CADIGAL GROUP

849-859, PACIFIC HIGHWAY AND 2-8 WILSON STREET, CHATSWOOD

Structural and Engineering Impact Assessment Report

PREPARED FOR

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12/06/2025

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Revision Table

Rev No	Details	Prepared by	Reviewed by	Date
01	Issued for information	NA	JT	12/06/2025

1. INTRODUCTION

Cadigal Group has been engaged to carry out a structural engineering work for the proposed development. As part of the services, preliminary structural analysis of the proposed development was performed to assist DA submission. This report specifically embellishes Structural and Engineering Impact Assessment adjacent to the Chatswood railway corridor and provides further reference material to the Sydney Metro- Technical Services.

We have conducted a visual inspection of the site including its surroundings. The project will require the demolition of the following lots to allow for the construction of new mixed-use development:

- Lot SP52947, address: 2 Wilson Street, Chatswood;
- Lot DP1189541, address: 8 Wilson Street, Chatswood.
- Lot SP1496, address: 849 Pacific Highway, Chatswood;
- Lot SP60178, address: 853 Pacific Highway, Chatswood;
- Lot SP10110, address: 859 Pacific Highway, Chatswood;

The proposed development consists of 2 towers of 36-storey mixed use residential and commercial development with an activated commercial podium and 6 levels of basements. The existing site area of the combined 5 lots amounted to 4,752 m^2.

This report is inclusive of proposed earthworks and excavations, temporary and permanent ground support, foundation designs, predicted displacements, stresses and structural actions as imposed on the structural support of Metro infrastructure at various stages of construction, pre-construction (including demolition), excavation, development construction and post-construction, proposed design and construction methods to prevent potential adverse effects on rail infrastructure facilities, an engineering assessment of the settlement and displacements of the development structure and also on the impact of hydrological design.

All designs mentioned within this report are adhered to all necessary standards including BCA requirements, AS3600, AS4100, AS1170.0, AS1170.1, AS1170.2, and AS1170.4.

2. PROPOSED DEVELOPMENT AT 849-859, PACIFIC HIGHWAY, CHATSWOOD

2.1 EXISTING SITE

The site which is approximately of 4,294 m^2 in extent is demarcated by Wilson Street on the north direction, Pacific highway on the west direction, O'Brien Street on the south and by the rail corridor at the east direction. A substation is also located in the edge of the land. The site has a land use classification as R4 – High Density Residential and comprises of four separate residential buildings with four access driveways on Wilson Street, Pacific Highway and O'Brien Street and a two-storey commercial building. The surrounding properties mostly including a mix of residential towers, commercial buildings and low and medium residential dwellings.

2.2 PROPOSED DEVELOPMENT

The multipurpose development project proposed in this land consists of two towers, which sit on a three-storey high podium. The two towers share six basements together. The two towers will go up to 35 stories and a roof area on top of them.

As per the architectural design the six basements have been assigned for car park facilities, while Ground and Level 1 have been nominated as commercial space along with live-work units. Level 2 has been allocated for communal gatherings, child care facilities and the swimming pool. Level 3 and 4 will again host space for live-work units. From 5th floor upwards the two towers will provide space for apartment units. The apartment unit consists of work- live units and 2 to 3 bedroom apartments. The roof slabs on both towers have been assigned for service and terrace space.

2.3 PROPOSED CONSTRUCTION METHODOLOGY

The construction sequence is proposed as below:

2.3.1 DEMOLITION OF THE EXISTING BUILDINGS.

- The existing apartment buildings and the commercial building at 849-859, Pacific Highway, Chatswood plot will be entirely demolished.

2.3.2 BASEMENT AND FOUNDATION CONSTRUCTION.

- Basement excavation is expected to reach depths of approximately 18.6 to 21.6 m in high strength shale/laminate.
- The foundation of the structure will be supported on either pad footings or pile footing with design maximum allowable bearing pressures stated in the geotechnical report (Class II to Class I Ashfield Shale) depending on the founding conditions reached. Reference is made with the geotechnical investigation report submitted by Fortify Geotech (Date 06/12/2023).
- During the excavations, 600mm diameter soldier pile with infill shotcrete will be used which typically consist 2.9m centres with tie-back anchors for stability as required has been proposed for the retaining wall structures at the three boundaries of the land neighbouring O' Brien Street, Wilson Street and Pacific Highway. For the Eastern side of the property near the TfNSW corridor 900mm diameter soldier piles have been proposed with 2m centre to centre spacing.

- During construction and in the long term, the seepage into the excavation will be controlled by perimeter drains connected to a "sump-and-pump" system. It is recommended to accommodate a drained basement in the geotechnical report with permanent drainage below the floor slab to direct seepage to the stormwater drainage system subjected to council approval.

2.3.2 TOWER CONSTRUCTION

- All columns, foundations and core walls will be constructed of reinforced concrete with grades starting from N40. The grade of the concrete will vary according to the table shown below.

Table 2.1: Concrete grade types recommended for the structure

Range in floor levels	Concrete grade used
Basement 6 to Level 5	N65
Level 6 to Level 25	N50
Level 26 to Roof	N40

- The building has two sets of core walls, separately on the two towers. The core walls layout is regular enough to permit an economic jump-form construction. However, the initial cost associated with jump-form setup versus speed of construction require financial viability to adopt jump construction. The jump-form construction is economical with tall building and generally typical cycle is 5-7 days per floor. The cores of the two towers may be constructed using jump form system since it is a financially feasible system to be used in buildings greater than 15 storeys. Alternatively, conventional formwork method of building wall is acceptable. Other core walls may require conventional formwork for construction.
- The floor plates will typically be post-tensioned concrete floors given the shape of the building and the spans involved. Temporarily back propping may typically extend to 2-3 floors below.

3. DESIGN PARAMETERS AND MODELLING WORKS

3.1 DESIGN PARAMETERS

The structural design takes into consideration the behaviour of the entire structure under vertical and lateral loads, design loading criteria, rules governing structural forms to resist the loads, robustness of the structure, construction materials and relevant environmental requirements.

The building has 6 basements below ground with 36 storeys above ground. The proposed Ground floor plate act as a transfer slab for the entire new built portion as well as to place the existing masonry walls of the heritage building. The lateral system of the building consists of reinforced concrete cores for the new development and the retained unreinforced masonry walls from the existing heritage building will also act part and parcel with the new core walls.

The following parameters are considered for the structural element sizing and the building stability.

<u>Gravity:</u>

Basement Carpark	SDL 0.5 kPa	LL 2.5 kPa
Car Park Storage	SDL 0.5 kPa	LL 6.5 kPa
Residential	SDL 1.5 kPa	LL 1.5 kPa, 2.0 kPa to balconies
Plant	SDL 5.0 kPa	LL 7.5 kPa
Roof	SDL 2.0 kPa	LL 0.25 kPa
Internal light weight partition walls	1 kN/m	

<u>Seismic:</u>

To Australian code AS 1170.4-2007:

Subsoil class= Ce

Importance Level = 3
Design working life=50 years

kp=1.0

Z=0.08

Sp=0.77

μ= 2

kt=0.05

Wind loads:

Preliminary code wind loads:

Australian code AS 1170.2:

Parameters		
Cp	0.8 Windward	0.5 Leeward
Ka	1	
Kc	1	
Kl	1	
Kp	1	
Wind Coefficients		
Vr	$46ms^{-1}$ (Ultimate)	
	$37ms^{-1}$ (Service)	
T.C.	2.5	
Md	1	
Ms	1	
Mt	1	
Cdyn	1	

3.2 ANALYTICAL MODELLING

Structural 3D model was developed using the structural analysis software ETABS, and verified by hand calculations. Figure 3.2A, 3.2B, 3.2C and 3.2D showcase the isometric views of the simulated model. The analysis was carried out with a linear elastic approach for the dead, live, wind and earthquake loads.

The model was developed using the column and wall markup arrangements prepared by Cadigal Group based on the architectural layouts. They have been prepared with a reasonably accurate representation of the proposed building.

The design of the structural elements is carried out using a group of structural programs such as ETABS, SAFE, RAM Concept, Structural Toolkit and Excel design spreadsheets. The elements were checked according to the serviceability and ultimate limit state conditions as described in Australian standards.

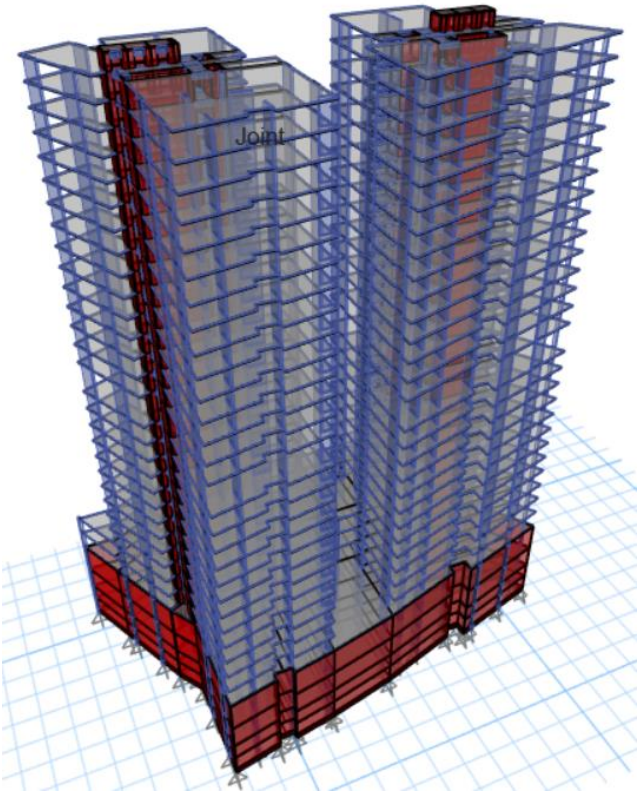


Fig 3.2.2.A- 3D Analytical model (view-1)

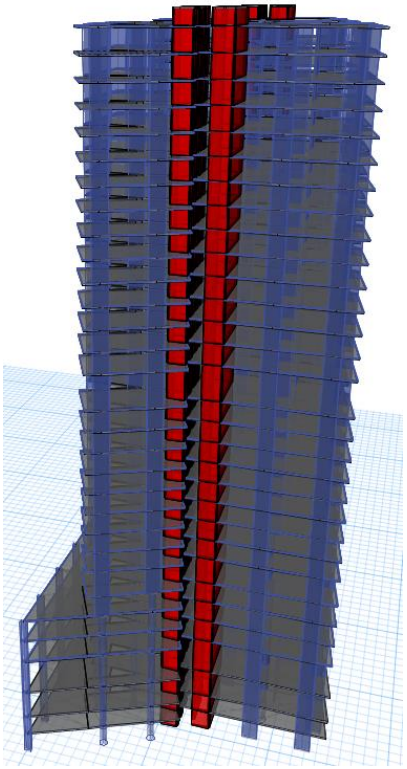


Fig 3.2.2.B- 3D Analytical model (view-2)

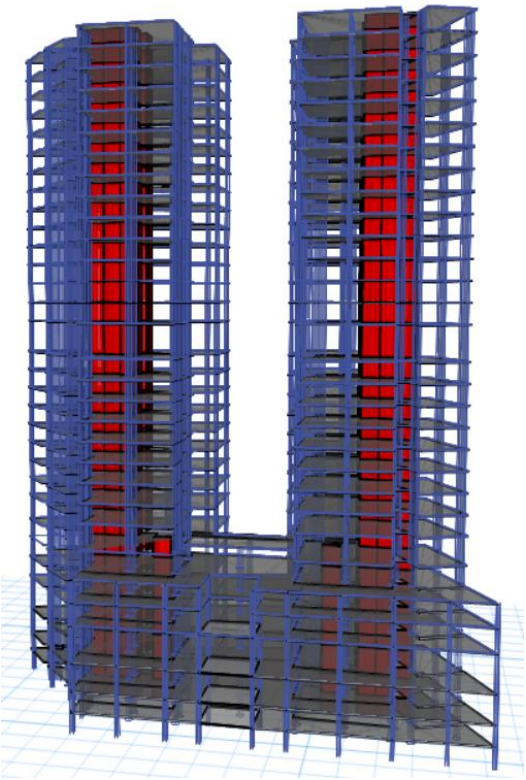


Fig 3.2.2.C- 3D Analytical model (view-3)

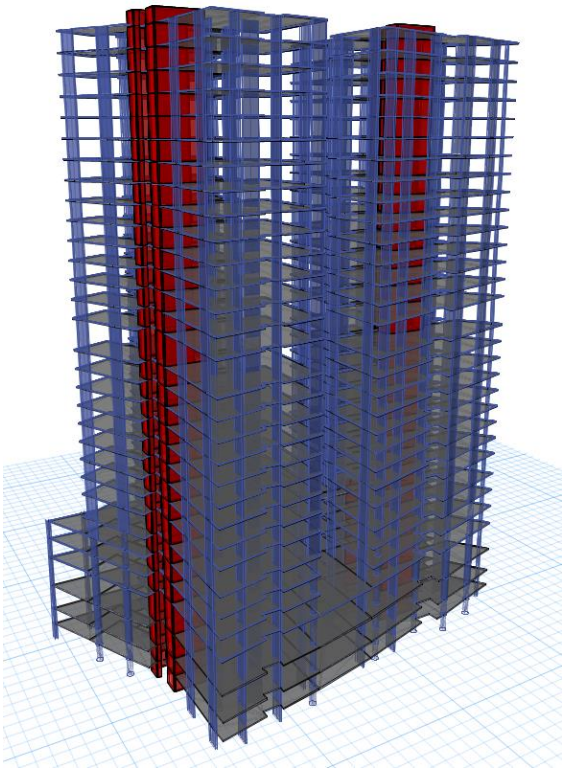


Fig 3.2.2.D- 3D Analytical model (view-4)

4. CONDITIONAL REQUIREMENT OF SYDNEY METRO- TECHNICAL SERVICES

The site is located adjacent to the Chatswood Rail corridor from the west orientation and surrounded by various roads and associated infrastructure from other orientations. The proposed development shoring wall and the retention system near the rail corridors are subjected to Sydney Trains conditions and special consideration of the Sydney Metro at Grade and Elevated Sections, Corridor Protection Guidelines

The design and construction of the development must fully consider the potential impacts on both the performance of the existing Metro and the feasibility of future Metro projects. As a key principle, the development must not compromise the stability and integrity of the Metro infrastructure or its safe operation. In general, it shall be ensured that the development and the construction do not negatively impact the performance of the Metro infrastructure regarding the following aspects specified in the THR C1 12090 ST Airspace and External Developments.

1. Amenity
2. Aesthetics
3. Structural integrity
4. Durability
5. Function
6. User/customer benefits
7. Safety during construction and operation and
8. Environmental performance.

Considering the general performance requirements and in order to cater to them, a detailed structural engineering and impact assessment should be conducted with the neighbouring developments and future planned activities, which can be obtained from the related authorities. Development-induced loads and displacements must not negatively impact the support structures or systems of the Metro infrastructure, both in the short and long term. Any structures proposed for construction over or adjacent to Metro at-grade or elevated systems must be properly designed to consider the existing Metro infrastructure and any future Metro projects. Construction methods should be integrated into the design process. The effects on Metro support elements and other infrastructure throughout the entire lifecycle of the development must be evaluated to ensure compliance with relevant standards.

Depending on the complexity of the project, either two-dimensional or three-dimensional numerical modelling (using finite element (FE) or finite difference (FD) methods) must be performed. This modelling is necessary to evaluate the effects on metro infrastructure facilities during various stages of construction and throughout operation post-commissioning, including the impacts of temporary works. The numerical modelling must be based on a realistic geological model derived from subsurface data obtained through geotechnical investigations. It should incorporate key geological features such as bedding planes, weak layers, joints, and other discontinuities. The results of the numerical modelling must be verified and validated during construction using carefully designed field monitoring instrumentation Additionally, the numerical modelling should account for existing conditions of metro infrastructure facilities, considering factors such as defects (e.g., cracks), drainage conditions, and support conditions identified through dilapidation surveys and in-situ strength tests where appropriate.

The main reason for the excessive concern of the particular development at Chatswood is the four-basement excavation of the building. The depth of excavation will define the zone of influence, thus clearly define the extent of the land area which

falls in the second reserve of the railway protection zone. The criterion mentioned above has been meticulously followed through the design and the construction pan of the project.

Details of the basement excavation, the geotechnical finite element analysis along with the structural design for shoring have been extensively discussed in the upcoming chapters of the report.

4.1 OVERVIEW OF BASEMENT

The project dives the natural ground level through six basements terminating its stretch at 91.42 RL level at the Basement 4 level. The basement will be designed as a drained basement with 120mm thick slab on grade concrete. The existing ground surface varies between RL 103.5 and 107 which creates a basement depth of approximately 14m.

4.2 PERFORMANCE CRITERIA IN THE SYDNEY METRO

Due to the zone of influence of the basement which falls within the reserves of the TfNSW and Sydney Metro, the following components of the development and the construction criterion could adversely affect the infrastructure. Thus, special consideration should be given to these components:

- Loading or unloading from the development
- Temporary structures
- Load from anchors
- Ground deformation resulting from excavations, tunnelling, thrust boring / pipe jacking and external loading
- Induced vibrations during construction and operation
- Ground borne noise impacts
- Discharge of stormwater from the development
- Changes to groundwater levels affecting design assumptions
- Loss of support to any at grade or elevated rail structure (including rock bolts and anchors)
- Electrolysis from earth leakage currents
- Protection of the traction power
- HV & LV power systems and earthing system
- Electro-magnetic interference
- Environmental management of the development
- Operations and maintenance, and emergency evacuation access zones

Each component has been elaborated in detail and related appendices in the report.

4.2.1 LOADING OR UNLOADING FROM THE DEVELOPMENT

It has to be noted that any temporary or permanent construction near the Metro may be affected by train loading therefore has been evaluated according to AS 5100 for live load surcharge. Areas of the development that could be impacted has been designed in compliance with T HR CI 12070 ST Version 2 and T HR CI 12075 ST Airspace Developments

The following loads illustrated in table 4.1 have been considered in designing the temporary structure (retaining wall) arrangement. All loads considered during the permanent design phase of the structure has been indicated in Section 3.

Table 4.1: Loads for the design of shoring wall arrangement

Type of load / surcharge	Value of the load / surcharge (kPa)
Pedestrian traffic	5
Existing dwelling	10
Train loading (300 LA train) Applied at the underside of the rail sleepers as per AS 5100:2:2017	131
Communications hut loading	10
Construction load allowance for any future rail corridor rail work	20

4.2.2 TEMPORARY STRUCTURE- SHORING WALL

The shoring methodology has been carried out with the basic concept of casting soldier piles within a designed spacing and then proceeding with the excavation. The staged excavation will be supported through tie back anchors which will be connected to the shoring wall as temporary supports. The entire process is sequential and all calculations for the shoring wall arrangements are reinforced with finite element geotechnical simulations. Geo technical information has been extracted through the geo technical investigation report (Rev 1) – S2207_GIA_01 provided by Fortify Geotech June 2025

Once the excavation is completed and the basements are gradually constructed, the tie back anchors will be removed and the supports that were provided by them, will be replaced with the permanent slabs at each basement level.

The shoring wall design extensively depends on the geotechnical profile of the area. The following details have been meticulously extracted from the reports and utilized in the design.

4.2.2.1. REGIONAL GEOLOGICAL CONDITION

As per the geological information provided by the Department of Regional NSW it has been notified that the area to be underlain by Middle Triassic age Ashfield Shale. Ashfield Shale consists of black to light grey marine shale and mudstone unit with minor siltstone that outcrops in easter Australia. Residual soils are expected above the shale bedrock.

4.2.2.2. SUBSURFACE CONDITION

According to the six borehole investigations carried out by Fortify Geotechnical engineers, it could be identified that the excavated depth for the basements of the project runs all the way from extremely weathered to slightly weathered shale rock conditions. Figure 4.1: Subsurface conditions extracted from the Geotechnical report illustrates the classifications and related depths for each rock type. Annexure A: Geo technical investigation report prepared by Fortify Pty. Ltd. Is attached for further reference.

Bore hole ID.	Approximate ground surface RL [1]	Top of Residual soils (Unit 2) (RL) [2]	Top of XW (Unit 3a) Bedrock (RL) [2]	Top of HW (Unit 3b) Bedrock (RL) [2]	Top of HW/MW (Unit 3c) Bedrock (RL) [2]	Top of MW (Unit 3d) Bedrock (RL) [2]	Top of SW (Unit 3e) Bedrock (RL) [2]
BH1	103.6	103.3	98.8	95.8	92.8	90.2	88.6
BH2	104.9	104.3	100.4	97.3	95.5	94.0	88.4
BH3	105.8	105.3	101.3	98.3	97.7	96.7	90.7
BH4	105.9	105.7	103.1	99.5	98.4	97.0	91.7
BH5	105.7	105.1	102.5	99.7	97.3	96.2	89.7
BH6	105.0	104.6	102.0	98.5	97.0	95.8	90.7

[1] RL's have been interpolated between survey points off the site survey.

[2] RL's have been calculated based on the interpolated RL at the top of each borehole.

Figure 4.1: Extract from the geotechnical report provided by Fortify geo technical experts

4.2.2.3. DESIGN OF THE STRUCTURE

Currently the proposed shoring methodology consists of soldier piles throughout all four sides of the proposed development. However, this option requires temporary anchors throughout all four sides of the property. At the Eastern side boundary next to rail line, the temporary anchors need to be coordinated to avoid any clashes with rail influence zone, which is under the scrutiny of TfNSW and Sydney Metro- Technical services. Figure 4.2: Plan view of shoring arrangement illustrates the arrangement below. More over the four sides of the shoring wall arrangement has been further classified into 9 types of shoring walls. SW1 to SW9. Of the nine types, SW3 and SW4 has been considered in the geotechnical analysis and the structural approach has also been focused on the two shoring walls. Refer Annexure B: Shoring wall drawings issued by Cadigal Group.

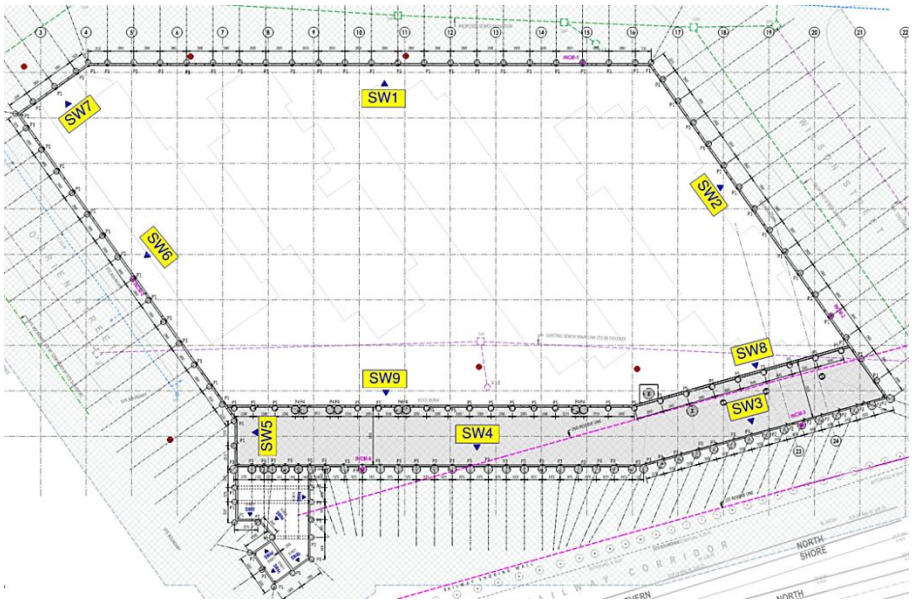


Figure 4.2: Plan view of shoring wall arrangement

Two types of piles have been used in the design. 600mm diameter soldier piles have been used with 2.9m centre to centre spacing in the three main boundaries along Wilson Street, O'Brien Street and the Pacific Highway. The Eastern side boundary which is neighboured by the railway line has been designed with 900mm diameter soldier piles. The spacing has been maintained as 2m centre to centre while encouraging a termination length of 4000mm. The geotechnical impact assessment conducted on the Eastern side of the wall (SW3 and SW4) are attached in Annexure C for further reference.

