<1

Concentration above the SAC — **VALUE**
Concentration above the PQL — **Bold**
GIL >PQL — Red

JKEnvironments

TABLE q1
GROUNDWATER QA/QC SUMMARY

		Dichlorodifluoromethane	Chloromethane	Vinyl Chloride	Bromomethane	Chloroethane	Trichlorofluoromethane	1,1-Dichloroethene	Trans-1,2-dichloroethene	1,1-dichloroethane	Cis-1,2-dichloroethene	Bromochloromethane	Chloroform	2,2-dichloropropane	1,2-dichloroethane	1,1,1-trichloroethane	1,1-dichloropropene	Cyclohexane	Carbon tetrachloride	Benzene	Dibromomethane	1,2-dichloropropane	Trichloroethene	Bromodichloromethane	trans-1,3-dichloropropene	cis-1,3-dichloropropene	1,1,2-trichloroethane	Toluene	1,3-dichloropropane	Dibromochloromethane	1,2-dibromoethane	Tetrachloroethene	1,1,1,2-tetrachloroethane	Chlorobenzene	Ethylbenzene	Bromoform	m+p-xylene	Styrene	1,1,2,2-tetrachloroethane	o-xylene	1,2,3-trichloropropane	Isopropylbenzene	Bromobenzene	n-propyl benzene	2-chlorotoluene	4-chlorotoluene	1,3,5-trimethyl benzene	Tert-butyl benzene	1,2,4-trimethyl benzene	1,3-dichlorobenzene	Sec-butyl benzene	1,4-dichlorobenzene	4-isopropyl toluene	1,2-dichlorobenzene	n-butyl benzene	1,2-dibromo-3-chloropropane	1,2,4-trichlorobenzene	Hexachlorobutadiene	1,2,3-trichlorobenzene
	PQL Envirolab SYD	*10*	*10*	*10*	*10*	*10*	*10*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
	PQL Envirolab VIC	*10*	*10*	*10*	*10*	*10*	*10*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	2	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Intra laboratory duplicate	MW103	<10	<10	<10	<10	<10	<10	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	WDUP1	<10	<10	<10	<10	<10	<10	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	1	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Inter laboratory duplicate	MW102	<10	<10	<10	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2	<1	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	WDUP2	<10	<10	<10	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.75	nc	nc	nc	nc	nc	nc	1.5	nc	1.5	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	67%	nc	nc	nc	nc	nc	nc	67%	nc	67%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc

		TRH C6 - C10	TRH >C10-C16	TRH >C16-C34	TRH >C34-C40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-Xylene	Naphthalene	Acenaphthylene	Acenaph-thene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b,j+k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h)anthra-cene	Benzo(g,h,i)perylene	Arsenic	Cadmium	Chromium VI	Copper	Lead	Mercury	Nickel	Zinc
	PQL Envirolab SYD	*10*	*50*	*100*	*100*	*1*	*1*	*1*	*2*	*1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*1*	*0.1*	*1*	*1*	*1*	*0.05*	*1*	*1*
	PQL Envirolab VIC	*10*	*50*	*100*	*100*	*1.0*	*1.0*	*1.0*	*2.0*	*1.0*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*1*	*0.1*	*1*	*1*	*1*	*0.05*	*1*	*1*
Intra laboratory duplicate	MW103	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	4	<0.1	<1	<1	<1	<0.05	<1	5
	WDUP1	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	4	<0.1	<1	<1	<1	<0.05	<1	5
	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	4	nc	nc	nc	nc	nc	nc	5
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	nc	nc	nc	nc	nc	nc	0%
Inter laboratory duplicate	MW102	<10	<50	<100	<100	<1	1	2	2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<1	<1	<0.05	<1	7
	WDUP2	14	<50	160	<100	<1	1	1	<2	<1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<1	<1	<0.05	<1	8
	MEAN	9.5	nc	105	nc	nc	1	1.5	1.5	nc	0.1	nc	nc	nc	nc	nc	nc	0.075	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	7.5
	RPD %	95%	nc	105%	nc	nc	0%	67%	67%	nc	0%	nc	nc	nc	nc	nc	nc	67%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	67%
Field Blank	TB-W1 12/10/2021	<10	NA	NA	NA	<1	<1	<1	<2	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trip Spike	TS-W1 12/10/2021	-	-	-	-	96%	109%	118%	110%	113%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Result outside of QA/QC acceptance criteria Value

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

CT:	Contaminant Threshold
FTS:	Fluorotelomer sulfonic acid
NA:	Not Analysed
NC:	Not Calculated
NEMP	National Environmental Management Plan
NSL:	No Set Limit
PFAS	Per- and polyfluoroalkyl substances
PFHxS	Perfluorohexanesulfonic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PQL:	Practical Quantitation Limit
RS:	Rinsate Sample
SAC:	Site Assessment Criteria
SCC:	Specific Contaminant Concentration
TB:	Trip Blank
TCLP:	Toxicity Characteristics Leaching Procedure
TS:	Trip Spike
UCL:	Upper Level Confidence Limit on Mean Value

Table Specific Explanations:

Groundwater Ecology Tables:

- 95% refers to a concentration that has been derived to protect 95% of aquatic species

TABLE
SUMMARY OF PFAS CONCENTRATIONS IN GROUNDWATER - ECOLOGY
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	NEMP 2018 95% Freshwater	SAMPLES			
			MW101	MW102	MW102 LAB DUP	MW103
PFAS Compound						
Perfluorobutanesulfonic acid	0.1	NSL	<0.01	**0.01**	**0.01**	<0.01
Perfluoropentanesulfonic acid	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Perfluoroheptanesulfonic acid	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Perfluorooctanesulfonic acid PFOS	0.1	0.13	<0.01	<0.01	<0.01	<0.01
Perfluorodecanesulfonic acid	0.2	NSL	<0.02	<0.02	<0.02	<0.02
Perfluorobutanoic acid	0.2	NSL	<0.02	<0.02	<0.02	<0.02
Perfluoropentanoic acid	0.2	NSL	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Perfluoroheptanoic acid	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Perfluorooctanoic acid PFOA	0.1	220	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Perfluorodecanoic acid	0.5	NSL	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid	0.5	NSL	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid	0.5	NSL	<0.05	<0.05	<0.05	<0.05
Perfluorotridecanoic acid	0.5	NSL	<0.1	<0.1	<0.1	<0.1
Perfluorotetradecanoic acid	5	NSL	<0.5	<0.5	<0.5	<0.5
4:2 FTS	0.1	NSL	<0.01	<0.01	<0.01	<0.01
6:2 FTS	0.1	NSL	<0.01	<0.01	<0.01	<0.01
8:2 FTS	0.1	NSL	<0.02	<0.02	<0.02	<0.02
10:2 FTS	0.1	NSL	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonamide	1	NSL	<0.1	<0.1	<0.1	<0.1
N-Methyl perfluorooctane sulfonamide	1	NSL	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctanesulfon amide	1	NSL	<0.1	<0.1	<0.1	<0.1
N-Me perfluorooctanesulfonamid oethanol	1	NSL	<0.05	<0.05	<0.05	<0.05
N-Et perfluorooctanesulfonamid oethanol	5	NSL	<0.5	<0.5	<0.5	<0.5
MePer uorooctanesulf-amid oacetic acid	0.2	NSL	<0.02	<0.02	<0.02	<0.02
EtPer uorooctanesulf-amid oacetic acid	0.2	NSL	<0.02	<0.02	<0.02	<0.02
Total Positive PFHxS & PFOS	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Total Positive PFOS & PFOA	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Total Positive PFAS	0.1	NSL	<0.01	**0.01**	**0.01**	<0.01

Positive PFAS result **Bold**
PFAS result above the SAC **Bold**

TABLE
SUMMARY OF PFAS CONCENTRATIONS IN GROUNDWATER - HUMAN HEALTH
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	NEMP 2020 Recreational	SAMPLES			
			MW101	MW102	MW102 LAB DUP	MW103
PFAS Compound						
Perfluorobutanesulfonic acid	0.1	NSL	<0.01	**0.01**	**0.01**	<0.01
Perfluoropentanesulfonic acid	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Perfluoroheptanesulfonic acid	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Perfluorooctanesulfonic acid PFOS	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Perfluorodecanesulfonic acid	0.2	NSL	<0.02	<0.02	<0.02	<0.02
Perfluorobutanoic acid	0.2	NSL	<0.02	<0.02	<0.02	<0.02
Perfluoropentanoic acid	0.2	NSL	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Perfluoroheptanoic acid	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Perfluorooctanoic acid PFOA	0.1	5.6	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Perfluorodecanoic acid	0.5	NSL	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid	0.5	NSL	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid	0.5	NSL	<0.05	<0.05	<0.05	<0.05
Perfluorotridecanoic acid	0.5	NSL	<0.1	<0.1	<0.1	<0.1
Perfluorotetradecanoic acid	5	NSL	<0.5	<0.5	<0.5	<0.5
4:2 FTS	0.1	NSL	<0.01	<0.01	<0.01	<0.01
6:2 FTS	0.1	NSL	<0.01	<0.01	<0.01	<0.01
8:2 FTS	0.1	NSL	<0.02	<0.02	<0.02	<0.02
10:2 FTS	0.1	NSL	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonamide	1	NSL	<0.1	<0.1	<0.1	<0.1
N-Methyl perfluorooctane sulfonamide	1	NSL	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctanesulfon amide	1	NSL	<0.1	<0.1	<0.1	<0.1
N-Me perfluorooctanesulfonamid oethanol	1	NSL	<0.05	<0.05	<0.05	<0.05
N-Et perfluorooctanesulfonamid oethanol	5	NSL	<0.5	<0.5	<0.5	<0.5
MePer uorooctanesulf-amid oacetic acid	0.2	NSL	<0.02	<0.02	<0.02	<0.02
EtPer uorooctanesulf-amid oacetic acid	0.2	NSL	<0.02	<0.02	<0.02	<0.02
Total Positive PFHxS & PFOS	0.1	0.7	<0.01	<0.01	<0.01	<0.01
Total Positive PFOS & PFOA	0.1	NSL	<0.01	<0.01	<0.01	<0.01
Total Positive PFAS	0.1	NSL	<0.01	**0.01**	**0.01**	<0.01

Positive PFAS result **Bold**
PFAS result above the SAC **Bold**

JKE GCS Borehole Logs

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **BH/MW101** **1/2**

Client: SWELL TRADING PTY LTD

Project: PROPOSED PRIVATE CAR STORAGE FACILITY DEVELOPMENT

Location: 8 GROSVENOR PLACE, BROOKVALE, NSW

Job No.: E34430BT **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 5/10/2021 **Datum:** -

Plant Type: JK205 **Logged/Checked by:** N.M./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
							0			CONCRETE: 510mm.t				
						N = 18 11,10,8			-	FILL: Silty sandy clay, medium to high plasticity, dark grey, trace of timber, ash and igneous gravel.	M			
ON 12/10/21 ▼							1							
						N = 14 6,8,6				FILL: Silty sandy clay, medium to high plasticity, grey, trace of igneous gravel, and sandstone gravel.				
ON 5/10/21 ▼							2		CL-CI	Silty CLAY: low to medium plasticity, grey.	w>PL			ALLUVIAL ORGANIC ODOUR INCREASING WITH DEPTH
						N = 0 1,0,0	3			as above, but dark grey.				
						N = 1 1,1,0	4							
							5		CI-CH	Silty CLAY: medium to high plasticity, grey mottled light red.	w>PL			
						N = 2 1,1,1	6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **BH/MW101** **2/2**

Client: SWELL TRADING PTY LTD

Project: PROPOSED PRIVATE CAR STORAGE FACILITY DEVELOPMENT

Location: 8 GROSVENOR PLACE, BROOKVALE, NSW

Job No.: E34430BT **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 5/10/2021 **Datum:** -

Plant Type: JK205 **Logged/Checked by:** N.M./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						N = 17 3,4,13			CI-CH	Silty CLAY: medium to high plasticity, grey mottled light red.	w>PL			
							8			END OF BOREHOLE AT 8.0m				Groundwater monitoring well installed to 8.0m. Class 18 machine slotted 50mm dia. PVC standpipe 8.0m to 2.0m. Casing 2.0m to 0.0m. 2mm sand filter pack 8.0m to 1.4m. Bentonite seal 1.4m to 0. 4m. Backfilled with sand to the surface. Completed with a concreted gatic cover.
							9							
							10							
							11							
							12							
							13							
							14							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **BH/MW102** **1/2**

Client: SWELL TRADING PTY LTD

Project: PROPOSED PRIVATE CAR STORAGE FACILITY DEVELOPMENT

Location: 8 GROSVENOR PLACE, BROOKVALE, NSW

Job No.: E34430BT **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 5/10/2021 **Datum:** -

Plant Type: JK205 **Logged/Checked by:** N.M./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
							0			CONCRETE: 180mm.t				
									-	FILL: Silty sandy clay, medium to high plasticity, grey brown, fine to medium grained grey sand, trace of ash, and igneous gravel.	M			
						N = 16 10,8,8	1							
ON 12/10/21 ▼														
						N = 13 6,7,5				FILL: Silty clay, medium to high plasticity, grey brown, trace of sand, and igneous gravel.				
							2							
ON 5/10/21 ▼									CI-CH	Silty CLAY: medium to high plasticity, dark grey.	w>PL			ALLUVIAL ORGANIC ODOUR INCREASING WITH DEPTH
						N = 0 1,0,0	3							
							4							
						N = 2 1,0,1								
							5							
						N = 2 1,1,1	6			as above, but grey mottled light red.				
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **BH/MW102** **2/2**

Client: SWELL TRADING PTY LTD

Project: PROPOSED PRIVATE CAR STORAGE FACILITY DEVELOPMENT

Location: 8 GROSVENOR PLACE, BROOKVALE, NSW

Job No.: E34430BT **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 5/10/2021 **Datum:** -

Plant Type: JK205 **Logged/Checked by:** N.M./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						N = 18 2,5,13			CH	Silty CLAY: high plasticity, grey mottled light red.	w>PL			
							8			END OF BOREHOLE AT 8.0m				Groundwater monitoring well installed to 8.0m. Class 18 machine slotted 50mm dia. PVC standpipe 8.0m to 2.0m. Casing 2.0m to 0.0m. 2mm sand filter pack 8.0m to 0.4m. Bentonite seal 0.5m to 0.15m. Backfilled to the surface. Completed with a concreted gatic cover
							9							
							10							
							11							
							12							
							13							
							14							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **BH/MW103** **1/2**

Client: SWELL TRADING PTY LTD

Project: PROPOSED PRIVATE CAR STORAGE FACILITY DEVELOPMENT

Location: 8 GROSVENOR PLACE, BROOKVALE, NSW

Job No.: E34430BT **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 5/10/2021 **Datum:** -

Plant Type: JK205 **Logged/Checked by:** N.M./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
							0			CONCRETE: 230mm.t				
									-	FILL: Silty sandy clay, medium plasticity, grey, fine to medium grained brown sand, trace of igneous gravel, and organic matter.	M			
ON 12/10/21 ▼						N = 18 11,11,7	1							
						N = 12 7,6,6	2							
									CI-CH	Silty CLAY: medium to high plasticity, dark grey.	w>PL			ALLUVIAL
▼ ON 5/10/21						N = 2 1,1,1	3			as above, but grey mottled light red.				ORGANIC ODOUR INCREASING WITH DEPTH
						N = 0 1,0,0	4							
							5							
						N = 2 0,1,1	6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **BH/MW103** **2/2**

Client: SWELL TRADING PTY LTD

Project: PROPOSED PRIVATE CAR STORAGE FACILITY DEVELOPMENT

Location: 8 GROSVENOR PLACE, BROOKVALE, NSW

Job No.: E34430BT **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 5/10/2021 **Datum:** -

Plant Type: JK205 **Logged/Checked by:** N.M./M.D.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						N = 18 4,2,16			CI-CH	as above, but grey mottled light red.	w>PL			
							8			END OF BOREHOLE AT 8.0m				Groundwater monitoring well installed to 8.0m. Class 18 machine slotted 50mm dia. PVC standpipe 8.0m to 2.0m. Casing 2.0m to 0.0m. 2mm sand filter pack 8.0m to 1.0m. Bentonite seal 1.0m to 0. 4m. Backfilled with sand to the surface. Completed with a concreted gatic cover
							9							
							10							
							11							
							12							
							13							
							14							

ENVIRONMENTAL LOGS EXPLANATION NOTES

INTRODUCTION

These notes have been provided to amplify the environmental report in regard to classification methods, field procedures and certain matters relating to the logging of soil and rock. Not all notes are necessarily relevant to all reports.