It should also be noted that a rock berm has been constructed along the railway-side boundary of the site to ensure that the zone of influence associated with the six-basement excavation does not extend the zone of influence of the excavation excessively. SW8 and SW9 refer to those shoring walls. This measure prevents the anchors from encroaching beyond the boundary while maintaining the required bond length. The retaining arrangement for this rock berm would be 600mm diameter piles spaced at 3m. These piles have been designed as cantilevered piles during the construction phase.

4.2.2.4. LAYING OF GROUND ANCHORS

The minimum distance from the shoring wall to the existing rail retaining wall is approximately 7.0 meters at the northeastern corner of the site. To maintain a 3.0-meter bond length for the first tieback anchor—installed after the full six-level basement excavation—the anchor trajectory would intersect or come into conflict with the rail retaining wall, as illustrated in Figure 4.3a. In light of this constraint, a rock berm was introduced at the fifth excavation level to mitigate the issue. However, even with the berm in place, the splay of the first anchor remains unacceptably close to the retaining wall, posing risks to construction tolerances and alignment. Consequently, a decision was made to implement a temporary internal bracing system as an alternative to the first anchor in order to avoid any interference with the existing soldier pile and ensure the structural and spatial requirements are met. (Refer Figure 4.3b)

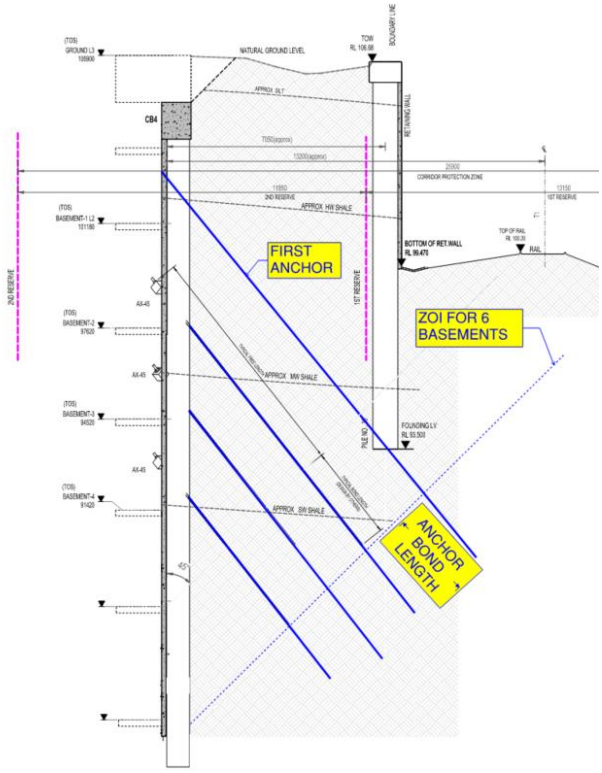


Figure 4.3a: Illustration on zone of influence on six basements

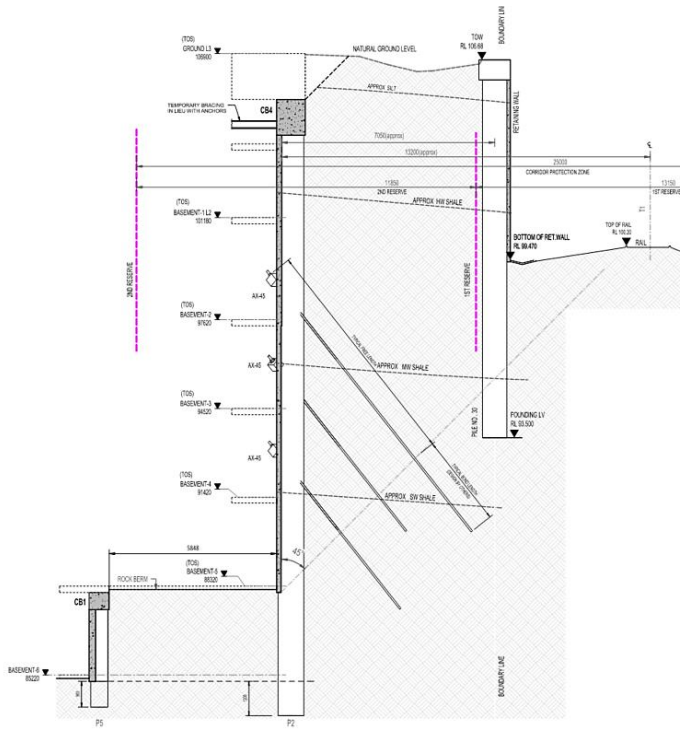


Figure 4.3b: Adoption of rock berm for the six basements option

4.2.2.5. USE OF INTERNAL BRACING

A steel bracing system has been incorporated along Shoring Wall 3 (SW3) at the elevation corresponding to the first layer of tieback anchors only. As previously discussed, this modification is necessitated by the requirement to maintain a construction tolerance of 350 mm between the edge of the railway retaining wall piles and the outermost edge of the anchor system. Due to the limited clearance in this specific portion of SW3, the required tolerance could not be achieved with conventional tieback anchors. As a result, the first row of anchors has been replaced with internal steel bracing supported by plunge columns. The remainder of the shoring wall height continues to be restrained using tieback anchors. It is important to note that the internal struts have been designed to withstand ultimate loading conditions in accordance with structural design requirements.

4.2.2.6. DESIGN OF TEMPORARY BRACING ARRANGEMENT

The internal bracing arrangement has been simulated as a 3D finite element model on SPACE GAS software to analyse the behaviour of the struts and columns the arrangement. The model also reflects the behaviour of the bracing arrangement during its construction phases through sequential modelling.

This analysis process has been an iterative process between the structural modelling and geotechnical modelling as the loads and deflection results obtained from structural modelling needs to be verified by the geotechnical assessment.

4.2.2.6.1 Modelling methodology

1. Soldier piles in the shoring wall along SW3 were simulated as concrete line elements with 900mm diameter spaced at 2m centre to centre spacing.

2. Another line element of 1250mm x1000 mm dimension was modelled as the caping beam to connect the 900mm diameter piles in cluster at the pile top.

3. Steel columns which are behaving as king posts of the bracing arrangement were modelled as line elements at the locations where permanent columns will be constructed within the building. (Please refer to Figure 4.4)

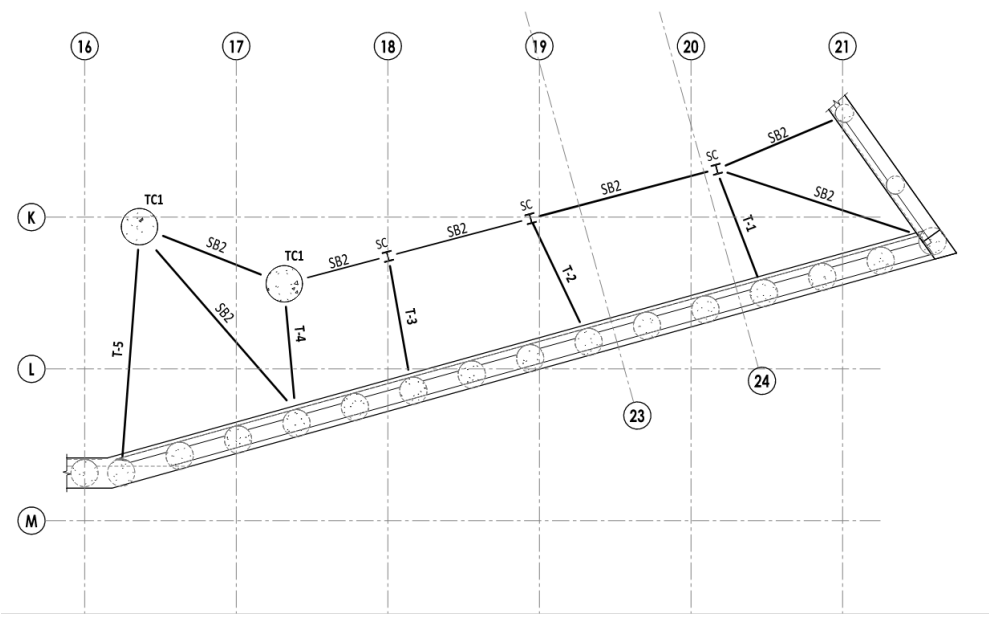


Figure 4.4: Placement of king posts of the internal bracing arrangement

4. Of the five steel columns, TC1 columns shown above are concrete columns. These concrete columns reduce the shoring wall deflection due to presence of higher axial and bending stiffness than the proposed steel columns. The bracings are then connected to each column diagonally and horizontally.

5. An initial value provided by the geotechnical engineer (230kN imposed on each pile at 45-degree inclination to the horizontal plane at the first anchor level) was considered. This load has been supplied by the geotechnical engineer when no bracing is used, and tie back anchors are used to fully retain the shoring wall along SW3.

6. It was conservatively assumed that approximately 3 pile reaction loads will be imposed on one horizontal bracing strut and at locations each strut is connected to the capping beam 490kN load was applied.

7. The supports of the columns were considered pinned to simulate the most conservative approach and the nodes in the soldier piles were restrained only in the direction of the shotcrete. The tie back anchors in the lower levels were not adopted in the model to create more conservative conditions in the analysis. It is worth to note that pile footing is placed under the steel column which may result in partial fixity to the steel/ concrete columns. The modelling assumption of pin support will result in conservative design of the shoring and the deflection; therefore, pin support was considered

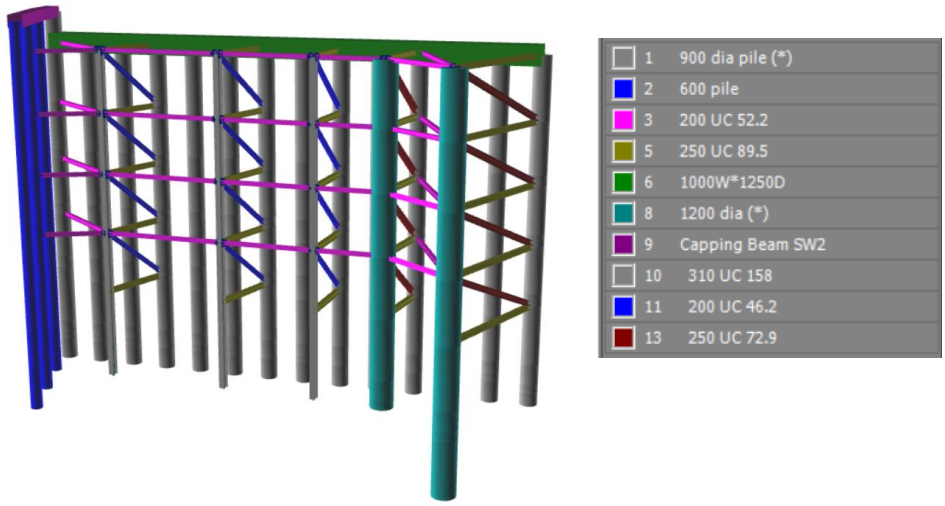


Figure 4.5: 3D view of the FEM model developed on SPACEGAS

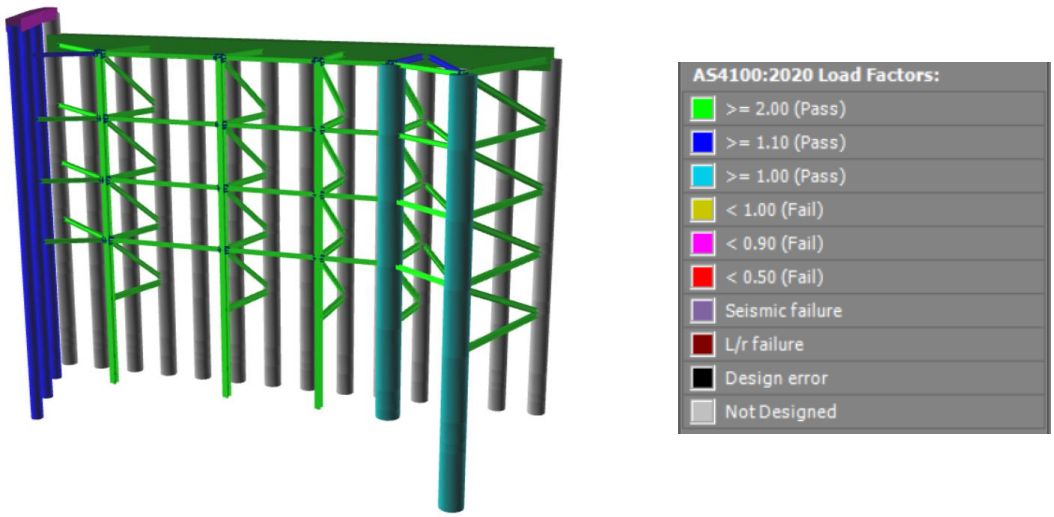


Figure 4.6: Member capacity verification for the first analysis

8. Based on these assumptions, the analysis was conducted. The steel section sizes were designated based on this first row of the iterative analysis process.

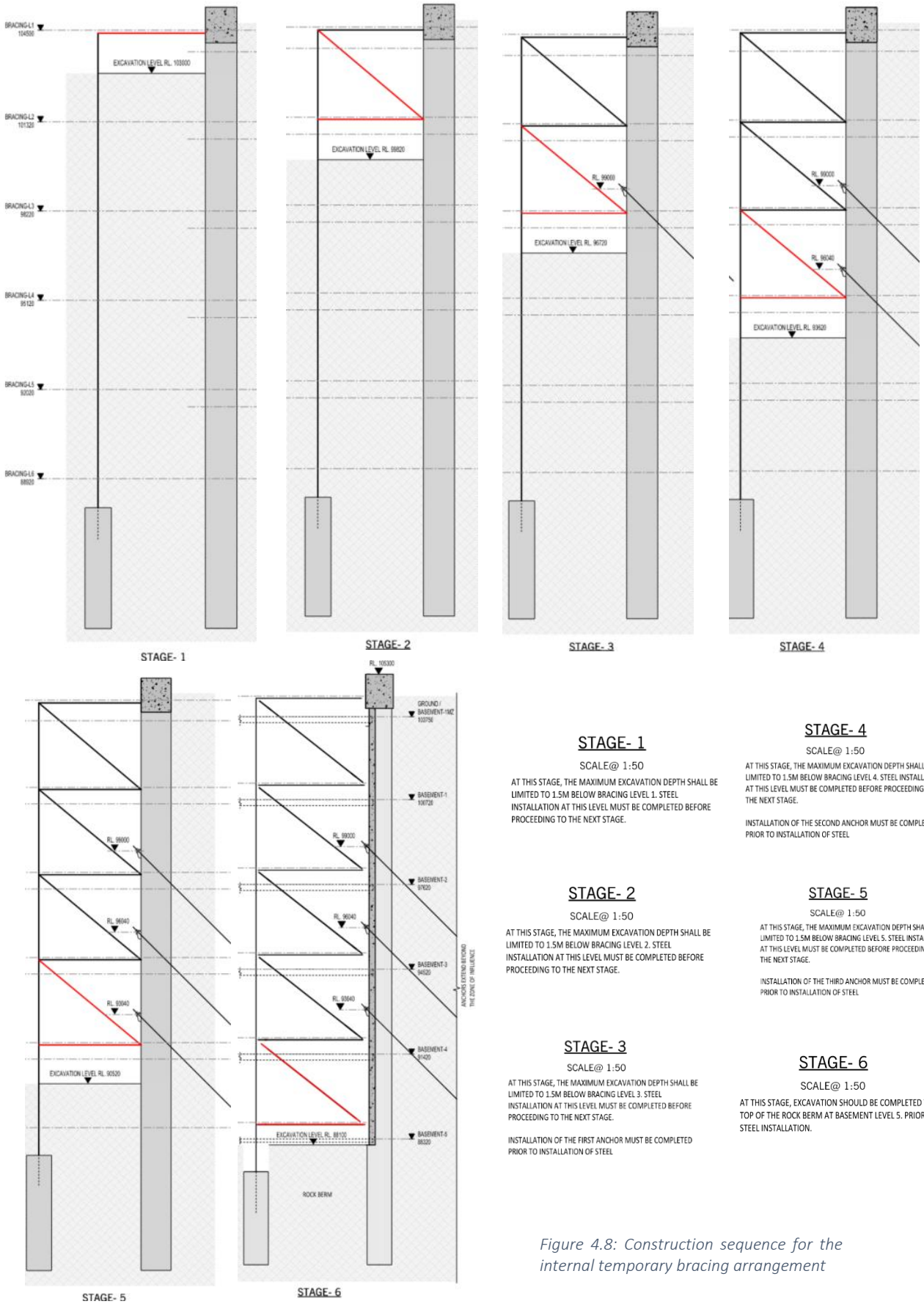
9. Once the steel sections were finalized, a displacement control phenomenon function was utilised to calibrate the geotechnical 2D model. Every horizontal node was pushed by 10mm and the corresponding member reaction forces and the other nodal displacements were submitted to the geotechnical engineer to provide spring stiffness in the geotechnical 2D model. Initially, this displacement value was applied on the node where the first layer of bracings was installed on the shoring wall. Reactions were obtained for the given displacement.

10. The same displacement control was applied on the second, third, fourth and fifth layers of bracing nodes respectively one at a time. Reaction loads were obtained for each analysis.

11. The reaction loads were applied on the geotechnical finite element analysis model and that model was calibrated with appropriate stiffness modifiers to induce 10mm deflection in the geotechnical model.

12. The equivalent calculated spring stiffness was then used in the geotechnical model that simulated actual condition of the shoring wall with the bracing arrangement. The geotechnical engineer used the provided parameters and calibrated their model with appropriate stiffness. Then applied soil pressure and other parameters to the idealised model. The output results of the geotechnical model were received and verified against structural model. It was ensured structural model loads are conservative for the structural design of the elements.

13. The structural model was also modelled and checked under construction sequence staging to identify if any critical stresses or excessive deflections were obtained during the construction phase. (Refer Figure 4.8 for the construction sequence)



STAGE- 1

SCALE@ 1:50

AT THIS STAGE, THE MAXIMUM EXCAVATION DEPTH SHALL BE LIMITED TO 1.5M BELOW BRACING LEVEL 1. STEEL INSTALLATION AT THIS LEVEL MUST BE COMPLETED BEFORE PROCEEDING TO THE NEXT STAGE.

STAGE- 2

SCALE@ 1:50

AT THIS STAGE, THE MAXIMUM EXCAVATION DEPTH SHALL BE LIMITED TO 1.5M BELOW BRACING LEVEL 2. STEEL INSTALLATION AT THIS LEVEL MUST BE COMPLETED BEFORE PROCEEDING TO THE NEXT STAGE.

STAGE- 3

SCALE@ 1:50

AT THIS STAGE, THE MAXIMUM EXCAVATION DEPTH SHALL BE LIMITED TO 1.5M BELOW BRACING LEVEL 3. STEEL INSTALLATION AT THIS LEVEL MUST BE COMPLETED BEFORE PROCEEDING TO THE NEXT STAGE.

INSTALLATION OF THE FIRST ANCHOR MUST BE COMPLETED PRIOR TO INSTALLATION OF STEEL

STAGE- 4

SCALE@ 1:50

AT THIS STAGE, THE MAXIMUM EXCAVATION DEPTH SHALL BE LIMITED TO 1.5M BELOW BRACING LEVEL 4. STEEL INSTALLATION AT THIS LEVEL MUST BE COMPLETED BEFORE PROCEEDING TO THE NEXT STAGE.

INSTALLATION OF THE SECOND ANCHOR MUST BE COMPLETED PRIOR TO INSTALLATION OF STEEL

STAGE- 5

SCALE@ 1:50

AT THIS STAGE, THE MAXIMUM EXCAVATION DEPTH SHALL BE LIMITED TO 1.5M BELOW BRACING LEVEL 5. STEEL INSTALLATION AT THIS LEVEL MUST BE COMPLETED BEFORE PROCEEDING TO THE NEXT STAGE.

INSTALLATION OF THE THIRD ANCHOR MUST BE COMPLETED PRIOR TO INSTALLATION OF STEEL

STAGE- 6

SCALE@ 1:50

AT THIS STAGE, EXCAVATION SHOULD BE COMPLETED TO THE TOP OF THE ROCK BERM AT BASEMENT LEVEL 5. PRIOR TO STEEL INSTALLATION.

Figure 4.8: Construction sequence for the internal temporary bracing arrangement

4.2.3 LOAD FROM ANCHORS

According to the borehole data the following parameter of the ultimate skin friction stresses have been adopted in the assignment to assess the ground anchor capacities. Refer Annexure C for more information on the loads imposed on the anchors.

Table 4.2: Allowable unit stresses in tension loads according different rock types

Unit	Allowable unit stresses for tension bond stress (kPa)
Unit 3a: XW Shale Bedrock	40
Unit 3b: HW Shale Bedrock (Class IV)	75
Unit 3c: HW /MW Shale Bedrock (Class III)	100-225
Unit 3d: MW Shale Bedrock (Class II/III)	250-400
Unit 3e: SW Shael Bedrock (Class II or better)	>400

These values have been utilized in designing the tension forces of the tie back anchors of the shoring wall at SW3 and SW4 that are adjacent to the railway line. Design Section 1, 2 and 3 in the table elaborates different segments in the given SW3 and SW4 shoring walls.

Table 4.3: Tensile capacity of tie back ground anchors

Design Section	Anchor level	Anchor pre-stress load (kN)	Maximum anchor load (kN)	Minimum bond length (m)	Bond material
1	1	80	120	4	HW Shale
	2	200	240	4	HW/MW Shale
	3	200	270	4	HW/MW Shale
	4	200	260	3	MW Shale
2	Strut	-	245		-
	Strut	-	715		-
	1	250	275	3	MW shale
	2	250	280	3	MW shale
	Strut	-	505	-	-
	3	250	275	3	MW shale
3	Strut	-	200	-	-
	Strut	-	400	-	-
	1	230	270	3	MW shale
	2	275	325	3	MW shale

	Strut	-	350	-	-
	3	275	350	3	SW Shale

4.2.2 GROUND DEFORMATION RESULTING FROM EXCAVATIONS

According to the results obtained from the final analysis of the geotechnical modelling presented through "Geotechnical Railway Impact Assessment- 849, 835 & 859 Pacific Highway, Chatswood" (Annexure C), all lateral displacements (at the final excavation and removal of last level of ground anchor) were found to be less than 10mm along the railway line. Near the Wilson Street vehicle overbridge (Design Section 1- specified in the above-mentioned report) the lateral movements were found to be less than 15mm. Those values obtained were also found to be exaggerated since the analysis did not consider the contribution of the bridge piles and any passive soil resistance in front of the wing wall has also not been included in it. Henceforth all lateral defection values expected during the temporary shoring construction is within the accepted limits.

It has also been stated in the geotechnical impact assessment report that even at a sensitivity analysis with 25% reduction of the Youngs Modulus of soil and rock layers, no significant changes to the lateral defections could be noted. Thus, it could be concluded that the basement excavation and the temporary shoring wall arrangement will not yield any adverse impacts or induced deformations in the existing Sydney railway assets.

4.2.3 INDUCED VIBRATIONS AND GROUND BORNE NOISE IMPACTS DURING CONSTRUCTION AND OPERATION

The use of heavy vibrational equipment for ripping and hammering in the in-situ bedrock necessitates careful attention to prevent damage to nearby structures from vibrations. Excavation activities are expected to occur within 10 meters of some structures, and the area's geology is likely to include shale bedrock beneath the surface. This is particularly concerning because vibrations can easily travel through solid bedrock, potentially damaging foundations built in the rock.

To mitigate risks, ground vibrations near adjacent foundations must not exceed 10 mm/s. To monitor this effectively, it is strongly advised to use specialized sensors for vibration monitoring. Fortify Geotech can perform this monitoring. These sensors should be operational before any excavation begins and will alert the relevant personnel if vibrations surpass the critical threshold of 10 mm/s. Should this limit be exceeded, all excavation work must stop immediately, and a qualified geotechnical engineer should be contacted to reassess the site. This step is crucial for ensuring the stability of the excavation and surrounding structures and may require adjustments to the excavation methods to keep vibrations below the critical level.

While the threshold is set at 10 mm/s, it is wise to aim for a design that keeps ground vibrations below 5 mm/s. Excavation methods and equipment should align with the guidelines in Figure 4.1 which provides recommendations to ensure that maximum peak particle velocities do not exceed acceptable limits. All related details have been elaborated in Annexure A: Geotechnical Investigation Report.

Distance from nearby building / Structures [m]	Maximum peak particle velocity [5mm/s]		Maximum Peak Particle Velocity [10mm/s]	
	Equipment Type	Operating Limit (% of Maximum Capacity)	Equipment Type	Operating Limit (% of maximum Capacity)
1.5 to 2.5	Hand operated Jack Hammer	100	300kg Rock Hammer	50
2.5 to 5.0	300kg Rock Hammer	50	300kg Rock Hammer 600kg Rock Hammer	100 50
5.0 to 10.0	300kg Rock Hammer 600kg Rock Hammer	100 50	600kg Rock Hammer 900kg Rock Hammer	100 50

NOTE: It is recommended that vibration monitoring is employed if excavation operations are expected to exceed ground vibrations of 5mm/s. Fortify Geotech Pty Ltd are in possession of vibration monitoring equipment and may be consulted to install the sensors and monitor vibrational data thereafter.

Figure 4.1: Extracts from the Geotechnical investigation report provided by Fortify Geotech

In certain situations, alternative methods like rock sawing may be employed if there is a risk of ground vibrations exceeding 10 mm/s from rock hammering. While saw cutting is less efficient, it can help prevent property damage caused by vibration transmission through the ground. It is advisable to perform saw cutting at depths of at least 1 meter before hammering to reduce vibrations traveling through the rock face. Additionally, hammering near the edges of the excavation should be done under the supervision of a geotechnical engineer, especially when close to adjacent structures (within approximately 10 meters).

All excavation equipment must be operated by experienced personnel who remain vigilant in minimizing vibrations and ensuring the stability and safety of the site. If any safety concerns arise, the operator must immediately inform the site foreman and a geotechnical engineer, and work in the area should stop until it is confirmed safe by the appropriate authorities.

4.2.4 DISCHARGE OF STORMWATER FROM THE DEVELOPMENT

As per the "Rail Corridor Interface - Preliminary Engineering Advice Report" (Annexure D) prepared by Kellogg Brown & Root Pty Ltd, the storm water discharge arrangement has been planned as below. The catch drains located at the top of the shoring walls have the capacity to safely convey a 2% Annual Exceedance Probability (AEP) to the track drainage at the base of the wall. The preliminary stormwater management plans do not direct any stormwater runoff towards the rail corridor. It is recommended to retain these drains as part of the wall structure, with further assessment needed in the next phase of the project.

Annexure F: Limited Environmental Investigation report also provides details of the Hydrological condition of the area. The report should be referred in need of further details and over all analysis of the site conditions.

4.2.5 CHANGES TO GROUNDWATER LEVELS AFFECTING DESIGN ASSUMPTIONS

Reditus Consulting monitored groundwater wells MW01, MW02, and MW03 in the weeks after the investigation to assess the stabilization level of the groundwater. The wells were pumped dry, and measurements of groundwater inflow were taken afterward. The groundwater level measurements, indicated in meters below the top of casing (mbTOC), are shown in Figure 4.2: Extracts of the Measured Ground water levels obtained from the Geo technical report.

Borehole/Monitoring Well No.	Standing Water Level (mbTOC)	Well Depth (mbTOC)	Date Measured
MW01	9.105	12.75	10/11/2023
MW02	11.85	12.88	10/11/2023
MW03	7.75	12.675	10/11/2023

Figure 4.2: Measured Ground water levels extracted from the Geotechnical report

The onsite wells have shown that groundwater stabilized at depths of 7.75m and 11.85m at locations MW01, MW02, and MW03. Consequently, the planned basement excavation, approximately 18.6 to 21.6m deep, is expected to intersect groundwater. Shallow seepages may occur after rainfall, and groundwater levels can fluctuate seasonally and daily due to rainfall and nearby developments. Groundwater is anticipated to flow into the excavation along the soil/rock interface and through bedrock defects, particularly after heavy rain. Monitoring seepage during excavation is recommended to assess drainage system effectiveness.

Preliminary estimates indicate that any seepage can be managed with a sump and pump system, which should be installed during construction and for long-term control beneath the basement slab. A hydraulic engineer should evaluate the excavation to ensure proper drainage measures are in place. Adequate surface drainage should be implemented to prevent pooling against structures. Shoring walls must be designed to withstand hydrostatic pressures unless drainage is installed behind impermeable walls, potentially utilizing strip drains connected to the stormwater system.

For basements below the groundwater table a drained basement design could be adopted, requiring a permanent pump and sump without the need for retaining walls to withstand hydrostatic pressures.

Further details to be extracted from Annexure A: Geotechnical Investigation report and Annexure F: Limited Environmental Investigation Report

4.2.6 RISK ANALYSIS - LOSS OF SUPPORT TO ANY AT GRADE OR ELEVATED RAIL STRUCTURE (INCLUDING ROCK BOLTS AND ANCHORS)

In case of tie back anchor failure or internal strut failure, the stresses imposed on the shoring walls would be increased and have an adverse impact on the excavation for the development. Since the railway retaining wall and other related Sydney railway assets have already been founded on pile foundations, it could be stated that any potential movement of the new shoring area might release stresses in the underlain strata of the adjoining property but will not create any detrimental impacts to TfNSW and Sydney Metro structures as the existing retaining wall in the rail corridor retain all the soil.

An elaborated version of the related risks could be referred through the “Rail Corridor Interface - Preliminary Engineering Advice Report” submitted by “Kellogg Brown & Root Pty Ltd” annexed in Annexure D. This proposes the related risks and mitigation plans to be executed in the short and long term of the development project.

4.2.7 ELECTRICAL CONSIDERATIONS

Following topics will be covered under this section.

- Electrolysis from earth leakage currents
- Protection of the traction power
- HV & LV power systems and earthing system
- Electro-magnetic interference

Electrolytic corrosion occurs due to the ionic flow of direct current (DC) leaving a metallic object. Stray DC current requires a voltage source, a conductive electrolytic medium (such as moist soil), the metallic object, and a path for the current to exit the conductive medium.

In railway systems, the drive motors operate on 1500V DC supplied by overhead contact wires (OHW) and train pantographs, with the return current traveling through the rail track system back to the supply substation. This return current can create a rail voltage between 10 and 70V DC. Ideally, all current would return via the rails; however, because they are in close contact with the ground through sleepers and ballast, some current will 'leak' from the rails and return to the substation through the ground, referred to as 'stray current' or 'leakage current.' Additionally, since OHW support structures are directly buried in the soil, stray currents can also arise from leakage across the supporting insulators. Mitigating the risk of stray current involves isolating and insulating the relevant components. The methods have been elaborated in the "Rail Corridor Interface - Preliminary Engineering Advice Report" submitted by "Kellogg Brown & Root Pty Ltd". Refer Annexure D for further information.

In addition to the general considerations to mitigate the electrolysis and earth leakages due to stray current and traction power, following precautions will be adopted during the design stage. These can be exercised as additional structural engineered precautions. These will also have a fortified protection over the electro-magnetic interference and the earthing system of the development.

- On grade slab: A moisture barrier will be used on the lower floor and basement on-ground slab. The moisture barrier acts as an electrical insulator to the conduction of stray traction current.
- Footing: Pad and strip footings will be provided at load-bearing areas. Concrete with a minimum strength of 40 MPa combined with a minimum of 60 mm clear concrete cover will be considered to have sufficient electrical resistance to reduce the conduction of a stray traction current
- Piles: All piles will be designed similar to footings with a concrete strength of Min 40 MPa with 60 mm of clear concrete cover.
- Rock and Ground anchors: In case of the use of anchors, it is recommended that from a stray current mitigation point of view that the anchors will be isolated to the slab-reinforcing steel.
- The service and other related engineers are also recommended to use mitigative proposals to ensure the stray current hazard does not impede the successful execution of the project.

4.2.8 ENVIRONMENTAL MANAGEMENT OF THE DEVELOPEMEMT

Related information in this regard has been provided in the "Environmental Detailed Site Investigation" report provided by Reditus Pty. Ltd. Reference to be made to Annexure E in the report.

4.2.9 OPERATIONS AND MAINTENANCE, AND EMERGENCY EVACUATION ACCESS ZONES

"Rail Corridor Interface - Preliminary Engineering Advice Report" submitted by "Kellogg Brown & Root Pty Ltd" (Annexure D) specifies the regulatory compliances and Guideline for the Management of Activities within Electricity Easements and Close to Electricity Infrastructure of the railway premises. Henceforth, it is recommended to refer the report for further inform

5. FURTHER INCLUSIONS TO THE STRUCTURAL AND ENGINEERING IMPACT ASSESSMENT.

5.1 GETOECHINCAL ASSESSMENT RESULTS

As per the test results of the numerical analysis conducted by Fortify Geotech using PLAXIS 2D, the following results could be extracted form the report (Refer Annexure C: Geotechnical Railway Impact Assessment by Fortify Geotech). It could be identified that the three main locations which have been taken into consideration during the analysis; the rail retaining wall, Wilson Street bridge and the Obrien St Pedestrian bridge (all have been classified as assets of Sydney trains) have demonstrated stress values in its sequential excavation stages. Below extracts show the related stress values.

Sydney Trains / Sydney Metro asset		Current condition (Stage 4)	Before 2nd Level of Strut / Excavation to Basement-3 Level (Stage 10/11)	End of excavation (Stage 18/19)	Removal of last level of ground anchors (Stage 28/29)	Largest differential to Stage 4
XX (horizontal) direction [1]						
Rail retaining wall along railway corridor		0 to < 80 kPa (Units 1 to 3a) ~470 to < 730 kPa (Below Unit 3a)	0 to < 60 kPa (Units 1 to 3a) ~450 to < 710 kPa (Below Unit 3a)	0 to < 55 kPa (Units 1 to 3a) ~220 to < 370 kPa (Below Unit 3a)	0 to < 50 kPa (Units 1 to 3a) ~215 to < 365 kPa (Below Unit 3a)	< 30 kPa (Units 1 to 3a) < 390 kPa (Below Unit 3a)
Wilson Street vehicle overbridge	Stem	0 to < 60 kPa	0 to < 55 kPa	0 to < 65 kPa	0 to < 65kPa	< 10 kPa
	Base	< 20 to < 90 kPa	5 to < 75 kPa	35 to < 100 kPa	25 to < 100 kPa	< 35 kPa
O'Brien St pedestrian bridge		0 to < 35 kPa	0 to < 35 kPa	0 to < 35 kPa	0 to < 35kPa	< 5 kPa

Figure 5.1: Extracts of the X-X direction stress values from the Geotechnical report due to the excavation

Sydney Trains / Sydney Metro asset		Current condition (Stage 4)	Before 2nd Level of Strut / Excavation to Basement-3 Level (Stage 10/11)	End of excavation (Stage 18/19)	Removal of last level of ground anchors (Stage 28/29)	Largest differential to Stage 4
YY (vertical) direction [1]						
Rail retaining wall along railway corridor		0 to < 260 kPa	0 to < 200 kPa	0 to < 220 kPa	0 to < 200 kPa	< 70 kPa
Wilson Street vehicle overbridge	Stem	5 to < 90 kPa	5 to < 85 kPa	5 to < 90 kPa	to < 95 kPa	< 15 kPa
	Base	~50 to < 210 kPa	~55 to < 205 kPa	~40 to < 240 kPa	~40 to < 235 kPa	< 25 kPa
O'Brien St pedestrian bridge		0 to < 75 kPa	0 to < 70 kPa	0 to < 70 kPa	0 to < 70 kPa	< 5 kPa

Figure 5.2: Extracts of the Y-Y direction stress values from the Geotechnical report due to the excavation

According to the analysis it has been concluded that this new development will have a minimum impact to the existing structure. The ground induced displacements also depict that there would be no adverse impacts on the assets.

Sydney Trains /Sydney Metro asset	Before 2nd Level of Strut / Excavation to Basement 3 Level (Stage 10/11)	End of excavation (Stage 18/19)	Removal of last level of ground anchors (Stage 28/29)	Largest differential to current conditions (Stage 4)
Rail retaining wall along railway corridor	< 5 mm	< 10 mm	< 10 mm	< 10 mm
Wilson Street vehicle overbridge	< 5 mm [1]	< 10 mm [1]	< 10 mm [1]	< 10 mm [1]
O'Brien St pedestrian bridge	< 5 mm	< 5 mm	< 5 mm	< 5 mm

Figure 5.3: Extracts of the displacement due to the excavation from the Geotechnical report

The analysis has also been conducted for another sensitivity analysis which has been carried out at each section with a reduction in Young Modulus values for all soil and rock layers of 25%. This has also produced values that depict the excavation to be safer within the considered area.

5.2 FOUNDATION DESIGN

All foundations to be founded on SW Shale bedrock considering the excavation depth of 18.6m to 21.6m for the six basements. Pad footings will be incorporated in the design. In case of locations where columns are terminated closer to the natural ground level, piles will be accommodated in the design. The piles will be terminated in the SW Shale bedrock.

Figure 5.1 showcases the recommended allowable bearing capacities for the footings

Foundation Material Type	Depth Below Existing Surface Level	Allowable End-Bearing Pressure			Allowable Shaft Adhesion on Bored Piers and Anchors	
		Strips	Pads	Bored Piers	Downward Loading	Uplift
Newly Placed Controlled Fill	-	100kPa	125kPa	N/A	N/A	N/A
Stiff Alluvial Soils	~0.4m/2m	100kPa	125kPa	150kPa	15kPa	7kPa
Very Stiff	~1.5m/3.0m	150kPa	175kPa	200kPa	20kPa	10kPa
HW Shale Bedrock	~6.0m/7.8m	500kPa	750kPa	1000kPa	100kPa	50kPa
MW Shale Bedrock	~8.9m/13.45m	1000kPa	1500kPa	2000kPa	200kPa	100kPa
SW Shale Bedrock	~14.25m/16.55m	3000kPa	3250kPa	3500kPa	350kPa	175kPa

Figure 5.6: Extracts of the recommended allowable bearing capacities for the footings from the Geotechnical report

5.3 USE OF CONSTRUCTION EQUIPEMENT

Apart from the details mentioned under CL 4.2.3, “Induced vibrations and ground borne noise impacts during construction and operation” it is also vital to understand the impact on the use of crane, drilling and pilling rigs and also other equipment used for the transportation of materials to the site.

It will also be noted that the location of any mobile crane or mobile piling rig will be restricted to a distance equal to the operating maximum extended boom length from the first reserve so that potential collapse or overturning will not impact the at-grade rail structure. Furthermore, cranes and other construction equipment such as, excavators, concrete pumps and access equipment, will not intrude into the rail corridor without prior approval of SMA. A detailed method statement and proposed work schedule will be submitted for prior approval of SMA before the construction work is initiated.

5.4 INCORPORATION OF INCIDENTAL LOADS DUE TO DERAILMENT IN THE TEMPORARY STRUCTURE DESIGN

The report "Rail Corridor Interface - Preliminary Engineering Advice Report," prepared by Kellogg Brown & Root Pty Ltd, (Annexure D) outlines several risks associated with the development's location, which features four tracks: the outer two operated by Sydney Trains and the inner two by Sydney Metro. The line speed in this area is 80 km/h, and passenger trains run frequently. The track is relatively straight, without turnouts or special trackwork, minimizing the risk of derailment due to overspeed or track failure.

It is noteworthy that at the northern end of the Chatswood Rail Enclosure Structure, the track transitions from a concrete slab to a ballasted track. This change in track type affects stiffness, typically managed by using a transition or approach slab beneath the ballasted section. This design helps avoid sudden stiffness changes, thereby reducing stress that could lead to rail breaks and derailments.

According to the report, there is a vertical grade change between the Sydney Trains and Metro Trains tracks, with the Metro tracks beginning their descent into a tunnel. To address the height difference, guardrails have been installed on the T1 Down Shore track within its 4ft width, preventing derailed trains from falling onto the lower-level Metro tracks. These guardrails also help reduce the risk of trains colliding with the retaining wall of the cutting. In the event of a derailment, the retaining wall and the cutting’s depth would act as barriers, preventing trains from impacting nearby buildings. Given these safety measures, the likelihood of a train derailment at this site is considered very low, rendering all associated structural risks minimal and negligible.

Furthermore, the impact of a train collision is also deemed negligible, thanks to the presence of the railway retaining wall and a buffer space of 7.3 meters between the building footprint and the site boundary. This buffer could be enhanced with passive landscaping to further mitigate any potential collision loads on the building.

5.5 REGULAR STRUCTURAL HEALTH MONITORING

In addition to the monitoring requirements and procedures listed out in “4.2.3 Induced vibrations and ground borne noise impacts during construction and operation” special instrumentation and monitoring plans will be executed with the execution of basement excavation process.

A point of main emphasis should be that the entire process of excavation, temporary retaining arrangement and conversion of the temporary arrangement into permanent retaining structure should be meticulously monitored and documented. The monitoring and instrumentation plan should be equipped with survey monitoring prisms installed along the capping beam and on selected vertical arrays. In addition to these, inclinometers should also be installed in selected locations behind the proposed basement wall so that the ground displacements can also be assessed. A stringent monitoring arrangement will enhance the credibility of the construction process and inhibit any unexpected catastrophic events during all execution phases of the project.

6. CONCLUSION

According to the structural and engineering impact assessment and the geotechnical railway impact assessment which comprises of a numerical finite analysis model simulating the TfNSW and SMA railway assets, it could be notified that there are no adverse or considerable impacts induced at the railway corridor of the Sydney railway assets. All deformations, stresses incurred have been identified to be within the acceptable limits. Vibrations that can occur during excavation requires to be maintained at the desired level and monitored throughout the phase.

All other considerations related to piling work, drainage, storm water runoff, stray current and electrolysis, protection of the traction power, HV & LV power systems and earthing system, environmental protection and operations and maintenance, and emergency evacuation access zones have been noted and taken into full accountability. Therefore, it could be concluded that all specifications imposed by the Sydney Metro- Technical service have been catered to in the report and the other related documents submitted along with this.

Please refer appendices for the further details and other component of the report.

Appendices

Annexure A:	Geotechnical investigation report submitted by Fortify Geotech
Annexure B:	Shoring wall drawings issued by Cadigal Group for DA submission
Annexure C:	Geotechnical Railway Impact Assessment by Fortify Geotech
Annexure D:	Rail Corridor Interface - Preliminary Engineering Advice Report by KBR
Annexure E:	Detailed Site Investigation Report Prepared by REDITUS
Annexure F:	Limited Environmental Investigation Report by Geotech Services- Extracts for Hydrology report
Annexure G:	Design calculation on the shoring piles provided by Cadigal Group

Annexure A: Geotechnical investigation report submitted by Fortify Geotech

GEOTECHNICAL INVESTIGATION REPORT

FORTIFY GEOTECH

Proposed Mixed Use Apartment Development

CLIENT

Reditus Consulting

ADDRESS

849, 853 & 859 Pacific Highway, 2 & 8 Wilson Street, Chatswood, NSW

DATE

November – December 2023

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14 December 2023
Our ref: JS/S1998 Rev2

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Attention: Natasha Pasley

Proposed Mixed Use Apartment Development – 849, 853 & 859 Pacific Highway, 2 & 8 Wilson Street, Chatswood, NSW

Geotechnical Investigation Report

We are pleased to present our geotechnical investigation report for the proposed mixed use apartment development, located at 849, 853 & 859 Pacific Highway, 2 & 8 Wilson Street, Chatswood, NSW.

The report outlines the methods and results of exploration, describes site subsurface conditions, and provides recommendations for building footing design, excavation conditions, preparation of subgrades, stability of cut and fill batters, design parameters for temporary and permanent excavation support, provides aggressivity test results and exposure classification, point load rock strength index test results, indicative design CBR values, and site drainage advice.

Yours faithfully
Fortify Geotech

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About us

We work with our clients to provide practical advice and solutions tailored to each project. Our professional services are reliable, responsive and efficient.

Our highly capable Geotechnical Engineers and Geologists have a comprehensive understanding of the industry. We provide the best engineering solution for complicated geotechnical engineering issues. This has earned us a solid reputation with our Construction Industry, Municipal and Government clients

INDUSTRIES WE WORK IN

- Residential
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- Geotechnical Site Investigations and Reporting;
- Engineering Geology;
- Mining/Rock Geotechnics;
- Foundation Engineering;
- Dam Engineering; Embankment Design and Specification;
- Geotechnical Design Recommendations;
- Pavement Engineering and Design;
- Pavement Condition Surveys;
- Slope Stability and Risk Assessments;
- Geotechnical and Hydrological Instrumentation and Monitoring;
- Footing and Excavation Supervision and Certifications;
- Excavated soil/rock assessments and VENM assessments;
- Supervision and Certification of Earthworks and Controlled Fill, including Level 1 supervision;
- Geotechnical Construction Specifications;
- Deep Excavation Support; and
- Slope/Retaining Structure Analysis and Design

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FORTIFY GEOTECH

Proposed Mixed Use Apartment Development – Chatswood

Geotechnical Investigation Report

QUALITY INFORMATION

Revision history

Reference/ Revision	Description	Date	Author	Reviewer
JS/S1998 Rev0	For issue	05/12/2023	JS	JM
JS/S1998 Rev1	For issue	12/12/2023	JS	AB
JS/S1998 Rev2	For issue	14/12/2023	JS	AB

Reditus Consulting

Proposed Mixed Use Apartment Development – 849, 853 & 859 Pacific Highway, 2 & 8 Wilson Street, Chatswood, NSW

Geotechnical Investigation Report

1 INTRODUCTION

At the request of Reditus Consulting, Fortify Geotech Pty Ltd carried out a geotechnical investigation for the proposed mixed use apartment development at 849, 853 & 859 Pacific Highway, 2 & 8 Wilson Street, Chatswood, NSW.