Where geotechnical borehole logs are utilised for environmental purpose, reference should also be made to the explanatory notes included in the geotechnical report. Environmental logs are not suitable for geotechnical purposes.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Environmental studies include gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726:2017 *'Geotechnical Site Investigations'*. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geoenvironmental practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached soil classification table qualified by the grading of other particles present (eg. sandy clay) as set out below:

Soil Classification	Particle Size
Clay	< 0.002mm
Silt	0.002 to 0.075mm
Sand	0.075 to 2.36mm
Gravel	2.36 to 63mm
Cobbles	63 to 200mm
Boulders	> 200mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose (VL)	< 4
Loose (L)	4 to 10
Medium dense (MD)	10 to 30
Dense (D)	30 to 50
Very Dense (VD)	> 50

Cohesive soils are classified on the basis of strength (consistency) either by use of a hand penetrometer, vane shear, laboratory testing and/or tactile engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength (kPa)	Indicative Undrained Shear Strength (kPa)
Very Soft (VS)	≤ 25	≤ 12
Soft (S)	> 25 and ≤ 50	> 12 and ≤ 25
Firm (F)	> 50 and ≤ 100	> 25 and ≤ 50
Stiff (St)	> 100 and ≤ 200	> 50 and ≤ 100
Very Stiff (VSt)	> 200 and ≤ 400	> 100 and ≤ 200
Hard (Hd)	> 400	> 200
Friable (Fr)	Strength not attainable – soil crumbles	

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'shale' is used to describe fissile mudstone, with a weakness parallel to bedding. Rocks with alternating inter-laminations of different grain size (eg. siltstone/claystone and siltstone/fine grained sandstone) are referred to as 'laminite'.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All methods except test pits, hand auger drilling and portable Dynamic Cone Penetrometers require the use of a mechanical rig which is commonly mounted on a truck chassis or track base.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils and 'weaker' bedrock if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for a large excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the

structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Refusal of the hand auger can occur on a variety of materials such as obstructions within any fill, tree roots, hard clay, gravel or ironstone, cobbles and boulders, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of limited reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

Rock Augering: Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock cuttings. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be assessed from the cuttings, together with some information from "feel" and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term 'mud' encompasses a range of products ranging from bentonite to polymers. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg. from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, NMLC or HQ triple tube core barrels, which give a core of about 50mm and 61mm diameter, respectively, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as NO CORE. The location of NO CORE recovery is determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the bottom of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289.6.3.1–2004 (R2016) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – Standard Penetration Test (SPT)'*.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63.5kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as

  N = 13
  4, 6, 7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as

  N > 30
  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

A modification to the SPT is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as 'N_c' on the borehole logs, together with the number of blows per 150mm penetration.

LOGS

The borehole or test pit logs presented herein are an interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment, but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The terms and symbols used in preparation of the logs are defined in the following pages.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than 'straight line' variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole or 'reverted' chemically if reliable water observations are to be made.

More reliable measurements can be made by installing standpipes which are read after the groundwater level has stabilised at intervals ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg. bricks, steel, etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably assess the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse environmental characteristics or behaviour. If the volume and nature of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing has not been undertaken to confirm the soil classification and rock strengths indicated on the environmental logs unless noted in the report.

SYMBOL LEGENDS

SOIL


FILL


TOPSOIL


CLAY (CL, CI, CH)


SILT (ML, MH)


SAND (SP, SW)


GRAVEL (GP, GW)


SANDY CLAY (CL, CI, CH)


SILTY CLAY (CL, CI, CH)


CLAYEY SAND (SC)


SILTY SAND (SM)


GRAVELLY CLAY (CL, CI, CH)


CLAYEY GRAVEL (GC)


SANDY SILT (ML, MH)


PEAT AND HIGHLY ORGANIC SOILS (Pt)

ROCK


CONGLOMERATE


SANDSTONE


SHALE/MUDSTONE


SILTSTONE


CLAYSTONE


COAL


LAMINITE


LIMESTONE


PHYLLITE, SCHIST


TUFF


GRANITE, GABBRO


DOLERITE, DIORITE


BASALT, ANDESITE


QUARTZITE

OTHER MATERIALS


BRICKS OR PAVERS


CONCRETE


ASPHALTIC CONCRETE

CLASSIFICATION OF COARSE AND FINE GRAINED SOILS

Major Divisions		Group Symbol	Typical Names	Field Classification of Sand and Gravel	Laboratory Classification	
Coarse grained soil (more than 65% of soil excluding oversize fraction is greater than 0.075mm)	GRAVEL (more than half of coarse fraction is larger than 2.36mm	GW	Gravel and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 4$ $1 < C_c < 3$
		GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		GM	Gravel-silt mixtures and gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	Fines behave as silt
		GC	Gravel-clay mixtures and gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	Fines behave as clay
	SAND (more than half of coarse fraction is smaller than 2.36mm)	SW	Sand and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 6$ $1 < C_c < 3$
		SP	Sand and gravel-sand mixtures, little or no fines	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		SM	Sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	N/A
		SC	Sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	

Major Divisions		Group Symbol	Typical Names	Field Classification of Silt and Clay			Laboratory Classification
				Dry Strength	Dilatancy	Toughness	% < 0.075mm
ine grained soils (more than 35% of soil excluding oversize fraction is less than 0.075mm)	SILT and CLAY (low to medium plasticity)	ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity	None to low	Slow to rapid	Low	Below A line
		CL, CI	Inorganic clay of low to medium plasticity, gravelly clay, sandy clay	Medium to high	None to slow	Medium	Above A line
		OL	Organic silt	Low to medium	Slow	Low	Below A line
	SILT and CLAY (high plasticity)	MH	Inorganic silt	Low to medium	None to slow	Low to medium	Below A line
		CH	Inorganic clay of high plasticity	High to very high	None	High	Above A line
		OH	Organic clay of medium to high plasticity, organic silt	Medium to high	None to very slow	Low to medium	Below A line
	Highly organic soil	Pt	Peat, highly organic soil	–	–	–	–

Laboratory Classification Criteria

A well graded coarse grained soil is one for which the coefficient of uniformity $Cu > 4$ and the coefficient of curvature $1 < C_c < 3$. Otherwise, the soil is poorly graded. These coefficients are given by:

$$C_U = \frac{D_{60}}{D_{10}} \qquad and \qquad C_C = \frac{(D_{30})^2}{D_{10}\, D_{60}}$$

Where D_{10}, D_{30} and D_{60} are those grain sizes for which 10%, 30% and 60% of the soil grains, respectively, are smaller.

NOTES:

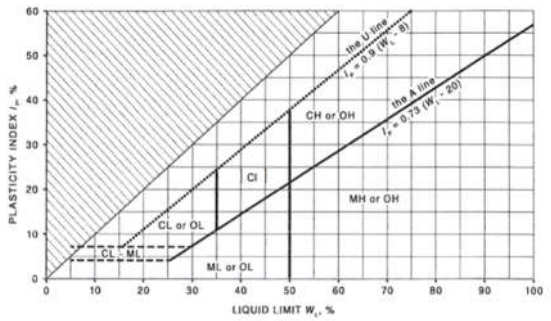
1 For a coarse grained soil with a fines content between 5% and 12%, the soil is given a dual classification comprising the two group symbols separated by a dash; for example, for a poorly graded gravel with between 5% and 12% silt fines, the classification is GP-GM.

2 Where the grading is determined from laboratory tests, it is defined by coefficients of curvature (C_c) and uniformity (C_u) derived from the particle size distribution curve.

3 Clay soils with liquid limits > 35% and ≤ 50% may be classified as being of medium plasticity.

4 The U line on the Modified Casagrande Chart is an approximate upper bound for most natural soils.

Modified Casagrande Chart for Classifying Silts and Clays according to their Behaviour



LOG SYMBOLS

Log Column	Symbol	Definition
Groundwater Record		Standing water level. Time delay following completion of drilling/excavation may be shown.
		Extent of borehole/test pit collapse shortly after drilling/excavation.
		Groundwater seepage into borehole or test pit noted during drilling or excavation.
Samples	ES	Sample taken over depth indicated, for environmental analysis.
	U50	Undisturbed 50mm diameter tube sample taken over depth indicated.
	DB	Bulk disturbed sample taken over depth indicated.
	DS	Small disturbed bag sample taken over depth indicated.
	ASB	Soil sample taken over depth indicated, for asbestos analysis.
	ASS	Soil sample taken over depth indicated, for acid sulfate soil analysis.
	SAL	Soil sample taken over depth indicated, for salinity analysis.
	PFAS	Soil sample taken over depth indicated, for analysis of Per- and Polyfluoroalkyl Substances.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'Refusal' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	N_c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60° solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25 PID = 100	Vane shear reading in kPa of undrained shear strength. Photoionisation detector reading in ppm (soil sample headspace test).
Moisture Condition (Fine Grained Soils)	w > PL $w \approx$ PL w < PL $w \approx$ LL w > LL	Moisture content estimated to be greater than plastic limit. Moisture content estimated to be approximately equal to plastic limit. Moisture content estimated to be less than plastic limit. Moisture content estimated to be near liquid limit. Moisture content estimated to be wet of liquid limit.
(Coarse Grained Soils)	D M W	DRY – runs freely through fingers. MOIST – does not run freely but no free water visible on soil surface. WET – free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS S F St VSt Hd Fr ( )	VERY SOFT – unconfined compressive strength ≤ 25kPa. SOFT – unconfined compressive strength > 25kPa and ≤ 50kPa. FIRM – unconfined compressive strength > 50kPa and ≤ 100kPa. STIFF – unconfined compressive strength > 100kPa and ≤ 200kPa. VERY STIFF – unconfined compressive strength > 200kPa and ≤ 400kPa. HARD – unconfined compressive strength > 400kPa. FRIABLE – strength not attainable, soil crumbles. Bracketed symbol indicates estimated consistency based on tactile examination or other assessment.
Density Index/ Relative Density (Cohesionless Soils)	VL L MD D VD ( )	**Density Index (I_D) Range (%)** / **SPT 'N' Value Range (Blows/300mm)** VERY LOOSE ≤ 15 / 0 – 4 LOOSE > 15 and ≤ 35 / 4 – 10 MEDIUM DENSE > 35 and ≤ 65 / 10 – 30 DENSE > 65 and ≤ 85 / 30 – 50 VERY DENSE > 85 / > 50 Bracketed symbol indicates estimated density based on ease of drilling or other assessment.

Log Column	Symbol	Definition
Hand Penetrometer Readings	300 250	Measures reading in kPa of unconfined compressive strength. Numbers indicate individual test results on representative undisturbed material unless noted otherwise.
Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Twin pronged tungsten carbide bit.
	T_{60}	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.
	Soil Origin	The geological origin of the soil can generally be described as: RESIDUAL – soil formed directly from insitu weathering of the underlying rock. No visible structure or fabric of the parent rock. EXTREMELY WEATHERED – soil formed directly from insitu weathering of the underlying rock. Material is of soil strength but retains the structure and/or fabric of the parent rock. ALLUVIAL – soil deposited by creeks and rivers. ESTUARINE – soil deposited in coastal estuaries, including sediments caused by inflowing creeks and rivers, and tidal currents. MARINE – soil deposited in a marine environment. AEOLIAN – soil carried and deposited by wind. COLLUVIAL – soil and rock debris transported downslope by gravity, with or without the assistance of flowing water. Colluvium is usually a thick deposit formed from a landslide. The description 'slopewash' is used for thinner surficial deposits. LITTORAL – beach deposited soil.

Classification of Material Weathering

Term		Abbreviation		Definition
Residual Soil		RS		Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
Extremely Weathered		XW		Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
Highly Weathered	Distinctly Weathered (Note 1)	HW	DW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately Weathered		MW		The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.
Slightly Weathered		SW		Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh		FR		Rock shows no sign of decomposition of individual minerals or colour changes.

NOTE 1: The term 'Distinctly Weathered' is used where it is not practicable to distinguish between 'Highly Weathered' and 'Moderately Weathered' rock. 'Distinctly Weathered' is defined as follows: *'Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores'*. There is some change in rock strength.

Rock Material Strength Classification

Term	Abbreviation	Uniaxial Compressive Strength (MPa)	Guide to Strength	
			Point Load Strength Index $Is_{(50)}$ (MPa)	Field Assessment
Very Low Strength	VL	0.6 to 2	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30mm thick can be broken by finger pressure.
Low Strength	L	2 to 6	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium Strength	M	6 to 20	0.3 to 1	Scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High Strength	H	20 to 60	1 to 3	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High Strength	VH	60 to 200	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High Strength	EH	> 200	> 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Appendix D: Arcadis PSI Data Summary Tables and Borehole Logs

Arcadis PSI Data Summary Tables

	Asbestos								Metals								TRH				
	Weight of sample	Asbestos (Trace)	Asbestos Type	Description	Approved Identifier:	Organic Fibre	Synthetic Mineral Fibre	Moisture Content	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	TRH F1	TRH F2	TRH F3	TRH F4	>C10 - C40 (Sum of total)
	g	Fibres	-	--	--	g/kg	g/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.01	5				0.1	0.1	1	5	1	2	5	5	0.1	2	5	10	50	100	100	50
NEPM 2013 HIL-D									3000		900	240000	1500	730	6000	400000					
CRC Care 2011 - Direct Contact HSL-D																	26000	20000	27000	38000	
CRC Care 2011 - Intrusive Maintenance Worker, Sand																					
0 to <2m																	NL	NL			
2 to <4m																	NL	NL			
>4m																	NL	NL			
NEPM 2013 HSL-D for VI, Sand																					
0 to 1m																	260	NL			
1 to 2m																	370	NL			
2 to 4m																	630	NL			
>4m																	NL	NL			
NEPM 2013 ML Coarse Soil																			3500	10000	
NEPM 2013 EILS for Comm/Ind (Aged)									160		8	20	1800		5	75					
NEPM 2013 ESLs for Comm/Ind, Coarse Soil, 0 to 2m																	215	170	1700	3300	
Field ID	**Sample Date**	**Lab Report Number**																			
BH01_0.2	07-Jun-21	ES2121325	407	0	1	1	1	0	0	10.2	<5	<1	**14**	7	21	<0.1	**8**	34	<10	<50	<100	<100	<50
BH01_2.0	07-Jun-21	ES2121325	-	-	-	-	-	-	-	37.8	<5	<1	**13**	8	32	<0.1	3	22	<10	<50	970	360	1330
BH02_0.1	07-Jun-21	ES2121325	305	0	1	1	1	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_2.0	07-Jun-21	ES2121325	-	-	-	-	-	-	-	15.4	<5	<1	**9**	<5	36	0.1	**5**	46	<10	<50	<100	<100	<50
BH02_5.0	07-Jun-21	ES2121325	-	-	-	-	-	-	-	52.4	<5	<1	**11**	5	27	<0.1	4	18	<10	<50	240	290	530
BH03_0.5	07-Jun-21	ES2121325	298	0	1	1	1	0	0	8.6	<5	<1	**17**	**21**	27	<0.1	**13**	26	<10	<50	<100	<100	<50
BH03_3.0	07-Jun-21	ES2121325	-	-	-	-	-	-	-	47.8	<5	<1	**9**	<5	22	<0.1	<2	10	<10	<50	260	310	570
BH04_0.1	07-Jun-21	ES2121325	284	0	1	1	1	0	0	12.8	<5	<1	**10**	9	72	<0.1	**8**	70	<10	<50	<100	<100	<50
BH04_2.0	07-Jun-21	ES2121325	-	-	-	-	-	-	-	43	<5	<1	7	7	88	0.1	2	46	<10	<50	200	230	430