The project is understood to involve the construction of a two-storey podium with a mix of commercial uses, two split residential towers of up to 27 storeys, and 4 level basement carparking with a loading dock. It is understood that excavations are expected to extend to RL 91.35, or ~14m to 16m depth below existing groundsurface levels.

The aim of the investigation was to:

i. Identify subsurface conditions including the extent and nature of any fill materials, soil strata, bedrock type and depth, and groundwater presence.

ii. Provide soil and rock properties including unit weight, friction angle, cohesion, Young's modulus, Poisson's ratio and earth pressure coefficients.

iii. Provide site classification to AS2870 "Residential Slabs & Footings".

iv. Advise on suitable footings systems, founding depths, allowable bearing pressures and design parameters for piles.

v. Advise on excavation conditions, suitability of excavated material for use in controlled fill platforms and advice for construction of building platforms.

vi. Advise on stable batter slopes and provide low retaining wall design parameters.

vii. Provide design parameters for temporary and permanent excavation support.

viii. Advise on pavement subgrade preparation and provide indicative design CBR values.

ix. Provide aggressivity test results and exposure classification.

x. Provide point load rock strength index test results.

xi. Provide earthquake Site Factor

xii. Drainage and other geotechnical advice.

2 SITE DESCRIPTION & GEOLOGY

The site is located at 849, 853 & 859 Pacific Highway, 2 & 8 Wilson Street, Chatswood, NSW. The site has a combined area of approximately ~4,660m^2, and is irregular in shape. The site is bounded by Wilson Street to the north, Pacific Highway to the west, O'Brien Street to the south and railway lines to the east. The site is presently occupied by existing residential unit buildings on the western portion of the site, and an existing warehouse structure on the eastern portion of the site. The groundsurface is mostly concrete covered where not developed and is relatively flat, with a vertical cut at the eastern boundary of the site adjacent to the railway lines. Figure 1 shows the site locality.

The geological information provided by the Department of Regional NSW (Reference 1) indicates the area to be underlain by Middle Triassic age Ashfield Shale. Ashfield Shale consists of black to light grey shale and laminite. Ashfield Shale is a Middle Triassic marine shale and mudstone unit with minor siltstone and sandstone that outcrops in eastern Australia.

3 INVESTIGATION METHODS

The site investigation was conducted between the 13th-17th & 20th-21st of November 2023, comprising six augered and cored boreholes, designated BH1 to BH6, drilled to target depths of ~18.96m/20.88m. The boreholes were drilled using a Christie Engineering track mounted drill rig fitted with solid flight augers and a tungsten carbide (TC) bit. The overburden soils were augered using a 110mm continuous flighted helix auger equipped with a tungsten tipped "V" bit. A NMLC triple-tube core barrel (~52mm internal diameter), with diamond impregnated drill-bit, was used to core the bedrock. Water was used as the recirculating fluid. SPT (Standard Penetration Testing) was conducted in boreholes BH1, BH2 & BH4-BH6, with testing intervals at 1.5-meter depths until refusal, aiming to ascertain the in-situ consistency and inferred density of the soil profiles.

Core retrieved from the boreholes was placed in metal core trays. Following drilling, the core was photographed, and selected core was tested for point load strength index testing. Borehole logs are presented in Appendix A, while core photographs are shown in Figures 4 to 9 for boreholes BH1 to BH6 following their respective cored borehole logs.

The auger profiles were visually logged in accordance with the Unified Soil Classification System (USCS) and AS1726-2017. Definitions of geotechnical engineering terms used on the logs and in this report, including a copy of the USCS chart, are provided in Appendix F.

Groundwater monitoring wells were installed near borehole BH1, BH4 and BH5 by Reditus Consulting, as shown on Figure 2.

4 INVESTIGATION RESULTS

4.1 SUBSURFACE CONDITIONS

The subsurface conditions of the proposed mixed use apartment development were investigated by six boreholes, designated BH1 to BH6. The subsurface profile found in the investigation boreholes is summarised in Table 1. The SPT results are summarised in Table 2.

Table 1: Subsurface Conditions

Geological Profile	Typical Depth Interval	Description
FILL	**0m to 0.2m/0.6m**	ASPHALT, CONCRETE, SANDY GRAVEL, GRAVELLY SAND; fine to coarse gravels, fine to coarse grained sand, grey to brown, dark brown to dark grey, trace low plasticity clay, dry, medium dense
ALLUVIAL/ RESIDUAL SOIL	**0.2m/0.6m to 2.8m/4.8m**	SANDY CLAY, SILTY CLAY, CLAY with SAND, CLAY, SANDY SILTY CLAY; low plasticity clay, low to medium plasticity clay, medium plasticity clay, medium to high plasticity clay, brown with red, brown, orange to brown mottled orange, pale orange to brown mottled red, pale grey and red to brown, pale grey mottled red to brown, pale grey trace red and orange, pale grey mottled red, grey, orange to brown mottled pale orange, trace fine to medium gravels, trace fine grained sand, trace ironstone, w<PL, w~PL, firm, firm to stiff, stiff, stiff to very stiff, very stiff, very stiff to hard, hard.
EXTREMELY WEATHERED BEDROCK	**2.8m/4.8m to 6.0m/7.8m**	SILTSTONE & SHALE; extremely weathered (XW), extremely to highly weathered (XW/HW), excavates as GRAVELLY SILTY CLAY, SILTY CLAY; low plasticity clay low to medium plasticity, medium plasticity, fine to medium gravels, pale grey with red and orange, pale grey to grey, pale grey with red and orange, grey trace red and orange, trace ironstone, very stiff to hard, hard, w<PL.
BEDROCK	**Below 6.0m/7.8m**	SHALE; highly weathered (HW), highly to moderately weathered (HW/MW), moderately weathered (MW), moderately to slightly weathered (MW/SW), slightly weathered (SW), slightly weathered to fresh (SW/FR), dark grey, grey, some iron staining, dry, very fine grained, low strength, medium strength, medium to high strength, high to very high strength.

Table 2: SPT Result Summary:

Depth from existing groundsurface levels (m)	Average N-Value	Geological Profile	Relative Density
1.5	17	ALLUVIUM	Stiff to Very Stiff
3	33	ALLUVIUM/RESIDUAL	Very Stiff to Hard
4.5 (BH1 & BH2 only)	44	RESIDUAL	Hard

Table 3: Borehole Summary with Approximate RL's

Borehole No.	Approximate RL at top of borehole[1]	Depth of fill (RL)[2]	Depth to XW Bedrock (RL)[2]	Depth to MW Bedrock (RL)[2]	Depth to SW Bedrock (RL)[2]
1	103.6	103.3	98.8	90.15	88.6
2	104.9	104.3	100.4	94.02	88.35
3	105.8	105.3	101.3	96.65	90.65
4	105.9	105.7	103.1	97	91.65
5	105.65	105.05	102.45	96.21	89.65
6	104.95	104.55	101.95	95.75	90.65

[1] RL's have been interpolated between survey points off the detailed the survey and therefore may have an error margin of +/-0.5.
[2] RL's have been calculated based on the interpolated RL at the top of each borehole.

4.2 POINT-LOAD STRENGTH INDEX TESTING

A total of one hundred and eight (108) point-load strength index tests were carried out on selected rock core specimens. The index values were used to derive the approximate compressive strength of the rock by applying the empirical relationship $q_u = 24 \times I_s(50)$ (Broch, E. & Franklin, J. A. (1972), "The Point-Load Strength Test", trans., Inst. Min. Metall.), where q_u is the ultimate compressive strength. The test method and calculation of point-load strength index $I_s(50)$ is in accordance with the test methods outlined by the International Society for Rock Mechanics (ISRM (1972), "Suggested Methods for Determining the Uniaxial Compressive Strength of Rock Materials and the Point-Load Strength Index", Committee on Laboratory Tests - Document No.1, Int. Soc. Rock Mechanics.). Testing was conducted both diametrially, with force applied parallel to the direction of lamination, and axially, with force applied perpendicular to the direction of lamination. Results of the point-load testing are presented in Appendix B. Estimated values of compressive strengths of the site bedrock are summarized in Table 4.

Table 4: Estimated Rock Compressive Strengths

Test Method	Estimated Compressive Strength		Number of Point Load Tests
	Range (MPa)	**Average (MPa)**	
Diametrial	0 – 67.44	14.42	108
Uniaxial	0.24 – 88.56	28.45	

Due to the bedded nature of the shale rock, the rock strength is anisotropic and is expected to have an average diametral compressive strength of 14.42MPa and an average uniaxial compressive strength of 28.45MPa. Diametral compressive strengths could range up to 67.44MPa and uniaxial compressive strengths could range to 88.56MPa based on the test results.

4.3 GROUNDWATER

The groundwater wells, MW01, MW02 and MW03 were monitored by Reditus Consulting in the weeks following the investigation to assess the level that groundwater stabilised. The wells were also pumped dry and then groundwater inflow measurements taken. The groundwater level measurements relative to metres below top of casing (mbTOC) are provided in Table 5.

Table 5: Measured Groundwater Levels

Borehole/Monitoring Well No.	Standing Water Level (mbTOC)	Well Depth (mbTOC)	Date Measured
MW01	9.105	12.75	10/11/2023
MW02	11.85	12.88	10/11/2023
MW03	7.75	12.675	10/11/2023

The onsite wells found the groundwater to stabilize at 7.75m/11.85m depth at the location of MW01, MW02 and MW03. Based on these readings, it is expected that the proposed ~14m-16m deep basement excavation will intercept groundwater.

Temporary, perched seepages could be encountered at shallower depths following rainfall within the more pervious soils. Note that groundwater levels may be subject to seasonal and daily fluctuations influenced by factors such as rainfall and future development of the surrounding properties. We expect groundwater inflows into the excavation along the soil/rock interface and through any defects within the bedrock (such as jointing, and bending planes, etc.) particularly following a period of heavy rain. The initial flows into the excavation may be locally high but would be expected to decrease with time as the bedding seams/joints are drained. We recommend that monitoring of seepage be implemented during the excavation works to confirm the capacity of the drainage system.

Estimates of groundwater inflow have been calculated by Reditus Consulting and are included in Appendix E. It should be noted that the groundwater inflow estimates are preliminary only.

We expect that any seepage that does occur should be able to be controlled by a conventional sump and pump system. We recommend that a sump-and-pump system be used both during construction and for permanent groundwater control below the basement floor slab. In the long term, drainage should be provided behind all basement retaining walls, around the perimeter of the basement and below the basement slab. The completed excavation should be inspected by a hydraulic engineer to confirm that adequate drainage has been allowed for. Drainage should be connected to the sump- and-pump system and discharged into the stormwater system. The permanent groundwater control system should take into account any possible soluble substances in the groundwater which may dictate whether or not groundwater can be pumped into the stormwater system. We recommend that pump-out tests be undertaken during construction of the basement to confirm the predicted groundwater seepage volumes into the excavation. The design of drainage and pump systems should take the above issues into account along with careful ongoing inspections and maintenance programs.

5 LABORATORY TESTING

5.1 AGGRESSIVITY SUITE TEST RESULTS

Six representative samples of the soil from auger holes, designated BH1 – BH6 were sampled between 14th November 2023 to 21st November 2023 and have been tested in a NATA laboratory for aggressivity (Cl, SO4, pH & EC).

Results of the laboratory tests performed on the soil samples are summarised in Table 6. The NATA certificates are attached in Appendix C.

Table 6 – Aggressivity Suite Laboratory Test Results Summary

Sample No.	BH1	BH2	BH3	BH4	BH5	BH6
Depth of sample	**4.8m**	**4.0m**	**2.5m**	**1.2m**	**1.7m**	**2.0m**
Material Description	RESIDUAL; Silty Clay	RESIDUAL; Silty Clay	RESIDUAL; Silty Clay	RESIDUAL; Silty Clay	ALLUVIUM; CLAY with SAND	RESIDUAL; SILTY CLAY trace SAND
pH	5.2	4.5	5.1	4.5	4.7	4.9
Electrical Conductivity (µS/cm)	80	44	72	65	67	180
Chloride, Cl (mg/kg)	<10	<10	<10	10	10	130
Sulphate, SO4 (mg/kg)	83	34	63	63	70	100

5.2 ATTERBERG LIMIT TEST RESULTS

Four representative sample of the soils from the auger holes, designated BH3-BH6 were sampled between 14th November 2023 to 21st November 2023 and have been tested in a NATA laboratory for Atterberg limits and linear shrinkage.

Results of the laboratory tests performed on the soil sample are summarised in Table 7. The NATA certificates are attached in Appendix D.

Table 7 – Soil Classification Laboratory Test Results Summary

Sample No.	BH3	BH4	BH5	BH6
Depth of sample	**1-1.5m**	**1.8m**	**1.5-1.8m**	**0.5-0.8m**
Material Description	**ALLUVIAL;** CLAY (CH); medium to high plasticity clay	**RESIDUAL;** Silty Clay (CI); medium plasticity clay	**ALLUVIAL;** CLAY with SAND (CH); medium to high plasticity clay, fine grained sand	**ALLUVIAL;** Sandy Clay (CH); medium to high plasticity clay, fine grained sand
Liquid Limit (%)	68	59	57	59.0
Linear Shrinkage (%)	15.5	14	13.5	14.5

6 DISCUSSION & RECOMMENDATIONS

6.1 SITE CLASSIFICATION

Due to the presence of uncontrolled fill material up to 0.6m depth, the site is designated as Class "P" (problem) site in accordance with AS2870 "Residential Slabs & Footings". If the fill is removed, and replaced with controlled fill, or if footings are founded in the natural soil or bedrock below the fill, a Class "H1" (highly reactive) category can be used in design of new footings. The characteristic ground surface movement "Y_s", as defined by AS2870 for the range of extreme dry to extreme wet moisture conditions is estimated to be between 40mm and 50mm.

Deemed-to-comply footing designs provided by AS2870 are applicable specifically to residential-style one and two-storey structures, or buildings with similar loads and superstructure stiffness.

6.2 GEOTECHNICAL DESIGN PARAMETERS

Geotechnical design parameters for the encountered soil/rock units are provided in Table 8.

Table 8: Geotechnical Design Parameters

Layer	Typical Interval Depth	γ_d (kN/m^3)	Cu (kPa)	C` (kPa)	Ø` (degrees)	Young's Modulus E (MPa)	Poisson`s Ratio (ν)
Firm Alluvial Soil	0.3m/0.6m to 1.5m/2m (BH1-BH4)	16	50	2	20	20	0.3
Stiff Alluvial/Residual Soil	0.4m/2m to 1.5m/3m	18	70	3	25	30	0.3
Very Stiff to Hard Alluvial/Residual Soil	1.5m/3m to 7.5m/7.8m	21	100	5	25	50	0.3
HW Bedrock	6.0m/7.8m to 8.9m/13.45m	23	200	50	34	150	0.25
MW Bedrock	Below 8.9m/13.45m	23	400	100	35	700	0.2

Where,

γ_d = in-situ, dry unit weight, in kN/m^3
Cu = undrained shear strength, in kPa
C' = effective drained cohesion, in kPa
Ø' = effective internal friction angle, in degrees

Table 9 provides preliminary coefficients of lateral earth pressure for the soils and rock encountered during the geotechnical investigation. The coefficients provided are based on horizontal ground surface and fully drained conditions.

Table 9: Preliminary Coefficients of Lateral Earth Pressure

Layer	Coefficient of Earth Pressure at Rest (K_0)	Coefficient of Active Earth Pressure (K_a)	Coefficient of Passive Earth Pressure (K_p)
Stiff Alluvial/Residual Soil			
Very Stiff Alluvial/Residual Soil	0.577	0.406	2.464
HW Bedrock	0.441	0.283	3.54
MW Bedrock	0.426	0.271	3.68

6.3 BUILDING FOOTINGS

AS2870 provides “deemed-to-comply” footing/slab designs, which for a Class “H1” site includes stiffened rafts, stiffened footing slabs, waffle rafts, and strip and/or pad footings with above ground floors. Footings and slabs should be in accordance with the principles of AS2870 (Reference 2).

For structures founded at existing grade or with a single level basement, footings, including thickened sections of slabs forming footings should be founded below the topsoil/fill material and any loose or moisture affected soil, and founded in stiff alluvial soils. A depth of ~0.4m/2m depth below existing surface levels may be required to reach a suitable founding stratum. Shallow footings could be founded in any newly placed controlled fill following (see Section 6.8). Alternatively, bored piers founded in natural soils or weathered bedrock below the fill material could be used. A four level, ~14m-16m deep basement is expected to expose moderately to slightly weathered (MW/SW) and slightly weathered (SW) high to very high strength weathered bedrock over the foundation.

We recommend the following geotechnical strength reduction factors to be applied to the ultimate capacities of:

- Shallow footings = 0.5 in accordance with AS5100.3- 2017
- Piles = The actual value adopted will depend on design methods adopted, extent of pile testing etc. AS2159-2009 should be consulted for further assessment of this value.

All footings should be inspected by a geotechnical engineer prior to pouring concrete or installing steel reinforcement, to verify the actual ground conditions against the proposed design parameters. Any topsoil, uncontrolled fill, organic materials, and other unsuitable or deleterious material should be stripped beneath the footprint of the shallow footings.

For pile systems, the vertical resistance to imposed footing loads would be provided by a combination of shaft adhesion and end-bearing. Settlements are estimated to be approximately 1% of pier diameters. Recommended allowable end-bearing pressures and shaft adhesion values for various footing systems and likely foundation materials are provided in Table 9.

Table 10: Recommended Allowable Bearing Pressures for Footings

Foundation Material Type	Depth Below Existing Surface Level	Allowable End-Bearing Pressure			Allowable Shaft Adhesion on Bored Piers and Anchors	
		Strips	Pads	Bored Piers	Downward Loading	Uplift
Newly Placed Controlled Fill	-	100kPa	125kPa	N/A	N/A	N/A
Stiff Alluvial Soils	~0.4m/2m	100kPa	125kPa	150kPa	15kPa	7kPa
Very Stiff	~1.5m/3.0m	150kPa	175kPa	200kPa	20kPa	10kPa
HW Shale Bedrock	~6.0m/7.8m	500kPa	750kPa	1000kPa	100kPa	50kPa
MW Shale Bedrock	~8.9m/13.45m	1000kPa	1500kPa	2000kPa	200kPa	100kPa
SW Shale Bedrock	~14.25m/16.55m	3000kPa	3250kPa	3500kPa	350kPa	175kPa

Notes to Table 10:

1. Ultimate bearing capacities would be three times the allowable values. Ultimate values should be used with the strength reduction factor in Section 6.3 above.
2. The parameters in Table 10 assume that the pile base is clear of debris. If seepage occurs into the pile excavation, dewatering should be conducted prior to pouring concrete, or concrete should be placed using a tremmie.
3. For bored piles, the subsurface profile encountered during pile excavation must be observed by a geotechnical engineer to confirm the design assumptions.
4. All piles shall be designed in accordance with the requirements of AS2159 – 2009 (Reference 3) and in accordance with good engineering practice.
5. Brom's assumption (as cited in Elson, 1984 (Reference 4)) that lateral resistance is zero to a depth of 1.5D, where D is the pile diameter, should be adopted.

All footings should be inspected and approved by an experienced geotechnical engineer to confirm the foundation material and design values, and to ensure the excavations are clean and stable.

Ground slabs can be constructed on the natural soils or newly placed controlled fill (see Section 6.6). Following excavation to the required level, slab areas on soil should be proof rolled by a pad foot roller to check for any weak, wet or deforming soils that may require replacement.

6.4 EXCAVATION CONDITIONS & USE OF EXCAVATED MATERIAL

It is understood that deep excavations to ~16m depth will be required for this project. Excavations to ~6.0m/7.8m will be through fill, alluvial/residual soils and weak weathered bedrock. The fill, alluvial/residual soils and weak weathered bedrock are readily diggable by backhoe and medium sized excavator to at least 6.0m/7.8m depth. Excavations below ~8.9m/13.45m depth are expected to encounter strong bedrock which will require rock hammering or use of a larger excavator with a ripper.

The measure of the excavatability of bedrock is dependent on two important factors - (1) the compressive strength of the rock, and (2) the nature and spacing of the defects in the rock. Pettifer and Fookes (1994) (Reference 5) have developed a chart to assist in providing a guide to what plant is required for given rock conditions. A copy of the chart is provided in

Figure 4. The green zone on the chart in Figure 4 shows the area corresponding to the expected rock and excavations conditions at this site.

Excavation slopes should be no steeper than 1H:1V as shale can be prone to slab failures. Temporary shoring or bracing may be required for worker safety within the excavation. Due to the clay-rich nature of the shale, the excavated material is not recommended for use as structural fill under load bearing elements. The excavated shale material, once crushed and screened, can potentially be utilized as general non-structural backfill, subbase material for pavements, or aggregate for concrete mixes after testing confirms the material has suitable engineering properties that meet required specifications. Any surplus excavated shale may be disposed of off-site at an approved facility.

Any low/medium plasticity alluvial and residual soils can be used in controlled fill construction of building platforms, provided any rock particles are broken down to <75mm size and the fill is environmentally suitable for re-use on site. Topsoil and existing uncontrolled fill material and any medium to high and high plasticity, clayey soils should not be used in controlled fill construction.

If imported fill is required, a suitable select fill material would include a low or medium plasticity soil such as clayey sand or gravelly clayey sand, containing less than 35% fines less than 0.075mm size (silt and clay), and no particles greater than 75mm size.

All materials unearthed during excavation processes shall be managed and disposed of in strict adherence to the stipulations set forth in the prevailing legislation and guidelines, encompassed by the Waste Classification Guidelines as delineated by the Environmental Protection Agency (EPA, 2014). This encompasses fill and natural materials that may be extracted from the site.

6.4.1 Excavation Vibrations

Use of heavy vibrational plant/equipment for ripping and hammering of the in-situ bedrock requires particular care to ensure that structures in the surrounding vicinity are not damaged/affected by vibrations. It is expected that the excavation operations may be at a distance ≤ 10m from some surrounding structures. The geology of the surrounding area is expected to have shale bedrock in its subsurface profile. This is of particular concern, as vibrations are readily transmitted through competent bedrock, potentially resulting in damage to footings founded in the bedrock.

It is required that ground vibrations in proximity of the adjacent structure's foundations do not exceed 10mm/s. To ensure this value is not exceeded, it is highly recommended that vibration monitoring using specialised sensors is conducted. Fortify Geotech has the capability to undertake this monitoring.

The monitoring devices should be functioning prior to conducting any excavation operations and will notify the appropriate individual if ground vibrations exceed a critical value (10mm/s). If this value is exceeded, all excavation should be ceased immediately, and an experienced geotechnical engineer must be contacted for reassessment of the site; this is necessary to ensure the stability of the excavation and surrounding structures, and to modify the current excavation methods to ensure that ground vibrations are reduced below the critical value thereafter.

Whilst it is required that ground vibrations do not exceed 10mm/s, it is prudent to design all excavation methods such that ground vibrations do not exceed 5mm/s. Excavation methods and equipment may be designed in accordance with the values provided below in Table 11, which outlines recommendations for excavation equipment such that maximum peak particle velocities (ground vibrations) are not exceeded.