	BTEX							PAH																			PCB
	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(a)pyrene TEQ calc (Half)	Benzo(g,h,i)perylene	Benzo(b+j)fluoranthene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Sum of total)	PCBs (Sum of total)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.1
NEPM 2013 HIL-D																									4000	7
CRC Care 2011 - Direct Contact HSL-D	430	99000	27000			81000																11000				
CRC Care 2011 - Intrusive Maintenance Worker, Sand																										
0 to <2m	77	NL	NL			NL																NL				
2 to <4m	160	NL	NL			NL																NL				
>4m	NL	NL	NL			NL																NL				
NEPM 2013 HSL-D for VI, Sand																										
0 to 1m	3	NL	NL			230																NL				
1 to 2m	3	NL	NL			NL																NL				
2 to 4m	3	NL	NL			NL																NL				
>4m	3	NL	NL			NL																NL				
NEPM 2013 ML Coarse Soil																										
NEPM 2013 EILS for Comm/Ind (Aged)																						370				
NEPM 2013 ESLs for Comm/Ind, Coarse Soil, 0 to 2m	75	135	165			180						1.4														

Field ID	Sample Date	Lab Report Number																									
BH01_0.2	07-Jun-21	ES2121325	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1
BH01_2.0	07-Jun-21	ES2121325	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	0.5	1.1	<0.1
BH02_0.1	07-Jun-21	ES2121325	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_2.0	07-Jun-21	ES2121325	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	0.5	1.9	**2.2**	3.1	1.4	2.3	0.9	1.8	<0.5	3.9	<0.5	1.1	<0.5	1.6	4.2	21.8	<0.1
BH02_5.0	07-Jun-21	ES2121325	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.8	<0.8	<0.8	<0.8	<0.8	1	<0.8	<0.8	<0.8	<0.8	<0.8	1.4	<0.8	<0.8	<0.8	<0.8	1.5	2.9	<0.1
BH03_0.5	07-Jun-21	ES2121325	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1
BH03_3.0	07-Jun-21	ES2121325	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	0.8	1.5	<0.1
BH04_0.1	07-Jun-21	ES2121325	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	0.7	1.3	<0.1
BH04_2.0	07-Jun-21	ES2121325	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	0.7	1.4	<0.1

	Organochlorine Pesticides																							
	a-BHC	Aldrin	Dieldrin	Aldrin + Dieldrin	b-BHC	chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	4,4-DDE	DDT	DDT+DDE+DDD	Endosulfan	Endrin ketone	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2
NEPM 2013 HIL-D				45		530							3600	2000					100			50		2500
CRC Care 2011 - Direct Contact HSL-D																								
CRC Care 2011 - Intrusive Maintenance Worker, Sand																								
0 to <2m																								
2 to <4m																								
>4m																								
NEPM 2013 HSL-D for VI, Sand																								
0 to 1m																								
1 to 2m																								
2 to 4m																								
>4m																								
NEPM 2013 ML Coarse Soil																								
NEPM 2013 EILS for Comm/Ind (Aged)												640												
NEPM 2013 ESLs for Comm/Ind, Coarse Soil, 0 to 2m																								

Field ID	Sample Date	Lab Report Number																							
BH01_0.2	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH01_2.0	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH02_0.1	07-Jun-21	ES2121325	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_2.0	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH02_5.0	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH03_0.5	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH03_3.0	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH04_0.1	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
BH04_2.0	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2

	Organophosphorous Pesticides																			
	Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenthion	Malathion	Methyl parathion	Monocrotophos	Parathion	Pirimphos-ethyl	Prothiofos	Hexachlorobenzene
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg
EQL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.2	0.2	0.05	0.05	50
NEPM 2013 HIL-D					2000															80000
CRC Care 2011 - Direct Contact HSL-D																				
CRC Care 2011 - Intrusive Maintenance Worker, Sand																				
0 to <2m																				
2 to <4m																				
>4m																				
NEPM 2013 HSL-D for VI, Sand																				
0 to 1m																				
1 to 2m																				
2 to 4m																				
>4m																				
NEPM 2013 ML Coarse Soil																				
NEPM 2013 EILS for Comm/Ind (Aged)																				
NEPM 2013 ESLs for Comm/Ind, Coarse Soil, 0 to 2m																				
Field ID	**Sample Date**	**Lab Report Number**																		
BH01_0.2	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	<50
BH01_2.0	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	<50
BH02_0.1	07-Jun-21	ES2121325	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_2.0	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	<50
BH02_5.0	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	<50
BH03_0.5	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	<50
BH03_3.0	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	<50
BH04_0.1	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	<50
BH04_2.0	07-Jun-21	ES2121325	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	<50

Appendix G - Table 2
ASS Results

							Acid Neutralising Capacity			Actual Acidity			Potential Acidity		Acid Base Accounting							SPOCAS		
			pH (F)	pH (Fox)	Net Acid Soluble Sulfur (in acid units)	Net Acid Soluble Sulfur (in sulfur units)	Acid Neutralising Capacity	ANCBT	sulfidic-Acid Neutral	pH (KCl)	sulfidic - Titratable Actual Acidity	Titratable Actual Acidity	Chromium Reducible Sulfur	Chromium Reducible Sulphur	a-Net Acidity without ANCE	Net Acidity excluding ANC (sulfur units)	ANC Fineness Factor	Liming Rate	Liming rate without ANCE	Net Acidity (acidity units)	Net Acidity (sulfur units)	KCl Extractable Sulfur	HCl Extractable Sulfur	Net Acid Soluble Sulfur
			pH Unit		mole H+/t	%S	%CaCO3	mole H+/t	%S	pH Unit	%S	mole H+/t	%S	mole H+/t	moles H+/t	%S	-	kg CaCO3/t	kg CaCO3/t	mole H+ / t	%S	%	%S	%S
EQL			0.1		10	0.02	0.01	10	0.01	0.1	0.02	2	0.005	10	10	0.02	0.5	1	1	10	0.02	0.02	0.02	0.02
ASSMAC 1998 Action criteria, medium texture											0.03	18												
Field ID	**Sampled Date**	**Lab Report Number**																						
BH01_2.0	07-Jun-21	ES2121325	6.7	2.7	-	-	4.05	810	1.3	7.3	<0.02	<2	0.041	25	25	0.04	1.5	<1	2	<10	<0.02	-	-	-
BH01_5.0	07-Jun-21	ES2121325	6	2.9	<10	<0.02	-	-	-	4.2	0.26	159	0.06	38	197	0.32	1.5	15	15	197	0.32	<0.02	<0.02	<0.02
BH02_3.0	07-Jun-21	ES2121325	5.8	2.2	<10	<0.02	-	-	-	4.1	0.32	200	0.061	38	238	0.38	1.5	18	18	238	0.38	<0.02	<0.02	<0.02
BH02_5.0	07-Jun-21	ES2121325	6.2	2.3	-	-	-	-	-	5	0.09	56	0.042	26	83	0.13	1.5	6	6	83	0.13	-	-	-
BH03_3.0	07-Jun-21	ES2121325	6.1	3.2	<10	<0.02	-	-	-	4.2	0.15	96	0.041	25	122	0.2	1.5	9	9	122	0.2	<0.02	<0.02	<0.02
BH03_5.0	07-Jun-21	ES2121325	5.8	2.9	<10	<0.02	-	-	-	4.3	0.29	180	0.057	36	216	0.35	1.5	16	16	216	0.35	<0.02	<0.02	<0.02
BH04_2.0	07-Jun-21	ES2121325	7	2.2	-	-	-	-	-	6.2	<0.02	7	0.037	23	30	0.05	1.5	2	2	30	0.05	-	-	-
BH04_5.0	07-Jun-21	ES2121325	6	2.9	<10	<0.02	-	-	-	4.2	0.25	156	0.041	26	182	0.29	1.5	14	14	182	0.29	<0.02	<0.02	<0.02