Table 11: Recommended Peak Particle Velocity

Distance from nearby building / Structures [m]	Maximum peak particle velocity [5mm/s]		Maximum Peak Particle Velocity [10mm/s]	
	Equipment Type	Operating Limit (% of Maximum Capacity)	Equipment Type	Operating Limit (% of maximum Capacity)
1.5 to 2.5	Hand operated Jack Hammer	100	300kg Rock Hammer	50
2.5 to 5.0	300kg Rock Hammer	50	300kg Rock Hammer 600kg Rock Hammer	100 50
5.0 to 10.0	300kg Rock Hammer 600kg Rock Hammer	100 50	600kg Rock Hammer 900kg Rock Hammer	100 50

NOTE: It is recommended that vibration monitoring is employed if excavation operations are expected to exceed ground vibrations of 5mm/s. Fortify Geotech Pty Ltd are in possession of vibration monitoring equipment and may be consulted to install the sensors and monitor vibrational data thereafter.

Use of other techniques such as rock sawing may be utilised in certain circumstances if it is expected that, or if ground vibrations of > 10mm/s are to be produced/are produced by rock hammering. Saw cutting, although less productive, may eliminate risks of damage to property through vibration effects transmitted via the ground. Saw cutting in runs of at least 1m depth should be conducted prior to hammering, to minimise vibrations propagating through the rock face. However, it is recommended that hammering along the perimeter of the excavation should be conducted under geotechnical supervision in the vicinity of adjacent structures (≤ ~10m).

All excavation plant/equipment must always be used by experienced operators, who should remain diligent to ensure that vibrations resulting from excavations are minimised, and the excavations remain stable and safe. Should any potential safety concerns be identified by an operator, the site foreman and a geotechnical engineer should be informed immediately, and work in the vicinity ceased until it is deemed to be safe by the appropriate personnel.

6.5 STABLE EXCAVATION BATTERS

Temporary site excavations to 1.5m depth can be formed near vertical, although loose fill and any moisture affected soils should be cut back at 1(H):1(V). Deeper temporary cuts can be formed at 1(H):1(V) in soil and XW shale bedrock and 0.5(H):1(V) in MW and less weathered shale bedrock. A geotechnical engineer should inspect all cut batters during construction to confirm stability. Exposed temporary batters should be protected from the weather by black plastic pinned to the face with link-wire mesh, or similar. Recommended maximum slopes for temporary batters are provided in Table 12 below.

Table 12: Recommended Batter Slopes (Temporary)

Material	Max. Batter Slope (H:V)
Fill	1.5:1
Residual Soil / Extremely Weathered Material	1:1
Very Low to Low Strength Shale	0.5:1
Low to Medium Strength Shale or Better	Vertical[1]

[1]*NOTE:* Subject to inspection by an Experienced Geotechnical Engineer and carry out any remedial works as recommended (e.g., shotcrete, rock bolting).

Permanent cut & fill batter slopes should be formed at no steeper than 2(H):1(V) in soil and be protected against erosion by shotcreting, stone pitching or other suitable methods. Alternatively, permanent excavations can be supported by structural retaining walls.

6.6 BASEMENT EXCAVATION TEMPORARY SUPPORT

Temporary basement excavations to 1.5m depth can be formed near vertical, although loose fill and any moisture affected soils should be cut back at 1(H):1(V). Deeper temporary cuts should be formed no steeper than the slopes given in Table 11. A geotechnical engineer should inspect all cut batters during construction to confirm stability. The soil batter surfaces should be temporarily protected against deterioration due to the weather by covering in plastic, held by pinned chain-link mesh.

Where space limitations preclude battering back to stable slopes, temporary support options include soldier piers with tie-back anchors, and horizontal lagging or reinforced shotcrete supporting the spaces between piers. Soldier piers, spaced at about three to five pier diameters, socketed below basement level, and secured by tensioned anchors, may be a suitable option. Soldier pier holes would typically be drilled from existing surface levels prior to bulk excavation. The excavation could then proceed in maximum 3m depth stages, with tie-back anchors installed and tensioned prior to excavation of the next level. Lateral support would also be provided by the passive and cantilever resistance of pier-sections socketing below final excavation level. Horizontal lagging or structural facing shotcrete between piers should be installed in sequence with deepening of the excavation.

6.6.1 Lateral Pressure on Temporary Support Systems

The loads in anchors or struts for tied-back walls used in the temporary support of vertical excavations, such as soldier piers tied back by tensioned ground anchors or internally strutted to the basement floor, can be calculated using a trapezoidal pressure distribution given by:

$$\sigma_h = (5H \times \frac{4z}{H}) + 0.4q \qquad \text{For } z < 0.25H$$

$$\sigma_h = (5H) + 0.4q \qquad \text{For } z > 0.25H$$

where,

σ_h	is the apparent horizontal earth/rock pressure acting on the back of the wall, in kPa
H	is the total height of the full excavation to be supported, in metres
z	is the distance from the top of the excavation, in metres
q	is any uniformly distributed vertical surcharge acting on the ground surface at the top of the excavation, in kPa

The above expression takes no account of groundwater pressure, as it is assumed the temporary walls will be fully drained. Where the walls are to be covered by shotcrete and/or where these will be incorporated into a permanent basement wall, synthetic drainage strips should be installed vertically against the excavated face, draining to collector pipes at the base of the excavation, taken to a basement pump-out sump.

6.6.2 Resistance Parameters for Temporary Support Systems

The allowable horizontal passive resistance provided by socketed sections of sheet piles and soldier piers or other retaining systems in hard soils below the basement excavation floor level can be calculated as:

$\sigma_p = 50z$	(Hard soil socket only)
$\sigma_p = 100z$	(HW and less weathered bedrock socket only)
$\sigma_p = 150z$	(MW and less weathered bedrock socket only)
$\sigma_p = 200z$	(SW and less weathered bedrock socket only)

where,

σ_p	is the allowable passive pressure acting on the front of the pier/footing at depth z, in kPa
z	is the pier socket length below excavation level in weathered bedrock, in metres

In light of the geotechnical investigation at the specified site, the ensuing parameters are suggested for the design of temporary shoring walls:

- The effective width of a socketed pier for calculation of allowable passive resistance can be assumed to be equivalent to twice its actual width, except where the centre-to-centre distance between the piers is two diameters or less, in which case the soldier piers can be considered to act as one continuous wall.

- If internal struts are used, propped to anchor blocks in the basement floor, the allowable passive resistance provided by the anchor blocks can be calculated using the same pressure distribution given above, although the effective width of the footing or block can be taken as 1.5 times its actual width. In addition, an allowable base friction factor (tanδ) of 0.35, and allowable base adhesion (c) of 5kPa can be used for calculation of sliding resistance of concrete anchor blocks in the hard soil and 50kPa in Class III (MW) Shale or better.

- An average ultimate bond value of 60kPa can be assumed for cement-grouted ground anchors in the hard soils, with 300kPa for HW bedrock, 600kPa for MW bedrock, and 1000kPa for SW bedrock. It is important that at least a few of the anchors should be proof tested by pull-out tests to confirm or adjust bond values. It is recommended that ground anchors be inclined downward at between 30° and 45°, and that the "fixed" (anchored) section be assumed to extend beyond a line inclined upward from the batter toe at 45°. Tensioned multi-strand cable anchors are recommended rather than using passive (non-tensioned) anchors. For anchors with bond lengths within Class III (MW) Shale or better, an allowable bond stress value of roughly 300 kPa may be employed, contingent upon specified conditions including anchor bond lengths of at least 3m behind the 'active' zone of the excavation, satisfactory overall stability including anchor group interaction, and proof loading of all anchors to at least 1.33 times the design working load, witnessed by an independent engineer.

- For scenarios encompassing progressively anchored or propped walls where minor movements are permissible (given the absence of movement-sensitive structures, infrastructures, and buried services), a trapezoidal earth pressure distribution of 5H kPa is recommended for the soils/extremely weathered material and bedrock, with H denoting the retained height in meters. The pressures should be considered uniform over the central 50% of the support system, diminishing to zero at the top and bottom.

- Conversely, in instances where progressively anchored or propped walls are supporting areas highly susceptible to movement (such as proximity to movement-sensitive structures, infrastructures, or buried services), a trapezoidal earth pressure distribution of 8H kPa is advocated.

- For piles entrenched into at least Class III (MW) Shale bedrock beyond the bulk excavation level, an allowable lateral toe resistance value of 200 kPa may be adopted, presuming the excavation doesn't encroach upon the zone of influence of the wall toe and the rock is devoid of adverse defects. The upper 0.3 m depth of the socket should be excluded to account for tolerance and disturbance effects during excavation.

- An alternative approach entails a detailed design of anchored or propped retaining walls utilizing computer-based soil structure interaction analysis methods like Rocscience or Plaxis. This methodology could potentially offer cost savings relative to designs predicated on simplified pressure assumptions. Our team is equipped to conduct such analysis upon request.

- In circumstances where piled retaining walls are envisioned to provide permanent support to proposed structures, extended pile sockets in rock may be requisite to accommodate additional lateral and axial loads.

- All surcharge loading impacting the walls, inclusive of construction equipment, loads, adjacent high-level footings, etc., should be factored into the retaining wall design employing an 'at rest' earth pressure coefficient, K_0 of 0.55.

- In scenarios where temporary anchors span beyond site boundaries, acquiring permission from adjacent properties is mandatory prior to installation. Furthermore, verification of neighbouring basements and/or services and their levels is crucial before finalizing anchor design.

- Lift-off tests should be executed on a minimum of 25% of all anchors approximately 4 days post-locking off to ascertain load maintenance. For permanent anchors, appropriate corrosion provisions are essential to ensure longevity.

This comprehensive elucidation intends to guide the design process, ensuring structural integrity and safety in line with the geotechnical conditions revealed at the subject site.

6.7 BASEMENT EXCAVATION PERMANENT SUPPORT

Permanent unsupported batters in soil would need to be formed no steeper than 2(H):1(V). Permanent batters should be protected against erosion by stone pitching, shotcreting, or other suitable means.

Permanent basement walls can be integrated into the temporary excavation support systems, or constructed separately from these, but with the space between backfilled or spanned by horizontal struts.

The walls and floor slabs for basement walls incorporated with or strutted to the temporary excavation supports should be designed to cater for the pressures given in Section 6.6.1.

Where basement walls are constructed in open excavation and backfilled later, the wall and floor slabs can be designed to resist lateral pressure using a distribution given by:

$$\sigma_h = (8d) + 0.4q$$

$$\sigma_h = (7d) + 0.4q \leftarrow \text{[for MW and less weathered rock]}$$

where,

d is the depth below the top of the backfill or retained ground, in metres

q is any uniformly distributed surcharge acting on the surface of the backfill, in kPa

The first term of the expression is a triangular pressure distribution, the second a uniform pressure distribution. The design pressure takes no account of hydrostatic pressure, as it is assumed that the walls will be provided with permanent backfill drainage, and that any groundwater is drawn below the level of the lower basement. Backfill materials for walls constructed in open excavation should be clean, granular and free-draining, and preferably the upper backfill can be a clayey soil to reduce infiltration of surface water.

6.8 LOW RETAINING WALLS

Retaining walls constructed in open excavation, with the gap between the excavation face and the wall backfilled later, can be designed for an earth pressure distribution given by:

$$\sigma_h = (K\gamma' h) + Kq$$

where,

σ_h is the horizontal earth pressure acting on the back of the wall, in kPa

K is the dimensionless coefficient of earth pressure; this can be assumed to be 0.4 when the top of the wall is unrestrained horizontally, and 0.5 when the top of the wall is restrained (i.e. by building slabs etc.)

γ' is the effective unit weight of the backfill, and can be assumed to be 20kN/m3 for a lightly compacted soil backfill

h is the height of the backfill, in metres

q is any uniform distributed vertical surcharge acting on the top of the backfill, in kPa

Apart from structural restraints such as floor slabs, resistance to overturning and sliding of retaining walls is provided by frictional and adhesive resistance on the base, and by passive resistance at the toe of the wall. For a natural soil or controlled fill foundation, an ultimate base friction factor (tanδ) of 0.5, base adhesion (c) of 50kPa, and allowable passive earth pressure coefficient Kp=2.5 can be used for calculation of sliding resistance.

Free-draining granular backfill or synthetic fabric drains should be installed behind all walls. These should connect to weep holes and/or a collector drain, and ultimately to the stormwater system. Granular backfill should be wrapped in a suitable filter fabric to minimise infiltration of silt/clay fines.

It is recommended that the initial design of any retaining system, or shoring with a single row of anchors or propping, be predicated on a triangular earth pressure distribution, utilizing the earth pressure coefficients delineated in Table 8. The 'Active' earth pressure coefficient (Ka) values may be employed in scenarios where a certain degree of wall movement is deemed acceptable. Conversely, the 'at rest' earth pressure (K_0) values should be utilized in circumstances necessitating minimized wall movement, such as adjacent to existing structures or utilities.

The design parameters adopted and tabulated in Table 8 in Section 6.2 were formulated based on the information available pertaining to the subject site, coupled with our accrued experience concerning analogous rock and soil types.

6.9 CONTROLLED FILL CONSTRUCTION

For construction of any new fill foundation platforms and road subgrades, it is recommended that:

- Areas be fully stripped of all existing uncontrolled fill and any moisture affected, soft or firm soils. A general stripping depth of 0.4m/2m is expected. Stripped foundations should be proof-rolled by a vibratory pad-foot roller of not less than 10 tonne static mass to check for any weak or wet areas that would require replacement. No fill should be placed until a geotechnical engineer has confirmed the suitability of the foundation.

- Controlled fill comprising suitable site excavated or imported materials of not greater than 75mm maximum particle size, be compacted in not greater than 150mm layers to not less than 98%StdMDD at about OMC. If clean sand is used as fill material, it must be compacted to a Density Index of not less than 70%. Any unsuitable existing fill (e.g. silty soils) is not to be used as controlled fill.

- Fill placement and control testing be overviewed and certified by a geotechnical engineer at Level 1 or 2 involvement of AS3798 – 2007 “Guidelines on Earthworks for Commercial & Residential Developments” (Reference 6).

6.10 PAVEMENT SUBGRADES

Pavement subgrades should be prepared as outlined in Section 6.9. Natural soil or controlled fill subgrades can be designed using a CBR value of 3%. Prepared subgrades should be inspected by a geotechnical engineer to confirm whether these are structurally sound, and to confirm a suitable design CBR value.

It is recommended that after removing any unsuitable material at the proposed driveway location, a thorough inspection by an experienced geotechnical engineer is conducted to confirm the appropriate CBR value for design.

Before constructing the proposed pavements/driveways, site preparation will be necessary. The earthworks recommendations provided in this report should be supplemented with reference to AS 3798 - 2007 Guidelines on earthworks for commercial and residential developments. The following approach is suggested for preparing the subgrade for pavements and adjusting site levels using engineered filling:

- Remove any existing uncontrolled fill until you reach the level of the underlying alluvial or residual soils/rock.

- When natural soil is exposed, a process called proof rolling of the subgrade will be necessary. This should be done before adding any more fill or constructing slabs. Proof rolling involves six passes of a smooth drum roller, weighing at least 10 tonnes. The final pass should be overseen by a geotechnical engineer to identify any soft or saturated areas. If such areas are found, they should be excavated to a maximum depth of 600 mm and replaced with compacted durable granular material.

- If additional fill is needed to raise surface levels, it should be placed in layers no thicker than 200 mm when loose and compacted to achieve a density between 98% and 100% of the standard dry density. The moisture content should be within ±2% of the optimum moisture content.

- The existing natural, alluvial and residual soil, and rock present on the site can be used as engineered filling as long as their maximum particle size does not exceed 100 mm. Any contamination present in the existing soils should be considered by an environmental consultant prior to its reuse.

6.11 AGGRESSIVITY TEST RESULTS & EXPOSURE CLASSIFICATION

The exposure classification for concrete piles can be determined in accordance with AS2159-2009, Table 6.4.2(C). Soil Conditions B can be used as the tested soils were clayey and mostly above the groundwater table. As the pH value are all within 4.5-5.5, the exposure classification for **concrete piles is mild**.

The exposure classification for steel piles can be determined in accordance with AS2159-2009, Table 6.5.2(C). All the test results are consistent with an exposure classification of **non-aggressive for steel piles**.

The exposure classification for steel piles can be determined in accordance with AS2870-2011, Table 5.1 and Table 5.2. The test results are consistent with an exposure classification for concrete **in saline soils of A1 and in sulfate soils of A2**.

6.12 EARTHQUAKE SITE FACTOR

The Geoscience Australia Earthquake Hazard Map (Reference 8) indicates the earthquake acceleration coefficients (with an annual probability of exceedance of 1/500) for Australia to be used in structural design. These values are equivalent to hazard factor, Z. The Chatswood area has an acceleration coefficient of 0.05g. AS1170.4 – 2007 – Minimum Design Loads on Structures – Part 4 Earthquake Loads (Reference 9) allows a minimum value of 0.08 to be used for the hazard factor, Z.

Section 4.2 of AS1170.4 “Minimum Design Loads on Structures – Part 4: Earthquake Loads” lists the site sub-soil classes to be considered in structural design. The site is classified as a “Class C_e – Shallow Soil Site”.

6.13 STRESS RELIEF

Given the relative young geological age of the rock formation and lack of stress relieving geological conditions, stress relief is expected to occur upon excavation of the bedrock. Such stress relief will result in horizontal movements into the excavation. Within the Ashfield Shale geological formation, such horizontal movements are typically a maximum of 0.15% of the excavation height, and as low as 0.05% of the excavation height. Based on a maximum basement excavation depth of 15m, a horizontal deflection of between 7.5mm and 22.5mm is expected. The maximum deflections will occur where there is the least restraint (i.e. in the centre along the longest excavated side of the site).

Active anchoring or propping of the excavation is unlikely to be sufficient to resist the relatively high in-situ horizontal stresses associated with stress relief movements. Therefore, it is recommended that appropriate allowance be made for movements of this order in construction and planning.

It is recommended that monitoring of excavation faces should be carried out to assess vertical and horizontal movements during excavation. Inclinometers could also be installed into soldier pile shoring walls to measure actual horizontal deflections. The geotechnical engineer must be supplied with the monitoring data to check for any unsual or large deflections that may require remediation.

6.14 SITE DRAINAGE

The ~16m deep basement excavation is expected to intercept groundwater, below about 7.75m/11.85m depth. The groundwater inflows will be through joints and bedding planes in the shale bedrock, with inflows rates expected to increase after periods of rainfall.

Basements founded below the expected groundwater table could be designed as fully tanked structures. The basement ground slab will also need to be designed to resist uplift pressure from groundwater, which is equivalent to 10kPa per metre depth of the slab below groundwater level. Allowable uplift resistance provided by piers or piles embedded below basement level can be calculated on the basis of 50% of the normally loaded shaft adhesion values.

However, as the groundwater inflow rates are expected to be through the joints in the bedrock, which will be consistent but slow, a drained basement design could be adopted. In this instance, the retaining walls do not need to be designed to withstand hydrostatic pressures, but must be fully drained, and the basement must have a permanent pump and sump. Some sub-floor drainage lines may have to be installed to direct groundwater to flow to the sump, but this can be established during construction. This option may require permission from Water NSW and may require a full hydrogeological assessment.

We expect that groundwater is conducted through the soil/rock interface and fractured upper bedrock, and that it ultimately stabilises at a general level of about ~7.75m/11.85m depth from existing groundsurface levels at the location of the monitoring wells. Seepage flow rates within and from the fractured rock or perched alluvial aquifers are expected to be low. It is expected that groundwater will enter the excavation at discrete locations, especially in areas where open rock joints are present. Estimates of groundwater inflow have been calculated by Reditus Consulting and are included in Appendix E.

As the basement excavation is expected to extend below the groundwater level, some dewatering during construction will be required. It is recommended that a sump is excavated to about 1m depth below the proposed maximum basement excavation depth to collect groundwater, which can then be pumped to the stormwater system.

Suitable surface drainage should be provided to ensure rainfall run-off or other surface water cannot pond against buildings or pavements. Drainage should be provided behind all retaining walls, and subsoil drains should be installed along the upslope sides of access roads and carparks.

Shoring walls must be designed to withstand complete hydrostatic pressures unless there's an option to install drainage for the area behind impermeable walls. This drainage system might involve 150 mm wide strip drains securely attached to the surface at intervals of 1 m to 2 m, positioned behind shotcrete infill panels. The lower part of these strip drains should protrude from the shoring wall, enabling any seepage to move into a surrounding toe drain, which is linked to the stormwater drainage system.

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REFERENCES

Reference 1 MinView – geological map - https://minview.geoscience.nsw.gov.au - Accessed 04/12/2023

Reference 2 Standards Australia, “AS2870 – Residential Slabs & Footings”, 2011.

Reference 3 Standards Australia, “AS2159-2009 – Piling – Design and installation”.

Reference 4 Elson, W. K., 1984, ‘‘Design of laterally-loaded piles.’’ CIRIA Rep. No. 103, Construction Industry Research and Information Association, London, 86.

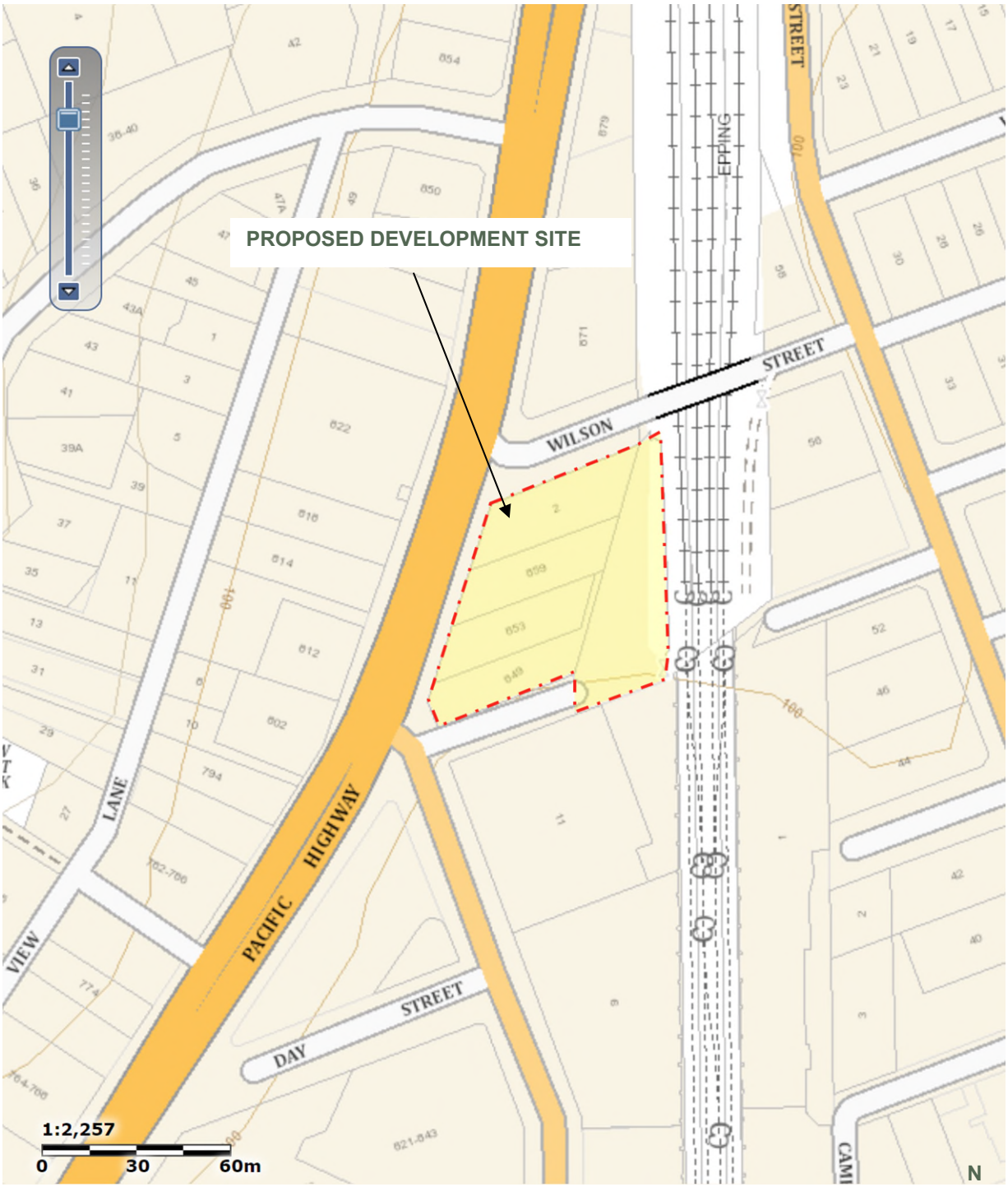
Reference 5 Pettifer, G. S. and Fookes, P. G, 1994, A revision of the graphical method for assessing the excavatability of rock, Quart, Journal of Engineering Geology, 27: 145-164.

Reference 6 AS3798 - 2007, “Guidelines on earthworks for commercial and residential developments”.

Reference 7 Department of Planning, Industry and Environment of NSW, NSW Soil and Land Information eSPADE - https://www.environment.nsw.gov.au/eSpade2Webapp/#

Reference 8 Geoscience Australia – earthquake hazards map - http://www.ga.gov.au/darwin-view/hazards.xhtml# - Accessed 04/12/2023

Reference 9 Standards Australia, “AS1170.4 – 2007 – Minimum Design Loads on Structures – Part 4 Earthquake Loads”.



SITE LOCALITY	S1998	FIGURE 1

N

AERIAL PHOTOGRAPH AND APPROXIMATE BOREHOLE LOCATIONS	S1998	FIGURE 2

Map	
23210_p01_f02_sampleiccs_v01	
Date of Export	Map Scale (approx. at A3)
01/11/2023	1:600
Author	Approver
NP	NP
Data Source	
Melbourne, Google Maps, Open Street Map, Geoscience Australia	

Legend

Site Boundary

Proposed Sample Locations

Borehole

Hand Auger

Groundwater Monitoring Well

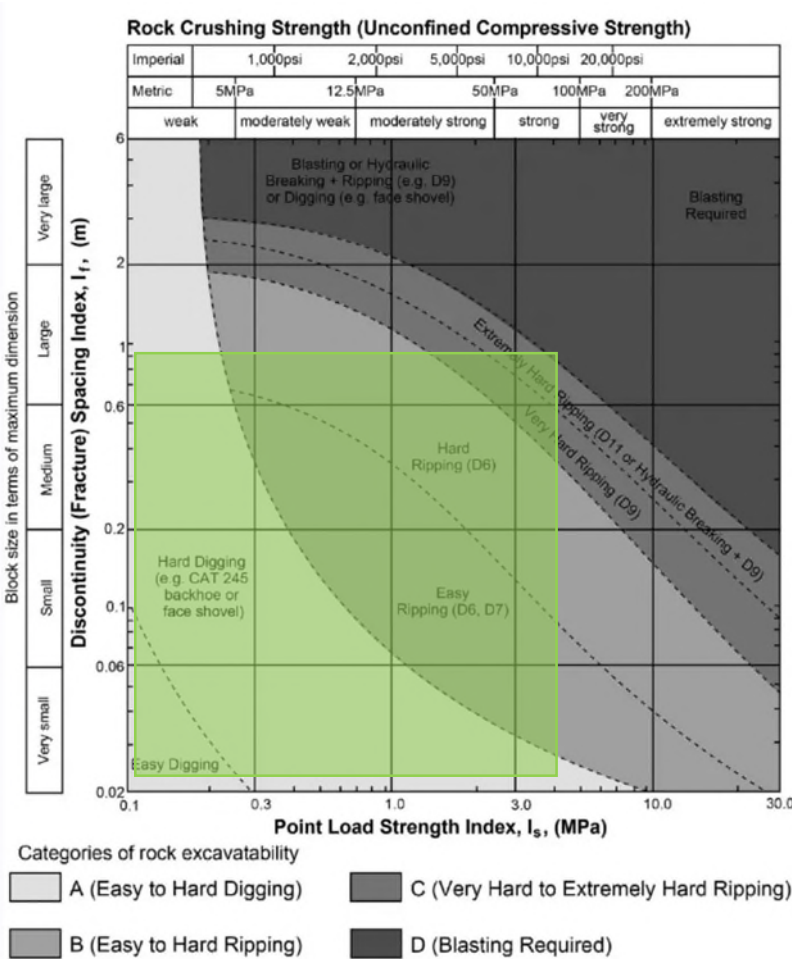
Figure 2 - Proposed Sample Locations

849, 853 & 859 Pacific Highway and 2 and 8 Wilson Street, Chatswood NSW

23210 - Detailed Site Investigation

BB Wilson Property Pty Ltd

GROUNDWATER MONITORING WELL LOCATIONS (PROVIDED BY REDITUS CONSULTING)	S1998	FIGURE 3



EXCAVATION CONDITIONS	S1998	FIGURE 4

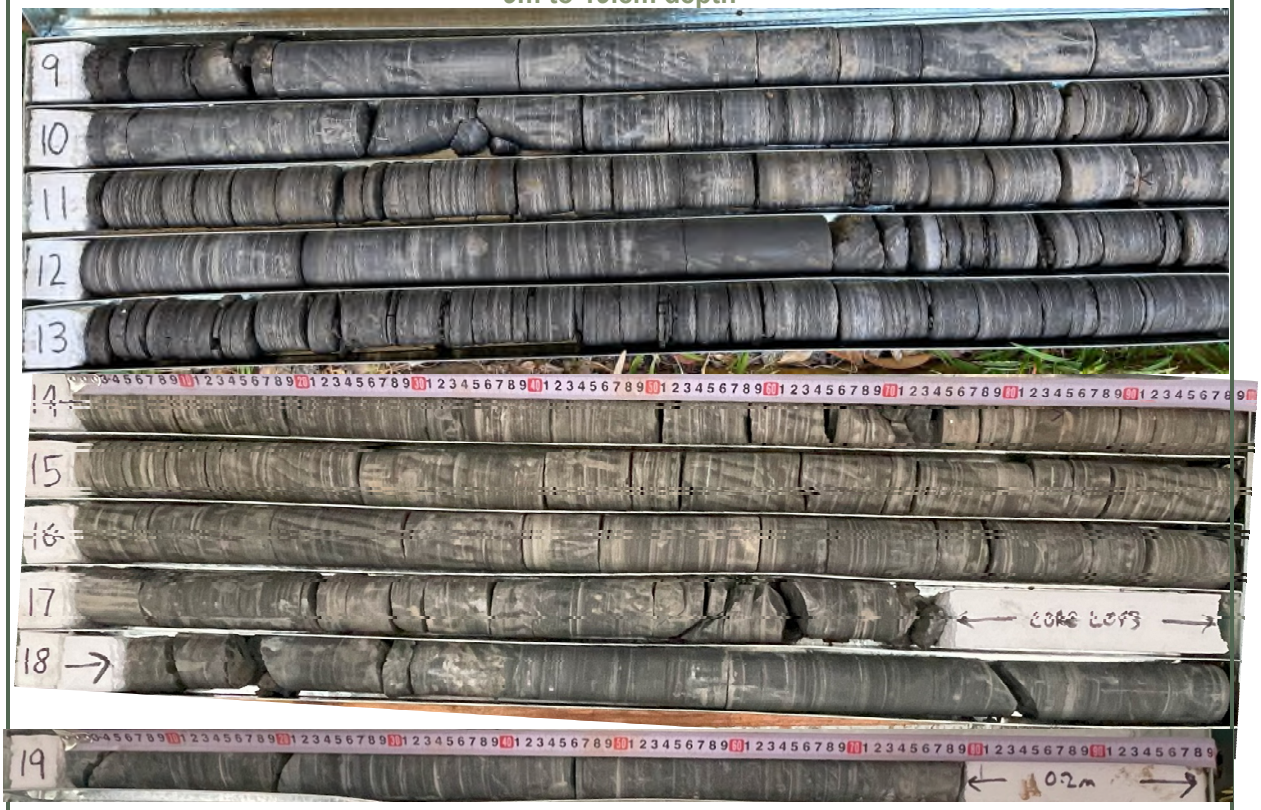
BOREHOLE BH1
9m to 20.27m depth

ROCK CORE PHOTOS	S1998	FIGURE 5

BOREHOLE BH2
9m to 20.88m depth

ROCK CORE PHOTOS	S1998	FIGURE 6

BOREHOLE BH3
9m to 19.8m depth

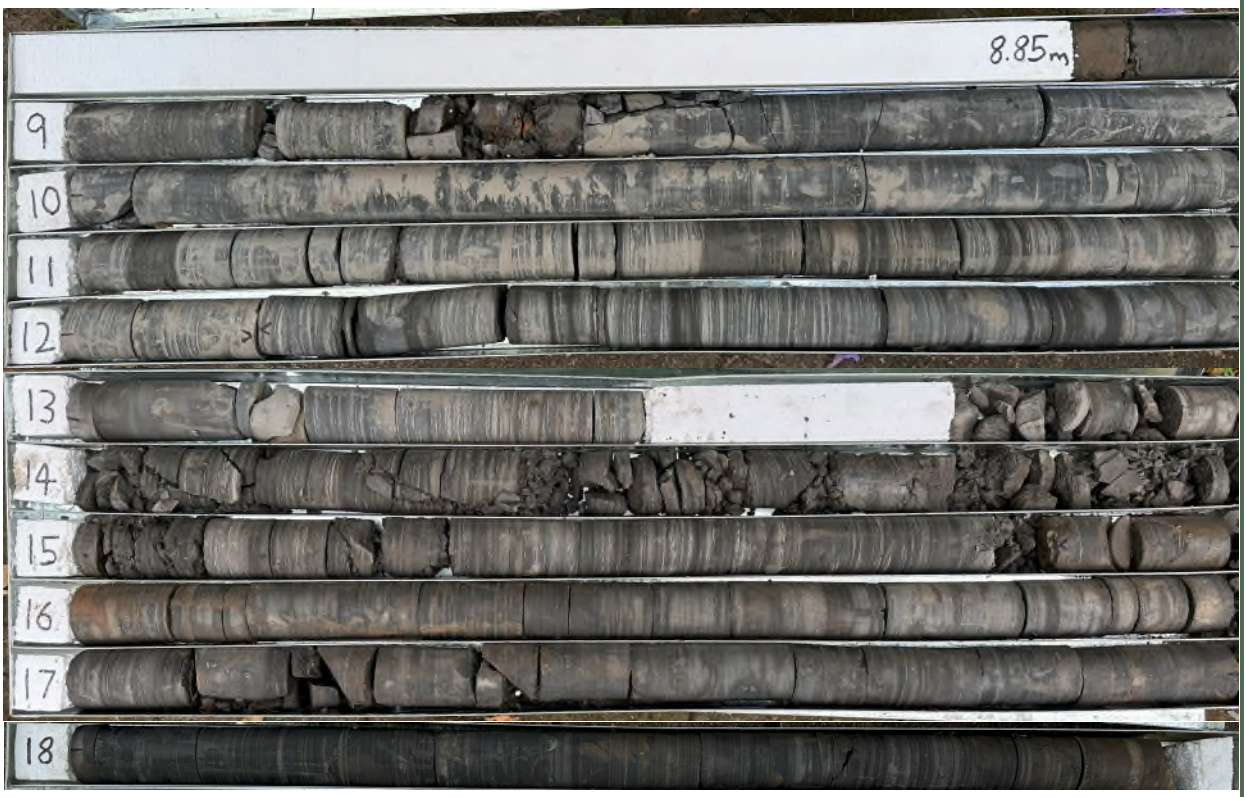


ROCK CORE PHOTOS	S1998	FIGURE 7

BOREHOLE BH4
6m to 19.98m depth

ROCK CORE PHOTOS	S1998	FIGURE 8

BOREHOLE BH5
8.85m to 18.96m depth



ROCK CORE PHOTOS	S1998	FIGURE 9

BOREHOLE BH6
9.2m to 19.85m depth

ROCK CORE PHOTOS	S1998	FIGURE 10

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Appendix A

Borehole Logs BH1 to BH6

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Borehole Log

Borehole No.	**BH1**
Sheet	1 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Location : See Report

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

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	AUGERING	0.05			GW	ASPHALT	D	MD		FILL
							SANDY GRAVEL; fine to coarse gravels, fine to coarse grained, grey to brown				
			0.3			CH	**SANDY CLAY**; medium to high plasticity, fine to medium grained, brown with red, grey, and orange	*w*~PL	F		
			0.8			CH	**SILTY CLAY**; medium to high plasticity, brown				ALLUVIAL SOIL
				1.0							
			1.2			CI	**SILTY CLAY**; medium plasticity, orange to brown mottled orange, trace fine gravels				
			1.5			CH	**SANDY CLAY**; medium to high plasticity, pale orange-brown mottled red, trace fine to medium gravels		F-St	SPT 3, 5, 5 N=10	
				2.0		CI	**SANDY CLAY**; medium plasticity, fine to medium grained, pale grey and red-brown, trace fine gravels,		St		
			2.5			CI	**SILTY CLAY**; medium plasticity, pale grey mottled red to brown	*w*<PL	St-VSt		RESIDUAL SOIL
				3.0			pale grey, trace red, trace fine grained sand		VSt	SPT 4, 8, 12 N=20	
				4.0		CL	**SILTY CLAY**; low to medium plasticity, pale grey trace red and orange, trace iron stone		VSt-H		
										SPT 12, 18, 24 N=42	
			4.8						H		XW BEDROCK
			5.0								

Logged By : JS	Date : 20/11/23	Checked By :	Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	BH1
Sheet	2 of 5
Job No.	S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

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

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	AUGERING		6.0 7.0			**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY, low to medium plasticity, fine to medium gravels, pale grey with red and orange, trace ironstone				XW BEDROCK
			7.8	8.0			**SHALE**; highly weathered (HW), fine grained, dark grey and black trace orange				WEATHERED BEDROCK
		NMLC CORING	9	9.0			**SHALE**; highly weathered (HW) with clay seams, dark grey trace brown				
			9.25				**SHALE** moderately weathered (MW), very fine grained, dark grey				
			9.6				**Clay Seam**				
			9.9 10.0								

Logged By : JS Date : 20/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH1**
Sheet	3 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

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

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	NMLC CORING					**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey				
			10.2				**SHALE**; moderately weathered (MW), very fine grained, dark grey				
			10.75				**Clay Seam**				
			10.8				**SHALE**; highly weathered (HW), very fine grained, dark grey				
				11.0			**SHALE**; extremely to highly weathered (XW/HW), excavates as SILTY GRAVELLY CLAY, low plasticity, fine to coarse gravels, dark grey				
			11.3				**SHALE**; highly weathered (HW), very fine grained, dark grey				
			11.45				**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey				
			11.65				**SHALE**; highly weathered (HW), very fine grained, dark grey				
			12.05	12.0			**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey				
			12.65				**SHALE**; highly weathered (HW), very fine grained, dark grey				
			12.85				CORE LOSS				CORE LOSS
			13.4	13.0							
			13.45				**Clay Seam**				WEATHERED BEDROCK
							SHALE; moderately weathered (MW), very fine grained, dark grey				
				14.0							
			15.05								

Logged By : JS	Date : 20/11/23	Checked By :	Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH1**
Sheet	4 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Location : See Report

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

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	NMLC CORING		16.0			**SHALE**; slightly weathered (SW), very fine grained, dark grey				
				17.0							
			17.6				**SHALE**; slightly weathered to fresh (SW/FR), very fine grained, dark grey				
				18.0							
				19.0							
			20.0								

Logged By : JS	Date : 20/11/23	Checked By :	Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH1**
Sheet	5 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Location : See Report

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

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
			20.27				**SHALE**; slightly weathered to fresh (SW/FR), very fine grained, dark grey				
							BOREHOLE TERMINATED AT 20.27m At Target				
				21.0							
				22.0							
				23.0							
				24.0							
			25.0								

Logged By : JS	Date : 20/11/23	Checked By :	Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

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Cored Borehole Log

Borehole No. **BH1**

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Job No. S1998

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
AUGERING			0.05			ASPHALT						
			0.3			**SANDY GRAVEL**; fine to coarse gravels, fine to coarse grained, grey to brown						
			0.8			**SANDY CLAY**; medium to high plasticity, fine to medium grained, brown with red, grey, and orange						
				1.0		**SILTY CLAY**; medium to high plasticity, brown						
			1.2			**SILTY CLAY**; medium plasticity, orange to brown mottled orange, trace fine gravels						
			1.5			**SANDY CLAY**; medium to high plasticity, pale orange-brown mottled red, trace fine to medium gravels						
				2.0		**SANDY CLAY**; medium plasticity, fine to medium grained, pale grey and red-brown, trace fine gravels,						
			2.5			**SILTY CLAY**; medium plasticity, pale grey mottled red to brown						
				3.0		pale grey, trace red, trace fine grained sand						
				4.0		**SILTY CLAY**; low to medium plasticity, pale grey trace red and orange, trace iron stone						
			4.8				EW					
			5.0									

Logged By : JS Date : 20/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No.	BH1
	2 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Drill Type :
Barrel Type, Length, Drilling fluid :

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL, L, M, H, VH, EH)	Is(50) MPa (D = diaxial, A = axial)	Core Length (mm) (30, 100, 300, 1000, 3000)	Defects	Defect Description
AUGERING				6.0		**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY, low to medium plasticity, fine to medium gravels, pale grey with red and orange, trace ironstone	EW					
				7.0								
			7.8			**SHALE**; highly weathered (HW), fine grained, dark grey and black trace orange	HW					
				8.0								
NMLC CORING	7% 100%		9	9.0		**SHALE**; highly weathered (HW) with clay seams, dark grey trace brown	HW					joint, joint,90°, planar, rough, , - - joints, infilled seam,-°, -, -, , clay seam joint, joint,0°, planar, rough, , - - joints, infilled seam,-°, -, -, , clay seam - joints, infilled seam,-°, -, -, , clay seam - joints, extremely weathered seam,-°, -, -, , -
			9.25			**SHALE** moderately weathered (MW), very fine grained, dark grey	MW		D = 0.0 A = 1.7			joint, joint,5°, planar, rough, , - joint, joint,5°, planar, rough, , - joint, joint,5,90°, stepped, rough, , - joint, parting,0°, planar, smooth, , - joint, joint,80,0°, planar, rough, , -
			9.6			**Clay Seam**						, infilled seam,°, , , , clay seam
			9.9									
			10.0				MW/HW					Fractured and fragmented, -

Logged By : JS Date : 20/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH1**

Job No. S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
NMLC CORING	0% 100%		10.2			**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey	MW/HW					Fractured and fragmented, -
												joint, parting,0°, planar, smooth, , -
												joint, parting,0°, planar, smooth, , -
												joint, parting,0°, planar, rough, , -
												joint, parting,0°, planar, rough, stained, iron stain
												joint, parting,0°, planar, rough, , -
						SHALE; moderately weathered (MW), very fine grained, dark grey	MW					, extremely weathered seam,°, , , , -
												joint, parting,0°, planar, rough, , -
												joint, parting,0°, planar, rough, , -
												joint, joint,90°, planar, rough, , -
			10.75			**Clay Seam**						joint, joint,5°, planar, rough, , -
			10.8				HW					- joints, infilled seam,-°, -, -, , clay seam
												joint, joint,°, curved, rough, , -
	0% 100%					**SHALE**; highly weathered (HW), very fine grained, dark grey						joint, joint,10°, planar, smooth, , -
				11.0								joint, joint,10°, planar, smooth, , -
												- joints, infilled seam,-°, -, -, , clay seam
							EW/HW					joint, joint,30°, planar, rough, , -
						SHALE; extremely to highly weathered (XW/HW), excavates as SILTY GRAVELLY CLAY, low plasticity, fine to coarse gravels, dark grey						- joints, extremely weathered seam,-°, -, -, , -
			11.3									
							HW					joint, joint,5°, planar, rough, , -
			11.45									- joints, infilled seam,-°, -, -, , clay seam
												joint, joint,20°, planar, smooth, , -
							MW/HW					- joints, infilled seam,-°, -, -, , clay seam
			11.65									joint, joint,20°, planar, rough, , -
												- joints, infilled seam,-°, -, -, , clay seam
						SHALE; highly weathered (HW), very fine grained, dark grey	HW					6 joints, joint,0,90,10°, irregular, rough, , -
												- joints, infilled seam,-°, -, -, , clay seam
												joint, joint,20°, planar, rough, , -
												joint, joint,5°, planar, rough, , -
	0% 100%		12.05	12.0		**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey						Fractured and fragmented, -
												- joints, infilled seam,-°, -, -, , clay seam
												joint, joint,90,0°, planar, rough, , -
												joint, parting,0°, planar, rough, , -
												joint, joint,90°, planar, rough, , -
												joint, joint,90°, planar, rough, , -
									D = 0.0 A = 0.2			- joints, crushed seam,-°, -, -, , -
						SHALE; highly weathered (HW), very fine grained, dark grey	MW/HW					- joints, infilled seam,-°, -, -, , clay seam
												7 joints, joint,90,0°, planar, rough, , -
												joint, parting,5°, planar, smooth, , -
												joint, joint,90°, planar, smooth, , -
												joint, parting,5°, planar, smooth, , -
												joint, joint,0,80°, planar, rough, , -
			12.65			**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey						- joints, extremely weathered seam,-°, -, -, , -
							HW					joint, parting,5°, planar, rough, , -
			12.85									joint, joint,5,90°, planar, rough, , -
						SHALE; highly weathered (HW), very fine grained, dark grey						joint, parting,5°, planar, rough, , -
				13.0								joint, joint,90°, planar, rough, , -
												joint, parting,5°, planar, rough, , -
												joint, parting,5°, planar, rough, , -
								CORE		LOSS		joint, joint,0°, irregular, rough, , -
						CORE LOSS						Fractured and fragmented, -
												- joints, extremely weathered seam,-°, -, -, , -
			13.4									
			13.45			**Clay Seam**						- joints, infilled seam,-°, -, -, , clay seam
	8% 100%											5 joints, joint,0,90°, planar, rough, , -
						SHALE; moderately weathered (MW), very fine grained, dark grey			D = 0.2 A = 3.1			
												joint, joint,0,20°, irregular, rough, , -
												joint, joint,80°, irregular, rough, , -
												5 joints, joint,0°, planar, rough, , -
												joint, parting,0°, planar, smooth, , -
												joint, parting,0°, planar, rough, , -
												joint, parting,0°, planar, rough, , -
				14.0								, infilled seam,°, , , , clay seam
												- joints, crushed seam,-°, -, -, , -
												3 joints, joint,0,90°, irregular, rough, , -
												joint, joint,0°, irregular, rough, , -
							MW					joint, joint,5,80°, irregular, rough, , -
												joint, parting,5°, planar, smooth, , -
												joint, joint,0°, planar, rough, , -
												joint, joint,90°, planar, rough, , -
												joint, joint,80°, irregular, rough, , -
												joint, parting,0°, planar, rough, , -
	0% 100%											Fractured and fragmented, -
												joint, joint,90°, irregular, rough, , -
												4 joints, joint,20,0,80°, irregular, rough, , -
									D = 19.9 A = 16.6			joint, parting,0°, planar, smooth, , -
												joint, joint,10°, planar, rough, , -
												joint, joint,20°, planar, rough, , -
												3 joints, joint,0°, planar, rough, , -
			15.0									joint, parting,0°, planar, rough, , -