	SDG	ALSE-Sydney 07-Jun-21	ALSE-Sydney 07-Jun-21		ALSE-Sydney 07-Jun-21	ENVIROLAB 2021-06-08T00:00:00	
	Field ID	BH02_2.0	FD01	RPD	BH02_2.0	FS01	RPD
	Sampled Date/Time	7/06/2021 15:00	7/06/2021 15:00		7/06/2021 15:00	7/06/2021 15:00	
Chem Name	Units	EQL						
Metals								
Arsenic	mg/kg	5 : 4 (Interlab)	<5	<5	0	<5	<4	0
Cadmium	mg/kg	1 : 0.4 (Interlab)	<1	<1	0	<1	<0.4	0
Chromium (III+VI)	mg/kg	2 : 1 (Interlab)	9	8	12	9	10	11
Copper	mg/kg	5 : 1 (Interlab)	<5	6	18	<5	3	0
Lead	mg/kg	5 : 1 (Interlab)	36	55	42	**36**	**65**	**57**
Mercury	mg/kg	0.1	0.1	<0.1	0	0.1	<0.1	0
Nickel	mg/kg	2 : 1 (Interlab)	5	2	86	5	2	86
Zinc	mg/kg	5 : 1 (Interlab)	46	57	21	46	31	39
TRH								
C6-C10	mg/kg	10 : 25 (Interlab)	<10	<10	0	<10	<25	0
>C6-C10 less BTEX (F1)	mg/kg	10 : 25 (Interlab)	<10	<10	0	<10	<25	0
C10-C16	mg/kg	50	<50	<50	0	<50	<50	0
>C10-C16 less Naphthalene (F2)	mg/kg	50	<50	<50	0	<50	<50	0
C16-C34	mg/kg	100	<100	<100	0	<100	150	40
C34-C40	mg/kg	100	<100	<100	0	<100	<100	0
>C10 - C40 (Sum of total)	mg/kg	50	<50	<50	0	<50	150	100
BTEX								
Benzene	mg/kg	0.2	<0.2	<0.2	0	<0.2	<0.2	0
Toluene	mg/kg	0.5	<0.5	<0.5	0	<0.5	<0.5	0
Ethylbenzene	mg/kg	0.5 : 1 (Interlab)	<0.5	<0.5	0	<0.5	<1	0
Xylene (m & p)	mg/kg	0.5 : 2 (Interlab)	<0.5	<0.5	0	<0.5	<2	0
Xylene (o)	mg/kg	0.5 : 1 (Interlab)	<0.5	<0.5	0	<0.5	<1	0
Xylene Total	mg/kg	0.5 : 3 (Interlab)	<0.5	<0.5	0	<0.5	<3	0
Total BTEX	mg/kg	0.2	<0.2	<0.2	0	<0.2		
PAH								
Acenaphthene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	0.1	0
Acenaphthylene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	1	67
Anthracene	mg/kg	0.5 : 0.1 (Interlab)	0.5	0.6	18	**0.5**	**1.9**	**117**
Benz(a)anthracene	mg/kg	0.5 : 0.1 (Interlab)	1.9	1.4	30	**1.9**	**5.2**	**93**
Benzo(a) pyrene	mg/kg	0.5 : 0.05 (Interlab)	2.2	1.5	38	**2.2**	**4.6**	**71**
Benzo(a)pyrene TEQ calc (Zero)	mg/kg	0.5	2.8	2	33	**2.8**	**6.7**	**82**
Benzo(a)pyrene TEQ calc (Half)	mg/kg	0.5	3.1	2.2	34	**3.1**	**6.7**	**73**
Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5	3.4	2.4	34	**3.4**	**6.7**	**65**
Benzo(g,h,i)perylene	mg/kg	0.5 : 0.1 (Interlab)	1.4	0.9	43	**1.4**	**2.6**	**60**
Benzo(b+j)fluoranthene	mg/kg	0.5	2.3	1.5	42	2.3		
Benzo(k)fluoranthene	mg/kg	0.5	0.9	0.7	25	0.9		
Chrysene	mg/kg	0.5 : 0.1 (Interlab)	1.8	1.4	25	**1.8**	**5**	**94**
Dibenz(a,h)anthracene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	0.6	18
Fluoranthene	mg/kg	0.5 : 0.1 (Interlab)	3.9	3.4	14	**3.9**	**10**	**88**
Fluorene	mg/kg	0.5 : 0.1 (Interlab)	<0.5	<0.5	0	<0.5	0.6	18
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5 : 0.1 (Interlab)	1.1	0.7	44	**1.1**	**2.1**	**63**
Naphthalene	mg/kg	1 : 0.1 (Interlab)	<1	<1	0	<1	<1 - 0.3	0
Naphthalene	mg/kg	0.5 : 1 (Interlab)	<0.5	<0.5	0	<0.5	<1 - 0.3	0
Phenanthrene	mg/kg	0.5 : 0.1 (Interlab)	1.6	2.5	44	**1.6**	**7.1**	**126**
Pyrene	mg/kg	0.5 : 0.1 (Interlab)	4.2	3.5	18	**4.2**	**10**	**82**
PAHs (Sum of total)	mg/kg	0.5	21.8	18.1	19	21.8		
PCBs								
PCBs (Sum of total)	mg/kg	0.1	<0.1	<0.1	0	<0.1	<0.1	0
Organochlorine Pesticides								
a-BHC	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Aldrin	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Dieldrin	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Aldrin + Dieldrin	mg/kg	0.05	<0.05	<0.05	0	<0.05		
b-BHC	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
chlordane	mg/kg	0.05	<0.05	<0.05	0	<0.05		
Chlordane (cis)	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Chlordane (trans)	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
d-BHC	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
DDD	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
4,4-DDE	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
DDT	mg/kg	0.2 : 0.1 (Interlab)	<0.2	<0.2	0	<0.2	<0.1	0
DDT+DDE+DDD	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Endosulfan	mg/kg	0.05	<0.05	<0.05	0	<0.05		
Endrin ketone	mg/kg	0.05	<0.05	<0.05	0	<0.05		
Endosulfan I	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Endosulfan II	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Endosulfan sulphate	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Endrin	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Endrin aldehyde	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
g-BHC (Lindane)	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Heptachlor	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Heptachlor epoxide	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Methoxychlor	mg/kg	0.2 : 0.1 (Interlab)	<0.2	<0.2	0	<0.2	<0.1	0
Organophosphorous Pesticides								
Azinophos methyl	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Bromophos-ethyl	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Carbophenothion	mg/kg	0.05	<0.05	<0.05	0	<0.05		
Chlorfenvinphos	mg/kg	0.05	<0.05	<0.05	0	<0.05		
Chlorpyrifos	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Chlorpyrifos-methyl	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Demeton-S-methyl	mg/kg	0.05	<0.05	<0.05	0	<0.05		
Diazinon	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Dichlorvos	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Dimethoate	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Ethion	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Fenamiphos	mg/kg	0.05	<0.05	<0.05	0	<0.05		
Fenthion	mg/kg	0.05	<0.05	<0.05	0	<0.05		
Malathion	mg/kg	0.05 : 0.1 (Interlab)	<0.05	<0.05	0	<0.05	<0.1	0
Methyl parathion	mg/kg	0.2	<0.2	<0.2	0	<0.2		
Monocrotophos	mg/kg	0.2	<0.2	<0.2	0	<0.2		
Parathion	mg/kg	0.2 : 0.1 (Interlab)	<0.2	<0.2	0	<0.2	<0.1	0
Pirimphos-ethyl	mg/kg	0.05	<0.05	<0.05	0	<0.05		
Prothiofos	mg/kg	0.05	<0.05	<0.05	0	<0.05		
Halogenated Benzenes								
Hexachlorobenzene	µg/kg	50 : 100 (Interlab)	<50	<50	0	<50	<100	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 100 (1-5 x EQL); 75 (5-10 x EQL); 50 (> 10 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