Logged By : JS Date : 20/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH1**

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Job No. S1998

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial, A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
NMLC CORING	43% 100%			16.0 17.0		**SHALE**; slightly weathered (SW), very fine grained, dark grey	SW		D = 9.6 A = 16.6 D = 13.0 A = 22.3			joint, joint,10,45°, irregular, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, joint,0,45°, irregular, rough, , - - joints, crushed seam,-°, -, -, , - joint, joint,0,45°, irregular, rough, , - joint, joint,30°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, joint,10°, planar, rough, , - joint, joint,0°, planar, rough, , - joint, joint,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,5°, planar, rough, , - joint, parting,5°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,5°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,5°, planar, smooth, , - joint, parting,5°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,5°, planar, smooth, , - joint, parting,5°, planar, smooth, , - joint, joint,30°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - 5 joints, joint,30,90,0°, irregular, rough, , - joint, parting,5°, planar, smooth, , - 2 joints, joint,25,30°, irregular, smooth, , -
			17.6			**SHALE**; slightly weathered to fresh (SW/FR), very fine grained, dark grey	SW		D = 38.2 A = 50.6 D = 12.0 A = 61.0			joint, joint,30°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, joint,10°, planar, smooth, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - - joints, extremely weathered seam,-°, -, -, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , -
	98% 100%			18.0 19.0 20.0			SW					joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, joint,85°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, joint,30°, planar, rough, , -

Logged By : JS Date : 20/11/23 Checked By : Date :

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH1**

Job No. S1998

CLIENT: Reditus Consulting

PROJECT Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
	98% 100%		20.27				SW		D = 29.0 A = 84.7			joint, parting,0°, planar, smooth, , -
						BOREHOLE TERMINATED AT 20.27m At Target						joint, parting,0°, planar, smooth, , -
				21.0								
				22.0								
				23.0								
				24.0								
			25.0									

Logged By : JS Date : 20/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH2**
Sheet	1 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

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

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	AUGERING	0.17				Concrete				FILL
						SW	**GRAVELLY SAND**; fine to coarse gravels, fine to coarse grained sand, dark brown to dark grey, trace low plasticity clay	D	MD		
			0.6			CH	**CLAY with sand**; medium to high plasticity, fine grained, orange to brown mottled pale orange, trace fine gravels	*w*~PL	F-St		ALLUVIAL SOIL
				1.0			orange to brown mottled red				
			1.5			CL	**SANDY CLAY**; low to medium plasticity, fine to medium grained, red to brown mottled pale grey and orange, trace fine to coarse gravels	*w*<PL	St	SPT 3, 4, 7 N=11	
				2.0		CI	**SILTY CLAY**; medium plasticity, pale grey mottled red, trace fine grained sand		St-VSt		RESIDUAL SOIL
							low to medium plasticity, trace fine gravels (some ironstone gravels)		VSt		
				3.0			medium plasticity		VSt-H	SPT 7, 12, 17 N=29	
				4.0		CL	low to medium plasticity		H		
			4.5			CL	**SHALE**; extremely weathered (XW), excavales as SILTY CLAY; low to medium plasticity, grey, trace fine to medium gravels			SPT 10, 20, 26 N=46	XW BEDROCK
				5.0							

Logged By : JOR Date : 14/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	BH2
Sheet	2 of 5
Job No.	S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

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

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	AUGERING				CL	**SHALE**; extremely weathered (XW), excavales as SILTY CLAY; low to medium plasticity, grey, trace fine to medium gravels				XW BEDROCK
				6.0							
			6.5				**SHALE**; extremely weathered (XW), excavales as SILTY CLAY, medium plasticity, pale grey to grey, trace fine to medium gravels				
				7.0							
			7.6				**SHALE**; highly weathered (HW), fine grained, dark grey and black trace orange				WEATHERED BEDROCK
				8.0							
			9	9.0			**SHALE**; highly weathered (HW), fine grained, dark grey and black trace orange				
		NMLC CORING	9.4				**SHALE**; highly to moderately weathered (HW/MW), dark grey trace orange, some iron staining				
			10.0								

Logged By : JOR Date : 14/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	BH2
Sheet	3 of 5
Job No.	S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

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

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	NMLC CORING	10.29								
							SHALE; highly weathered (HW), fine grained, dark grey				
			10.88								
				11.0			**SHALE**; moderately weathered (MW), fine grained, dark grey				
				12.0							
			12.95								
				13.0			**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey				
				14.0							
			15.0								

Logged By : JOR Date : 14/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH2**
Sheet	4 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Location : See Report

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

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	NMLC CORING		16.0			**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey				
			16.55				**SHALE**; slightly weathered (SW), very fine grained, dark grey				
				17.0							
				18.0							
				19.0							
			20.0								

Logged By : JOR Date : 14/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH2**
Sheet	5 of 5
Job No.	S1998
CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood
Location : See Report	
Collar Level : Not Known Angle From Vertical : 0° Bearing : N.A.	

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered		20.9				**SHALE**; slightly weathered (SW), very fine grained, dark grey				
				21.0			BOREHOLE TERMINATED AT 20.9m At Target				
				22.0							
				23.0							
				24.0							
			25.0								

Logged By : JOR Date : 14/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH2**

CLIENT:	Reditus Consulting	Job No. S1998
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood	Location : See Report
Drill Type : Barrel Type, Length, Drilling fluid :		Collar Level : Not Known Angle From Horizontal : 90° Bearing : N.A.

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
AUGERING			0.17			Concrete						
			0.6			**GRAVELLY SAND**; fine to coarse gravels, fine to coarse grained sand, dark brown to dark grey, trace low plasticity clay						
				1.0		**CLAY with sand**; medium to high plasticity, fine grained, orange to brown mottled pale orange, trace fine gravels orange to brown mottled red						
			1.5			**SANDY CLAY**; low to medium plasticity, fine to medium grained, red to brown mottled pale grey and orange, trace fine to coarse gravels						
			2	2.0		**SILTY CLAY**; medium plasticity, pale grey mottled red, trace fine grained sand low to medium plasticity, trace fine gravels (some ironstone gravels)						
				3.0		medium plasticity						
				4.0		low to medium plasticity						
			4.5			**SHALE**; extremely weathered (XW), excavales as SILTY CLAY; low to medium plasticity, grey, trace fine to medium gravels						
			5.0									

Logged By : JOR	Date : 14/11/23	Checked By :	Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH2**

Job No. S1998

CLIENT: Reditus Consulting

PROJECT Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
AUGERING						**SHALE**; extremely weathered (XW), excavales as SILTY CLAY; low to medium plasticity, grey, trace fine to medium gravels						
				6.0								
			6.5			**SHALE**; extremely weathered (XW), excavales as SILTY CLAY, medium plasticity, pale grey to grey, trace fine to medium gravels	EW					
				7.0								
			7.6			**SHALE**; highly weathered (HW), fine grained, dark grey and black trace orange	HW					
				8.0								
			9	9.0		**SHALE**; highly weathered (HW), fine grained, dark grey and black trace orange	HW					- joints, infilled seam,-°, -, -, -, clay joint, parting,0°, planar, rough, coating, clay joint, parting,0°, planar, rough, -, - joint, joint,0,90,0°, stepped, smooth, -, -
NMLC CORING	42% 100%		9.4			**SHALE**; highly to moderately weathered (HW/MW), dark grey trace orange, some iron staining	HW/MW		D = 2.2 A = 6.0			joint, parting,0°, undulating, smooth, -, - , infilled seam,°, -, -, , clay joint, parting,0°, planar, rough, -, - - joints, extremely weathered seam,-°, -, -, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, stained, clay joint, parting,0°, planar, rough, stained, clay joint, parting,0°, planar, smooth, -, -
			10.0									

Logged By : JOR Date : 14/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No.	BH2
	3 of 5

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Job No. S1998

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range	Is(50) MPa (D = diaxial A = axial)	Core Length (mm)	Defects	Defect Description
NMLC CORING	42% 100%		10.29	11.0		**SHALE**; highly weathered (HW), fine grained, dark grey	HW/MW		D = 0.0 A = 7.2			joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - , infilled seam,0°, planar, , -, clay Fractured and fragmented, - , extremely weathered seam,°, , , -, - joint, parting,0°, planar, smooth, veneer, clay joint, joint,0,80°, irregular, rough, -, - joint, parting,0°, planar, rough, veneer, xw Fractured and fragmented, - - joints, infilled seam,0°, planar, -, -, clay joint, extremely weathered seam,0°, planar, smooth, stained, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - , infilled seam,0°, planar, -, -, - joint, parting,0°, planar, smooth, veneer, clay
			10.83			**SHALE**; moderately weathered (MW), fine grained, dark grey	HW					
							MW		D = 0.0 A = 14.9			joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - - joints, infilled seam,-°, -, -, -, clay joint, parting,0°, planar, rough, veneer, clay joint, parting,0°, planar, rough, veneer, clay joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, veneer, clay joint, parting,0°, planar, smooth, veneer, clay joint, parting,0°, planar, smooth, -, -
	48% 100%		12.95	13.0		**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey	MW/SW		D = 17.8 A = 42.5			joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, joint,90°, irregular, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, irregular, smooth, -, - joint, joint,0,30°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, joint,30°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - 4 joints, joint,0,70°, irregular, rough, -, - joint, parting,0°, planar, smooth, -, - - joints, extremely weathered seam,0°, planar, -, -, clay joint, parting,0°, planar, smooth, veneer, clay joint, joint,0,90°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, veneer, clay joint, parting,0°, planar, smooth, veneer, clay - joints, infilled seam,-°, -, -, -, clay
				14.0								
			15.0						D = 0.0 A = 5.5			joint, parting,0°, planar, smooth, veneer, clay

Logged By : JOR Date : 14/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH2**

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Job No. S1998

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial, A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
NMLC CORING	54% 100%		16.55	16.0		**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey	MW/SW		D = 17.3 A = 73.7			joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - 4 joints, parting,0°, planar, smooth, -, - - joints, crushed seam,-°, -, -, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, CO, xw joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, -
				17.0		**SHALE**; slightly weathered (SW), very fine grained, dark grey						joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, -
	91% 100%			18.0			SW		D = 67.4 A = 88.6			joint, parting,0°, planar, smooth, -, -
				19.0								joint, parting,2°, planar, smooth, -, - joint, parting,2°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, -
				20.0								

Logged By : JOR Date : 14/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH2**

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Job No. S1998

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
	91% 100%		20.9			**SHALE**; slightly weathered (SW), very fine grained, dark grey	SW					joint, joint,90°, irregular, rough, -, -
				21.0		BOREHOLE TERMINATED AT 20.9m At Target						
				22.0								
				23.0								
				24.0								
			25.0									

Logged By : JOR Date : 14/11/23 Checked By : Date :

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH3**
Sheet	1 of 4
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Location : See Report

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

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	AUGERING	0.11				CONCRETE				FILL
						CL	**SANDY CLAY**; medium plasticity, fine to coarse grained, brown trace orange, grey, and red	*w*~PL	F-St		
			0.5			CH	**CLAY**; medium to high plasticity, pale red-brown with grey	*w*<PL	St		ALLUVIAL SOIL
				1.0		CH	**CLAY**; medium to high plasticity, pale grey and pale red		St-VSt		
			1.5			CI	**SILTY CLAY**; medium plasticity, pale grey with pale red		VSt		RESIDUAL SOIL
				2.0							
				3.0		CL	**SANDY SILTY CLAY**; fine grained, low plasticity, pale grey-brown, with fine to medium gravels		VSt-H		
				4.0							
			4.5				**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY, low to medium plasticity, fine to medium gravels, pale grey with red and orange, trace ironstone				XW BEDROCK
			5.0								

Logged By : JS	Date : 21/11/23	Checked By :	Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH3**
Sheet	2 of 4
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Location : See Report

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

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	AUGERING		6.0 7.0			**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY, low to medium plasticity, fine to medium gravels, pale grey with red and orange, trace ironstone				XW BEDROCK
			7.5				**SHALE**; highly weathered (HW), fine grained, dark grey and black trace orange				WEATHERED BEDROCK
			8.1	8.0			**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey				
		NMLC CORING	9.15	9.0			**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey **SHALE**; moderately to slighly weathered (MW/SW), very fine grained, dark grey				
				10.0							

Logged By : JS	Date : 21/11/23	Checked By :	Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH3**
Sheet	3 of 4
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Location : See Report

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

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	NMLC CORING					**SHALE**; moderately to slighly weathered (MW/SW), very fine grained, dark grey				
			10.5				**SHALE**; moderately weathered (MW), very fine grained, dark grey				
				11.0							
			11.8				**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey				
				12.0							
			12.65				**SHALE**; moderately weathered (MW), very fine grained, dark grey				
				13.0							
			13.9				**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey				
				14.0							
			15.0								

Logged By : JS	Date : 21/11/23	Checked By :	Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	BH3
Sheet	4 of 4
Job No.	S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

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

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	NMLC CORING	15.15								
							SHALE; slightly weathered (SW), very fine grained, dark grey				
				16.0							
				17.0							
			17.75								
							CORE LOSS				CORE LOSS
			18.08	18.0							
							SHALE; slightly weathered (SW), very fine grained, dark grey				WEATHERED BEDROCK
			18.29								
							SHALE; slightly weathered to fresh (SW/FR), very fine grained, dark grey				
				19.0							
			19.8								
							BOREHOLE TERMINATED AT 19.8m At Target				
			20.0								

Logged By : JS Date : 21/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No.	BH3
	1 of 5

CLIENT:	Reditus Consulting	Job No.	S1998
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood	Location : See Report	
Drill Type : Barrel Type, Length, Drilling fluid :		Collar Level : Not Known Angle From Horizontal : 90° Bearing : N.A.	

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
AUGERING			0.11			CONCRETE						
			0.5			**SANDY CLAY**; medium plasticity, fine to coarse grained, brown trace orange, grey, and red						
				1.0		**CLAY**; medium to high plasticity, pale red-brown with grey						
			1.5			**CLAY**; medium to high plasticity, pale grey and pale red						
				2.0		**SILTY CLAY**; medium plasticity, pale grey with pale red						
				3.0		**SANDY SILTY CLAY**; fine grained, low plasticity, pale grey-brown, with fine to medium gravels						
				4.0								
			4.5				EW					
			5.0									

Logged By : JS	Date : 21/11/23	Checked By :	Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No.	**BH3**
	2 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Drill Type :
Barrel Type, Length, Drilling fluid :

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial, A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
AUGERING						**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY, low to medium plasticity, fine to medium gravels, pale grey with red and orange, trace ironstone						
				6.0								
				7.0								
			7.5			**SHALE**; highly weathered (HW), fine grained, dark grey and black trace orange	HW					
				8.0								
			8.1			**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey	MW/HW					
NMLC CORING				9 9.0			MW/HW					- joints, infilled seam,-°, -, -, -, clay
	31% 100%		9.15			**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey	MW/SW		D = 10.1 A = 20.6			joint, parting,0°, planar, smooth, -, - joint, joint,15°, irregular, rough, -, - 2 joints, joint,0°, irregular, rough, -, - joint, joint,0,20°, irregular, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, -
						SHALE; moderately to slightly weathered (MW/SW), very fine grained, dark grey						joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, -
				10.0								

Logged By : JS Date : 21/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH3**

Job No. S1998

CLIENT: Reditus Consulting

PROJECT Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range	Is(50) MPa (D = diaxial A = axial)	Core Length (mm)	Defects	Defect Description
NMLC CORING	31% 100%		10.5	11.0		**SHALE**; moderately to slighly weathered (MW/SW), very fine grained, dark grey	MW		D = 8.2 A = 7.9			joint, parting,0°, planar, smooth, -, - joint, joint,30,0°, planar, rough, -, - joint, joint,0,70,80°, irregular, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - - joints, extremely weathered seam,-°, -, -, stained, Fe - joints, extremely weathered seam,-°, -, -, stained, Fe joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, joint,0,90°, irregular, rough, -, - joint, parting,0°, planar, rough, -, - 2 joints, parting,0°, planar, rough, -, - - joints, extremely weathered seam,-°, -, -, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, veneer, clay joint, parting,0°, planar, rough, veneer, clay joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, joint,90°, irregular, rough, -, -
			11.8	12.0		**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey	MW/SW		D = 36.5 A = 13.4			joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, stained, Fe joint, parting,0°, planar, smooth, stained, Fe joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, stained, Fe joint, parting,0°, planar, rough, -, - 2 joints, parting,0°, planar, smooth, -, - 2 joints, extremely weathered seam,0°, planar, rough, -, - - joints, extremely weathered seam,-°, -, -, , -
	26% 100%		12.65	13.0		**SHALE**; moderately weathered (MW), very fine grained, dark grey	MW					joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, irregular, rough, -, - joint, parting,0°, planar, slickensided, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, joint,90°, irregular, rough, -, - joint, parting,0°, planar, rough, -, - joint, joint,45°, undulating, rough, -, - joint, joint,5°, irregular, rough, -, - joint, joint,0°, irregular, rough, -, - joint, parting,0°, planar, smooth, -, - 2 joints, parting,0°, planar, smooth, -, - - joints, extremely weathered seam,-°, -, -, -, -, - joints, crushed seam,-°, -, -, -, - joint, parting,5°, planar, rough, -, - joint, parting,5°, planar, smooth, -, - - joints, extremely weathered seam,-°, -, -, -, -
	38% 100%		13.9	14.0		**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey	MW/SW		D = 1.2 A = 24.7			joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - - joints, extremely weathered seam,-°, -, -, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - 2 joints, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, joint,90°, irregular, rough, -, - joint, parting,0°, planar, rough, -, - - joints, infilled seam,-°, -, -, -, clay joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - - joints, extremely weathered seam,-°, -, -, -, - joint, parting,0°, planar, rough, -, -
				15.0								

Logged By : JS Date : 21/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH3**

Job No. S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial, A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
NMLC CORING	38% / 100%		15.15	16.0		**SHALE**; slightly weathered (SW), very fine grained, dark grey	SW		D = 2.2 A = 39.1 D = 27.4 A = 36.0			joint, parting,0°, planar, rough, -, - 2 joints, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - 2 joints, parting,0°, planar, rough, -, - joint, joint,90°, irregular, rough, -, - joint, parting,0°, planar, rough, -, - - joints, crushed seam,-°, -, -, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, joint,90°, irregular, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, crushed seam,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - 2 joints, joint,5,0°, planar, rough, -, - joint, joint,0,5°, irregular, rough, -, - Fractured and fragmented, - joint, parting,0°, planar, smooth, -, - joint, joint,0,45°, irregular, smooth, -, - joint, parting,0°, planar, smooth, -, - 2 joints, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - 3 joints, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, joint,0,80°, stepped, rough, -, -
			17.75	17.0								
			18.05	18.0		CORE LOSS		CORE		LOSS		joint, parting,5°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - 2 joints, parting,0°, planar, rough, -, -
	74% / 85%		18.29	19.0		**SHALE**; slightly weathered (SW), very fine grained, dark grey **SHALE**; slightly weathered to fresh (SW/FR), very fine grained, dark grey	SW SW/FR		D = 12.7 A = 82.1			joint, parting,5°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - 2 joints, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, slickensided, -, - joint, parting,0°, planar, slickensided, -, - joint, parting,0°, planar, slickensided, -, - joint, parting,0°, planar, slickensided, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, joint,70,0°, irregular, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, rough, -, - joint, parting,0°, planar, smooth, -, - joint, joint,45°, irregular, rough, -, - 3 joints, joint,0,45°, irregular, rough, -, - 2 joints, joint,0,30°, irregular, rough, -, - Fractured and fragmented, - joint, joint,10°, planar, rough, -, - joint, joint,5,10°, irregular, rough, veneer, clay Fractured and fragmented, -
			19.8									
			20.0			BOREHOLE TERMINATED AT 19.8m At Target						joint, joint,20°, planar, smooth, -, - joint, joint,10,60°, planar, rough, -, - joint, joint,-°, curved, rough, -, -

Logged By : JS Date : 21/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No.	BH3
	5 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Drill Type :
Barrel Type, Length, Drilling fluid :

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
												joint, parting,0°, planar, rough, -, - joint, joint,40°, planar, smooth, -, - joint, parting,0°, planar, smooth, -, - joint, joint,40°, irregular, rough, -, - joint, joint,0,30°, irregular, rough, -, - joint, parting,0°, planar, smooth, -, -
				21.0								
				22.0								
				23.0								
				24.0								
			25.0									

Logged By :	JS	Date :	21/11/23	Checked By :		Date :	

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH4**
Sheet	1 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

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

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
			0.11				**CONCRETE**				FILL
			0.2			CL CH	**SANDY CLAY**; fine to medium grained sand, brown with orange, trace fine sized gravels	*w*~PL *w*<PL	F-St F		ALLUVIAL SOIL
							CLAY; medium to high plasticity, orange to brown mottled orange, with fine grained sand, trace fine sized gravels				
			0.8			CL	**CLAY**; medium plasticity, orange to brown mottled orange, with fine grained sand, trace fine sized gravels		St		
				1.0		CL	**SILTY CLAY**; low to medium plasticity, pale grey mottled red, trace fine gravels		St-VSt		RESIDUAL SOIL
			1.5			CL	**SILTY CLAY**; medium plasticity, pale grey mottled red, with fine grained sand, trace fine iron stone gravels		VSt	SPT 5, 9, 12 N=21	
	None Encountered	AUGERING		2.0			low to medium plasticity		St-VSt		
							hard		VSt-H		
			2.8			CL	**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY; low to medium plasticity, fine to medium gravel, grey trace red and orange, trace iron stone			SPT 15, 29	XW BEDROCK
				3.0							
				4.0			**SILTSTONE**; extremely to highly weathered (XW/HW), very fine grained, dark grey and grey trace orange, with clay seams		H		
			4.5								

Logged By : JS Date : 15/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH4**
Sheet	2 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

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

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	AUGERING		5.0			**SILTSTONE**; extremely to highly weathered (XW/HW), very fine grained, dark grey and grey trace orange, with clay seams				
			5.5			CL	**GRAVELLY SILTY CLAY**; medium plasticity, grey with brown and orange-brown, with siltstone and ironstone bands		VSt-H		RESIDUAL SOIL
		NMLC CORING		6.0							
			6.4			CL	**SILTY CLAY & SHALE**; highly weathered (HW), medium plasticity, grey with brown and orange-brown, alternating bands of clay and shale		H		RESIDUAL SOIL/XW BEDROCK
				7.0							
			7.3				CORE LOSS				CORE LOSS
			7.55				**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey trace orange, trace iron stain				WEATHERED BEDROCK
			8	8.0		CL	**SILTY CLAY**; medium plasticity, grey				
			8.14				**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey trace orange, trace iron stain				
			8.23 8.32			CL	**SILTY CLAY**; medium plasticity, grey				
			8.55				**SHALE**; highly weathered (HW), very fine grained, dark grey, some iron stains				
			8.72				**SHALE**; extremely to highly weathered (XW/HW), excavates as GRAVELLY SILTY CLAY, low plasticity, dark grey with orange				
			8.9								
			9.0								

Logged By : JS	Date : 15/11/23	Checked By :	Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	BH4
Sheet	3 of 5
Job No.	S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

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

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	NMLC CORING					**SHALE**; highly to moderately weathered (HW/MW), dark grey trace orange, some iron staining **SHALE**; moderately weathered (MW), very fine grained, dark grey, trace iron staining				
				10.0							
			10.68								
			10.8				CORE LOSS				CORE LOSS
				11.0			**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey				WEATHERED BEDROCK
				12.0							
				13.0							
			13.5								

Logged By : JS Date : 15/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	BH4
Sheet	4 of 5
Job No.	S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

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

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	NMLC CORING					**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey				WEATHERED BEDROCK
				14.0							
			14.25				**SHALE**; slightly weathered to fresh (SW/FR), very fine grained, dark grey				
				15.0							
				16.0							
			16.4				**SHALE**; slightly weathered (SW), very fine grained, dark grey				
				17.0							
			17.55				**SHALE**; slightly weathered to fresh (SW/FR), very fine grained, dark grey				
				18.0							

Logged By : JS Date : 15/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH4**
Sheet	5 of 5
Job No.	S1998
CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood
Location : See Report	
Collar Level : Not Known Angle From Vertical : 0° Bearing : N.A.	