SDG	ALSE-Sydney 07-Jun-21
Field ID	TB01
Sampled Date/Time	7/06/2021 15:00
Sample Type	Trip_B

Chem Name		**Units**	**EQL**	
BTEX				
	Benzene	mg/kg	0.2	<0.2
	Toluene	mg/kg	0.5	<0.5
	Ethylbenzene	mg/kg	0.5	<0.5
	Xylene (m & p)	mg/kg	0.5	<0.5
	Xylene (o)	mg/kg	0.5	<0.5
	Xylene Total	mg/kg	0.5	<0.5
	Total BTEX	mg/kg	0.2	<0.2
PAH				
	Acenaphthene	mg/kg	0.5	
	Acenaphthylene	mg/kg	0.5	
	Anthracene	mg/kg	0.5	
	Benz(a)anthracene	mg/kg	0.5	
	Benzo(a) pyrene	mg/kg	0.5	
	Benzo(a)pyrene TEQ calc (Zero)	mg/kg	0.5	
	Benzo(a)pyrene TEQ calc (Half)	mg/kg	0.5	
	Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5	
	Benzo(g,h,i)perylene	mg/kg	0.5	
	Benzo(b+j)fluoranthene	mg/kg	0.5	
	Benzo(k)fluoranthene	mg/kg	0.5	
	Chrysene	mg/kg	0.5	
	Dibenz(a,h)anthracene	mg/kg	0.5	
	Fluoranthene	mg/kg	0.5	
	Fluorene	mg/kg	0.5	
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5	
	Naphthalene	mg/kg	0.5	<1
	Phenanthrene	mg/kg	0.5	
	Pyrene	mg/kg	0.5	
	PAHs (Sum of total)	mg/kg	0.5	
TRH				
	C6-C10	mg/kg	10	<10
	>C6-C10 less BTEX (F1)	mg/kg	10	<10
	C10-C16	mg/kg	50	
	>C10-C16 less Naphthalene (F2)	mg/kg	50	
	C16-C34	mg/kg	100	
	C34-C40	mg/kg	100	
	>C10 - C40 (Sum of total)	mg/kg	50	

SDG	ALSE-Sydney 07-Jun-21
Field ID	RB01
Sampled Date/Time	7/06/2021 15:00
Sample Type	Rinsate

Chem Name	Units	EQL	
BTEX			
Benzene	µg/L	1	<1
Toluene	µg/L	2	<2
Ethylbenzene	µg/L	2	<2
Xylene (m & p)	µg/L	2	<2
Xylene (o)	µg/L	2	<2
Xylene Total	µg/L	2	<2
Total BTEX	µg/L	1	<1
Halogenated Benzenes			
Hexachlorobenzene	µg/L	0.5	<0.5
Metals			
Arsenic	µg/l	1	<1
Cadmium	µg/l	0.1	<0.1
Chromium (III+VI)	µg/l	1	<1
Copper	µg/l	1	<1
Lead	µg/l	1	<1
Mercury	µg/l	0.1	<0.1
Nickel	µg/l	1	<1
Zinc	µg/l	5	<5
Organochlorine Pesticides			
a-BHC	µg/L	0.5	<0.5
Aldrin	µg/L	0.5	<0.5
Dieldrin	µg/L	0.5	<0.5
Aldrin + Dieldrin	µg/L	0.5	<0.5
b-BHC	µg/L	0.5	<0.5
chlordane	µg/L	0.5	<0.5
Chlordane (cis)	µg/L	0.5	<0.5
Chlordane (trans)	µg/L	0.5	<0.5
d-BHC	µg/L	0.5	<0.5
DDD	µg/L	0.5	<0.5
4,4-DDE	µg/L	0.5	<0.5
DDT	µg/L	2	<2
DDT+DDE+DDD	µg/L	0.5	<0.5
Endrin ketone	µg/L	0.5	<0.5
Endosulfan I	µg/L	0.5	<0.5
Endosulfan II	µg/L	0.5	<0.5
Endosulfan sulphate	µg/L	0.5	<0.5
Endrin	µg/L	0.5	<0.5
Endrin aldehyde	µg/L	0.5	<0.5
g-BHC (Lindane)	µg/L	0.5	<0.5
Heptachlor	µg/L	0.5	<0.5
Heptachlor epoxide	µg/L	0.5	<0.5
Methoxychlor	µg/L	2	<2
Organophosphorous Pesticides			
Azinophos methyl	µg/L	0.5	<0.5
Bromophos-ethyl	µg/L	0.5	<0.5
Carbophenothion	µg/L	0.5	<0.5
Chlorfenvinphos	µg/L	0.5	<0.5
Chlorpyrifos	µg/L	0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.5	<0.5
Demeton-S-methyl	µg/L	0.5	<0.5
Diazinon	µg/L	0.5	<0.5
Dichlorvos	µg/L	0.5	<0.5
Dimethoate	µg/L	0.5	<0.5
Ethion	µg/L	0.5	<0.5
Fenamiphos	µg/L	0.5	<0.5
Fenthion	µg/L	0.5	<0.5
Malathion	µg/L	0.5	<0.5
Methyl parathion	µg/L	2	<2
Monocrotophos	µg/L	2	<2
Parathion	µg/L	2	<2
Pirimphos-ethyl	µg/L	0.5	<0.5
Prothiofos	µg/L	0.5	<0.5
PAH			
Acenaphthene	µg/L	1	<1
Acenaphthylene	µg/L	1	<1
Anthracene	µg/L	1	<1
Benz(a)anthracene	µg/L	1	<1
Benzo(a) pyrene	µg/L	0.5	<0.5
Benzo(a)pyrene TEQ calc (Zero)	µg/L	0.5	<0.5
Benzo(g,h,i)perylene	µg/L	1	<1
Benzo(b+j)fluoranthene	µg/L	1	<1
Benzo(k)fluoranthene	µg/L	1	<1
Chrysene	µg/L	1	<1
Dibenz(a,h)anthracene	µg/L	1	<1
Fluoranthene	µg/L	1	<1
Fluorene	µg/L	1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	1	<1
Naphthalene	µg/L	1	<5
Phenanthrene	µg/L	1	<1
Pyrene	µg/L	1	<1
PAHs (Sum of total)	µg/L	0.5	<0.5
PCBs			
PCBs (Sum of total)	µg/L	1	<1
TRH			
C6-C10	µg/L	20	<20
>C6-C10 less BTEX (F1)	µg/L	20	<20
C10-C16	µg/L	100	<100
>C10-C16 less Naphthalene (F2)	µg/L	100	<100
C16-C34	µg/L	100	<100
C34-C40	µg/L	100	<100
>C10 - C40 (Sum of total)	µg/L	100	<100

Arcadis PSI Borehole Logs

Borehole Log

Borehole No.	**BH1**
Sheet	1 of 1
Job No.	S1294

CLIENT: Arcadis

PROJECT: Proposed Development
8 Grosvenor Place, Brookvale, NSW

Location :

Collar Level : Not Known
Angle From Vertical : 0°
Bearing : N.A.

Equipment Type : Geoprobe 6625 CPT
Hole Diameter : 55mm

Depth (Metres)	Graphic Log	U.S.C.S.	Material Description, Structure (Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure)	Consistency or Relative Density	Geological Profile
0.12			CONCRETE		FILL
0.15		GM	SILTY GRAVEL; ROADBASE, angular gravels to 20mm size, grey, dry	Medium Dense	
		GWS	SILTY SANDY GRAVEL; angular gravels to 20mm size, fine to coarse grained sand, grey to brown, dry	Medium Dense to Dense	
0.45					
0.5		CL	SILTY CLAY; medium plasticity clay, brown, trace orange, some angular gravels to 5mm size, dry to moist	Stiff	
0.7					
0.8		SC	SANDSTONE; sub angular gravels to 20mm size, fine to coarse grained, red, pale grey, dry to moist	Dense	
		GWS		Medium Dense	
1.0		CH	CLAYEY SAND; fine to coarse grained sand, low plasticity clay, brown to grey, some grey, some sub angular sandstone gravels to 10mm size, dry to moist	Medium Dense	
			SANDY GRAVEL; sub angular gravels to 8mm size		
1.3		GW	SANDY CLAY; medium to high plasticity clay, fine to coarse grained sand, black, some grey, some sandstone gravels to 10mm size, dry to moist	Stiff to Very Stiff	
			CLAYEY GRAVEL; angular gravels to 20mm size, medium plasticity clay, brown to grey, some anthropogenic material (brick), dry to moist	Dense	
2.0		ML	CLAYEY SILT; medium plasticity clay, black, some plant roots, moist	Soft to Firm	PEAT
			Wet		
3.0				Soft	
4.0					
5.0			BOREHOLE TERMINATED AT 5m At Target		
6.0					
7.0					
7.7					

Samples: 1, 2, 5

Water: None Encountered

Casing:

Logged By : AB Date : 7/6/21

Checked By : Date :

BOREHOLE/EXCAVATION LOG S1294.GPJ ACT GEO.GDT 15/6/21

ACT Geotechnical Engineers

Fortify Geotech

Borehole Log

Borehole No.	**BH2**
Sheet	1 of 1
Job No.	S1294

CLIENT: Arcadis

PROJECT: Proposed Development
8 Grosvenor Place, Brookvale, NSW

Location :

Collar Level : Not Known
Angle From Vertical : 0°
Bearing : N.A.

Equipment Type : Geoprobe 6625 CPT
Hole Diameter : 55mm

Samples	Water	Casing	Depth (Metres)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered		0.15			CONCRETE			FILL
			0.5		GM	SILTY GRAVEL; ROADBASE, angular gravels to 20mm size, grey, dry	Medium Dense		
			1.0		SC	CLAYEY SAND; fine to coarse grained sand, medium plasticity clay, grey, some angular gravels to 30mm size, dry to moist	Medium Dense to Dense		
			1.5			some silt			
			1.8			SANDSTONE; fine to coarse grained, yellow to brown, dry	Dense		
			2.0		SC	GRAVELLY CLAYEY SAND; fine to coarse grained sand, low to medium plasticity clay, angular gravels to 15mm size, grey to brown, trace anthropogenic material (brick), moist	Dense		
			2.6		ML	CLAYEY SILT; low plasticity clay, black, some plant roots, dry to moist	Soft to Firm		PEAT
			3.0						
			4.0						
			5.0			BOREHOLE TERMINATED AT 5m At Target			
			6.0						
			7.0						
			7.7						

Logged By : AB Date : 7/6/21 | Checked By : Date :

ACT Geotechnical Engineers

Fortify Geotech

Borehole Log

Borehole No.	BH3
Sheet	1 of 1
Job No.	S1294

CLIENT: Arcadis

PROJECT: Proposed Development
8 Grosvenor Place, Brookvale, NSW

Location :

Collar Level : Not Known
Angle From Vertical : 0°
Bearing : N.A.

Equipment Type : Geoprobe 6625 CPT
Hole Diameter : 55mm

Samples	Water	Casing	Depth Metres	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered		0.18			CONCRETE			FILL
			0.5		GM	SILTY GRAVEL; ROADBASE, angular gravels to 20mm size, grey, dry	Medium Dense		
			1.0		SWG	GRAVELLY SAND; medium to coarse grained sand, angular gravels to 10mm size, grey to brown, dry Orange to brown	Loose to Medium Dense		
			1.65		ML	CLAYEY SILT; low plasticity clay, black, some plant roots, dry to moist	Soft to Firm		PEAT
			2.0						
			3.0						
			4.0						
			5.0		CL	SILTY CLAY; medium plasticity clay, black, wet	Firm		ALLUVIUM
			5.6		SC	SAND/CLAYEY SAND; fine to coarse grained sand, medium plasticity clay, pale grey, moist	Medium Dense to Dense		
			6.0						
			7.0						
			7.4			BOREHOLE TERMINATED AT 7.4m At Target			
			7.7						

Logged By : AB Date : 7/6/21 | Checked By : Date :

BOREHOLE/EXCAVATION LOG S1294.GPJ ACT GEO.GDT 15/6/21

ACT Geotechnical Engineers

Fortify Geotech

Borehole Log

Borehole No.	**BH4**
Sheet	1 of 1
Job No.	S1294

CLIENT: Arcadis

PROJECT: Proposed Development
8 Grosvenor Place, Brookvale, NSW

Location :

Collar Level : Not Known
Angle From Vertical : 0°
Bearing : N.A.

Equipment Type : Geoprobe 6625 CPT
Hole Diameter : 55mm

Samples	Water	Casing	Depth (Metres)	Graphic Log	U.S.C.S.	Material Description, Structure (Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure)	Consistency or Relative Density	Field Test Results	Geological Profile
			0.1			CONCRETE			FILL
			0.15		GM	SILTY GRAVEL; ROADBASE, angular gravels to 20mm size, grey, dry	Medium Dense to Dense		
					SC	GRAVELLY CLAYEY SAND; fine to coarse grained sand, low plasticity clay, angular gravels to 20mm size, grey to brown, some red and grey, dry	Medium Dense		
			1.0		SC	SAND/CLAYEY SAND; medium to coarse grained sand, pale brown, low plasticity clay, dry to moist	Medium Dense		
			1.4		ML	CLAYEY SILT; medium plasticity clay, black, some plant roots, moist	Soft to Firm		PEAT
			2.0						
			3.0			Wet	Soft		
			4.0						
	▽		5.0			BOREHOLE TERMINATED AT 5m At Target			
			6.0						
			7.0						
			7.7						

Groundwater Level

Logged By : AB Date : 7/6/21 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1294.GPJ ACT GEO.GDT 15/6/21

ACT Geotechnical Engineers

Fortify Geotech

Appendix E: Example Waste Tracking Record

Offsite Disposal

Waste Classification Report/ Letter			Source Area Matches Area in Classification Letter/ Report?	Stockpile [2]					Material Observations		Treatments [7]				Statistics [7]	
Reference	Classification Under Letter[1]	Volume Classified Under Letter (m^3)		ID	Volume	Temporary Storage Area/ Reference	Volume (m^3)	Bulking Factor Used	Description	Evidence of Contamination	Treatment Details	Post-Treatment	Post Treatment Sampling	Post Treatment Classification [1]	Type	Results

[1] After NSW EPA Waste Classification Guidelines/ The excavated natural material order 2014 / Meets POEO VENM Definition / other

[2] If material was excavated and stockpiled post classification

[3] Samples must include those collected specifically for waste classification purposes and samples collected from the source area for purposes other than waste classification

[4] Keep Units Consistant

[5] If volume on docket is different to volume on Waste Classification Letter

[6] If one is available

[7] If undertaken

Disposal						
Receiving Facility	Receiving Facility Licence Numbr	Disposal Docket Reference	Quantity on Docket (m^3/ tonnes) [4]	Bulking Factor [5]	Consignment Note Reference [6]	Running Total Under the Waste Classification Letter (m3/ tonnes) [4]