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	NMLC CORING		19.0			**SHALE**; slightly weathered to fresh (SW/FR), very fine grained, dark grey				
			19.98	20.0			BOREHOLE TERMINATED AT 19.98m At Target				
				21.0							
				22.0							
			22.5								

Logged By : JS Date : 15/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH4**

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Job No. S1998

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
AUGERING			0.11			**CONCRETE**						
			0.2			**SANDY CLAY**; fine to medium grained sand, brown with orange, trace fine sized gravels						
						CLAY; medium to high plasticity, orange to brown mottled orange, with fine grained sand, trace fine sized gravels						
			0.8			**CLAY**; medium plasticity, orange to brown mottled orange, with fine grained sand, trace fine sized gravels						
				1 1.0		**SILTY CLAY**; low to medium plasticity, pale grey mottled red, trace fine gravels						
			1.5			**SILTY CLAY**; medium plasticity, pale grey mottled red, with fine grained sand, trace fine iron stone gravels						
				2.0		low to medium plasticity						
						hard						
			2.8			**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY; low to medium plasticity, fine to medium gravel, grey trace red and orange, trace iron stone						
				3.0			EW					
				4 4.0		**SILTSTONE**; extremely to highly weathered (XW/HW), very fine grained, dark grey and grey trace orange, with clay seams	HW/EW					
			4.5									

Logged By : JS Date : 15/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH4**

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Job No. S1998

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range	Is(50) MPa (D = diaxial A = axial)	Core Length (mm)	Defects	Defect Description
AUGERING				5.0		**SILTSTONE**; extremely to highly weathered (XW/HW), very fine grained, dark grey and grey trace orange, with clay seams	HW/EW					
			5.5			**GRAVELLY SILTY CLAY**; medium plasticity, grey with brown and orange-brown, with siltstone and ironstone bands						
NMLC CORING	0% 100%			6.0								
			6.4			**SILTY CLAY & SHALE**; highly weathered (HW), medium plasticity, grey with brown and orange-brown, alternating bands of clay and shale						
	0% 73%			7.0					D = 0.0 A = 1.4			
			7.3			CORE LOSS		CORE		LOSS		
			7.55			**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey trace orange, trace iron stain	MW/HW					joint, parting,0°, planar, rough, stained, trace iron staining joint, parting,0°, planar, rough, stained, trace iron staining joint, parting,0°, planar, rough, stained, trace iron staining joint, parting,0°, planar, rough, stained, trace iron staining
	0% 79%		8	8.0		**SILTY CLAY**; medium plasticity, grey						joint, joint,30,10°, irregular, rough, , - joint, parting,0°, planar, rough, stained, trace iron staining
			8.14			**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey trace orange, trace iron stain	MW/HW		D = 0.2 A = 1.2			joint, parting,5°, planar, rough, stained, trace iron staining joint, joint,0°, planar, rough, ,
			8.23 8.32				HW					joint, parting,0°, planar, rough, veneer, trace clay joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, veneer, trace clay joint, parting,0°, planar, rough, veneer, trace clay
			8.55			**SILTY CLAY**; medium plasticity, grey	HW/EW					- joints, infilled seam,-°, -, -, -, clay seam joint, parting,0°, planar, smooth, ,
			8.72			**SHALE**; highly weathered (HW), very fine grained, dark grey, some iron stains	MW/HW					joint, joint,90,40°, irregular, rough, ,
	29% 95%		8.9				MW					- joints, infilled seam,-°, -, -, -, clay seam joint, joint,5°, planar, smooth, ,
			9.0									- joints, infilled seam,-°, -, -, -, clay seam joint, joint,80°, planar, rough, , - - joints, extremely weathered seam,-°, -, -, -, - joint, parting,0°, planar, smooth, ,

Logged By : JS Date : 15/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH4**

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Job No. S1998

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range	Is(50) MPa (D = diaxial A = axial)	Core Length (mm)	Defects	Defect Description
NMLC CORING	29% 95%			10.0		**SHALE**; extremely to highly weathered (XW/HW), excavates as GRAVELLY SILTY CLAY, low plasticity, dark grey with orange **SHALE**; highly to moderately weathered (HW/MW), dark grey trace orange, some iron staining **SHALE**; moderately weathered (MW), very fine grained, dark grey, trace iron staining	MW		D = 5.5 A = 3.6 D = 15.1 A = 3.6			joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, stained, trace iron staining joint, joint,50°, planar, smooth, stained, iron staining joint, joint,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, joint,80°, planar, smooth, , - joint, joint,0°, planar, rough, , - 3 joints, joint,70,0,5°, irregular, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, joint,0°, curved, smooth, , - 3 joints, joint,0°, irregular, rough, , - joint, joint,0,45,20°, irregular, rough, , - joint, joint,0°, planar, rough, , - Fractured and fragmented, - Fractured, - joint, joint,90°, planar, rough, , - Fractured and fragmented, -
			10.68			CORE LOSS						Fractured, - - joints, ,-°, -, -, , CORE LOSS
	28% 100%		10.8	11.0		**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey	MW/SW		D = 11.0 A = 26.9			Fractured and fragmented, - joint, joint,70°, planar, rough, , - joint, joint,0°, curved, rough, , - joint, joint,5°, planar, smooth, , - joint, joint,80,5°, irregular, rough, , - joint, joint,0°, planar, smooth, , - joint, joint,5,45°, irregular, smooth, , - 3 joints, joint,45,20,30°, irregular, rough, , - joint, joint,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, joint,0°, planar, rough, , - Fractured, - joint, joint,0,40°, irregular, smooth, , - joint, joint,0,10°, irregular, rough, , - joint, joint,0°, planar, rough, , - joint, joint,20°, planar, smooth, , -
	57% 100%			12.0 13.0					D = 25.9 A = 31.7			joint, joint,10°, planar, smooth, , - joint, joint,30,0°, irregular, rough, , - Fractured and fragmented, - joint, parting,0°, planar, smooth, , - joint, joint,0,45°, irregular, smooth, , - joint, joint,45°, planar, smooth, , - joint, joint,10,20°, irregular, rough, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, joint,5°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, joint,5°, planar, slickensided, , - joint, parting,0°, planar, rough, , - joint, joint,5°, planar, slickensided, , - joint, joint,5°, planar, slickensided, -
			13.5									

Logged By : JS	Date : 15/11/23	Checked By :	Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH4**

Job No. S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range	Is(50) MPa (D = diaxial, A = axial)	Core Length (mm)	Defects	Defect Description
NMLC CORING						**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey	MW/SW		D = 2.6 A = 23.5			2 joints, parting,0°, planar, slickensided, , - joint, parting,5°, planar, slickensided, , - joint, joint,5°, stepped, slickensided, , - joint, parting,5°, planar, slickensided, , -
				14.0								
	57% 100%		14.25									joint, joint,5°, planar, slickensided, , - joint, joint,5°, planar, slickensided, , -
						SHALE; slightly weathered to fresh (SW/FR), very fine grained, dark grey						
									D = 22.8 A = 33.8			joint, parting,0°, planar, slickensided, , -
				15.0								joint, parting,0°, planar, slickensided, , -
							FR/SW					
												joint, parting,0°, planar, slickensided, , -
	71% 100%			16.0					D = 18.5 A = 48.5			joint, joint,30°, planar, smooth, , -
												2 joints, joint,0,40°, irregular, smooth, , - joint, parting,0°, planar, smooth, , -
			16.4									joint, joint,0,30°, planar, smooth, , -
						SHALE; slightly weathered (SW), very fine grained, dark grey						joint, joint,0,20°, planar, rough, , - joint, joint,60°, irregular, rough, , - joint, parting,0°, planar, rough, , - joint, joint,60°, irregular, rough, , - joint, joint,10°, planar, rough, , - joint, joint,20,0°, planar, rough, , - joint, joint,10,20°, irregular, rough, , - joint, parting,10°, planar, -, , CLOSED joint, parting,10°, planar, -, , CLOSED joint, parting,5°, planar, smooth, , - joint, parting,5°, planar, smooth, , - Fractured and fragmented, -
				17.0			SW					
									D = 53.0 A = 53.8			joint, joint,10,0°, irregular, rough, , - joint, parting,0°, planar, slickensided, , -
												joint, joint,45,10°, planar, rough, , -
	79% 100%		17.55									joint, joint,0°, planar, slickensided, , -
						SHALE; slightly weathered to fresh (SW/FR), very fine grained, dark grey	FR/SW					
			18.0									joint, joint,0°, planar, slickensided, , -

Logged By : JS Date : 15/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH4**

Job No. S1998

CLIENT: Reditus Consulting

PROJECT Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
NMLC CORING	79% 100%			19.0		**SHALE**; slightly weathered to fresh (SW/FR), very fine grained, dark grey	FR/SW		D = 27.4 A = 54.7 D = 12.5 A = 66.5			joint, joint,0°, planar, slickensided, , - joint, joint,0°, planar, slickensided, , - joint, joint,0°, planar, slickensided, , - joint, joint,0,40°, irregular, rough, , - joint, parting,0°, planar, slickensided, , - joint, joint,0,15°, planar, smooth, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, joint,0,25°, planar, smooth, , - joint, parting,0,25°, planar, smooth, , - joint, parting,0,25°, planar, smooth, , - 3 joints, joint,0,70°, planar, rough, , -
			19.98	20.0		BOREHOLE TERMINATED AT 19.98m At Target						
				21.0								
				22.0								
			22.5									

Logged By : JS Date : 15/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH5**
Sheet	1 of 4
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Location : See Report

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

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	AUGERING				OL	**SILTY SAND/ SANDY SILT**; fine to medium grained, dark brown, trace fine to coarse gravels, grass roots at surface	D	L-MD		TOPSOIL
			0.2			CL-ML	**CLAYEY SILTY SAND**; fine to medium grained, low plasticity, brown trace orange and grey, trace fine gravels				FILL
			0.6			CH	**SANDY CLAY**; medium to high plasticity, fine grained, red to brown mottled pale orange	*w*<PL	St-VSt		ALLUVIAL SOIL
				1.0							
			1.2			CH	**CLAY with SAND**; medium to high plasticity, fine grained, pale grey mottled red and orange, trace fine to medium gravels			SPT 7, 10, 11 N=21	
									VSt		
				2.0		CL	**SILTY CLAY trace SAND**; medium plasticity, fine grained, pale grey mottled red, trace orange, trace fine gravels				RESIDUAL SOIL
									VSt-H		
			2.8			CL	**SILTY CLAY trace SAND**; low plasticity, fine grained, pale grey trace orange and red, trace ironstone gravels		H		
				3.0						SPT 25, 15+ for 30mm N>15	
			3.2				**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY; low plasticity, fine to medium gravels, pale grey with red and orange				XW BEDROCK
				4.0							
			5.0								

Logged By : JS	Date : 16/11/23	Checked By :	Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	BH5
Sheet	2 of 4
Job No.	S1998
CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood
Location : See Report	
Collar Level : Not Known Angle From Vertical : 0° Bearing : N.A.	
Equipment Type : BG Drilling CE180 Drill Rig Hole Diameter : 100mm	

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	AUGERING					**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY; low plasticity, fine to medium gravels, pale grey with red and orange				XW BEDROCK
			6	6.0			**SILTY CLAY & SHALE**; highly weathered (HW), medium plasticity, grey with brown and orange-brown, alternating bands of clay and shale				RESIDUAL/XW BEDROCK
			7.5	7.0			**SHALE**; highly weathered (HW), very fine grained, dark grey	D			WEATHERED BEDROCK
			8.4	8.0			**SHALE** highly to moderately weathered (HW/MW), very fine grained, dark grey				
		NMLC CORING	8.85				**SILTY CLAY**; dark grey,		VSt-H		
			9	9.0			**SHALE**; moderately weathered (MW), very fine grained, dark grey, trace iron staining		H		
			9.33 9.4 9.44				**SHALE**; highly weathered (HW), very fine grained, dark grey, trace iron staining				
			9.6				**SILTY CLAY**; dark grey,				
							SHALE; moderately weathered (MW), very fine grained, dark grey, trace iron staining				
			10.0								

Logged By : JS Date : 16/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	BH5
Sheet	3 of 4
Job No.	S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

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

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	NMLC CORING	10.05				**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey, trace iron staining				
							SHALE; slightly weathered (SW), very fine grained, dark grey, trace iron staining				
				11.0							
				12.0							
			13	13.0			**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey, trace iron staining				
			13.48				CORE LOSS				CORE LOSS
			13.74				**SHALE**; moderately to slightly weathered (MW/SW), very fine grained, dark grey, trace iron staining				WEATHERED BEDROCK
				14.0							
			14.37 14.44				**SILTY CLAY**; dark grey,				
							SHALE; moderately weathered (MW), very fine grained, dark grey, trace iron staining				
			14.75								
			15.0								

Logged By : JS Date : 16/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	BH5
Sheet	4 of 4
Job No.	S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

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

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	NMLC CORING	15.1				**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey, trace iron staining				
							SHALE; moderately to slightly weathered (MW/SW), very fine grained, dark grey, trace iron staining				
			16	16.0			**SHALE**; slightly weathered (SW), very fine grained, dark grey, trace iron staining				
				17.0							
				18.0							
			18.96	19.0			BOREHOLE TERMINATED AT 18.96m At Target				
				20.0							

Logged By : JS Date : 16/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH5**

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Job No. S1998

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
AUGERING			0.2			**SILTY SAND/ SANDY SILT**; fine to medium grained, dark brown, trace fine to coarse gravels, grass roots at surface						
			0.6			**CLAYEY SILTY SAND**; fine to medium grained, low plasticity, brown trace orange and grey, trace fine gravels						
				1.0		**SANDY CLAY**; medium to high plasticity, fine grained, red to brown mottled pale orange						
			1.2			**CLAY with SAND**; medium to high plasticity, fine grained, pale grey mottled red and orange, trace fine to medium gravels						
				2.0		**SILTY CLAY trace SAND**; medium plasticity, fine grained, pale grey mottled red, trace orange, trace fine gravels						
			2.8			**SILTY CLAY trace SAND**; low plasticity, fine grained, pale grey trace orange and red, trace ironstone gravels						
				3.0								
			3.2			**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY; low plasticity, fine to medium gravels, pale grey with red and orange						
				4.0			EW					
			5.0									

Logged By : JS Date : 16/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH5**

Job No. S1998

CLIENT: Reditus Consulting

PROJECT Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range	Is(50) MPa (D = diaxial, A = axial)	Core Length (mm)	Defects	Defect Description
AUGERING						**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY; low plasticity, fine to medium gravels, pale grey with red and orange	EW					
				6 6.0		**SILTY CLAY & SHALE**; highly weathered (HW), medium plasticity, grey with brown and orange-brown, alternating bands of clay and shale	HW					
				7.0								
			7.5			**SHALE**; highly weathered (HW), very fine grained, dark grey	HW					
				8.0								
			8.4			**SHALE** highly to moderately weathered (HW/MW), very fine grained, dark grey	HW/MW					
			8.85			**SILTY CLAY**; dark grey,	EW					, extremely weathered seam,-°, -, -, -, -
NMLC CORING	54% 100%			9 9.0		**SHALE**; moderately weathered (MW), very fine grained, dark grey, trace iron staining	MW		D = 12.7 A = 11.0			joint, joint,0°, irregular, rough, , - joint, joint,0°, planar, rough, , - joint, joint,0°, planar, rough, , - Fractured and fragmented, -
			9.33 9.4 9.44			**SHALE**; highly weathered (HW), very fine grained, dark grey, trace iron staining	HW EW MW					- joints, extremely weathered seam,-°, -, -, , - 5 joints, joint,0,80°, irregular, rough, , - Fractured and fragmented, -
	76% 100%		9.6			**SILTY CLAY**; dark grey,						joint, joint,-°, curved, -, , CLOSED
			10.0			**SHALE**; moderately weathered (MW), very fine grained, dark	MW/SW					joint, parting,0°, planar, smooth, , -

Logged By : JS Date : 16/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH5**

Job No. S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing: NMLC CORING

R.Q.D./Lift: 76% 100%; 38% 89%; 0% 100%; 32% 100%

Water

RL (m): 10.05; 13.48; 13.74; 14.37; 14.44; 14.75; 15.0

Depth (m): 11.0; 12.0; 13.0; 14.0

Graphic Log

Soil or Rock Substance Description

grey, trace iron staining

SHALE; moderately to slightly weathered (MW/SW), very fine grained, dark grey, trace iron staining

SHALE; slightly weathered (SW), very fine grained, dark grey, trace iron staining

SHALE; moderately to slightly weathered (MW/SW), very fine grained, dark grey, trace iron staining

CORE LOSS

SHALE; moderately to slightly weathered (MW/SW), very fine grained, dark grey, trace iron staining

SILTY CLAY; dark grey,

SHALE; moderately weathered (MW), very fine grained, dark grey, trace iron staining

Degree of Weathering: SW; MW/SW; MW/SW; EW; MW; HW/MW

Estimated Strength Range: VL L M H VH EH

Is(50) MPa (D = diaxial A = axial): D = 4.1, A = 3.6; D = 3.4, A = 12.2; D = 1.7, A = 26.9; D = 18.0, A = 37.0; D = 4.8, A = 7.7

Core Length (mm): 30 100 300 1000 3000

Defects

Defect Description

joint, joint,70,0°, irregular, smooth, , -
joint, parting,0°, planar, slickensided, , -
joint, parting,0°, planar, slickensided, , -
joint, parting,0°, planar, slickensided, , -
joint, parting,0°, planar, slickensided, , -
joint, parting,0°, planar, smooth, , -
joint, parting,0°, planar, smooth, veneer, CLAY VENEER
joint, parting,0°, planar, smooth, veneer, CLAY VENEER
joint, parting,0°, planar, rough, , -
joint, parting,0°, planar, rough, veneer, CLAY VENEER
joint, parting,0°, planar, smooth, , -
joint, parting,0°, planar, smooth, , -
joint, parting,0°, planar, smooth, , -
joint, parting,0°, planar, smooth, , -
joint, parting,0°, planar, rough, , -
joint, parting,0°, planar, rough, , -
joint, parting,0°, planar, smooth, , -
joint, parting,0°, planar, smooth, , -
Fractured and fragmented, -
joint, parting,0°, planar, smooth, , -
joint, parting,0°, planar, slickensided, , -
joint, parting,0°, planar, smooth, , -
joint, parting,0°, planar, smooth, , -
joint, joint,0°, irregular, rough, , -
joint, joint,80°, irregular, rough, , -
joint, parting,0°, planar, smooth, , -
joint, parting,0°, planar, slickensided, , -
- joints, ,-°, -, -, , CORE LOSS
Fractured and fragmented, -
joint, parting,0°, planar, rough, , -
joint, joint,90°, irregular, -, , CORE LOSS
Fractured and fragmented, -
joint, joint,0°, irregular, rough, , -
6 joints, joint,0,70,30°, irregular, rough, , -
Fractured and fragmented, -
joint, joint,30,45°, irregular, rough, , -
Fractured and fragmented, -
Fractured, -

Logged By : JS Date : 16/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH5**

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Job No. S1998

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range	Is(50) MPa (D = diaxial A = axial)	Core Length (mm)	Defects	Defect Description
NMLC CORING	32% 100%		15.1			**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey, trace iron staining	HW/MW		D = 32.2 A = 37.4			
						SHALE; moderately to slightly weathered (MW/SW), very fine grained, dark grey, trace iron staining	MW/SW					
			16	16.0		**SHALE**; slightly weathered (SW), very fine grained, dark grey, trace iron staining			D = 16.3 A = 19.0			
	42% 100%			17.0			SW		D = 24.0 A = 23.5			Fractured and fragmented, - Fractured and fragmented, - Fractured and fragmented, - joint, joint,0°, planar, rough, , - joint, joint,0°, planar, smooth, , - joint, joint,0°, planar, smooth, , - joint, joint,30°, planar, rough, , - - joints, extremely weathered seam,-°, -, -, -, - joint, joint,0°, planar, rough, veneer, CLAY VENEER joint, joint,0,80°, irregular, rough, , - joint, parting,0°, planar, slickensided, , - - joints, extremely weathered seam,-°, -, -, -, - joint, parting,0°, planar, smooth, , - Fractured and fragmented, -
				18.0					D = 11.3 A = 23.8			joint, joint,60°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, joint,70°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , -
			18.96	19.0		BOREHOLE TERMINATED AT 18.96m At Target						joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, , - 5 joints, parting,80,0°, irregular, rough, , - joint, joint,45,90°, irregular, rough, , - joint, joint,0,45°, irregular, rough, , - joint, joint,0°, planar, rough, , - joint, joint,0,45°, irregular, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , -
				20.0								

Logged By : JS Date : 16/11/23 Checked By : Date :

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH6**
Sheet	1 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Location : See Report

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

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	AUGERING				OL	**SANDY SILT/ SILTY SAND**; fine to medium grained, dark brown, trace fine to medium gravels, grass roots at surface	D-M	L-MD		TOPSOIL
			0.2			CL	**SANDY CLAY/ CLAYEY SAND**; fine to coarse grained, low to medium plasticity, brown trace grey, trace anthropogenic material (bricks),	*w*~PL	MD		FILL
			0.4			CH	**SANDY CLAY**; medium to high plasticity, fine grained, orange to brown mottled orange, trace fine gravels	*w*<PL	St		ALLUVIAL SOIL
			0.8			CH	**SANDY CLAY**; medium to high plasticity, fine to medium grained, pale grey mottled red trace orange, trace fine gravels				
				1.0							
			1.2			CI	**SILTY CLAY trace SAND**; medium plasticity, fine grained, pale grey mottled red trace orange, some iron staining		St-VSt		RESIDUAL SOIL
										SPT 4, 8, 14 N=22	
						CL	pale grey trace red and orange		VSt		
				2.0							
									VSt-H		
				3.0			**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY; low plasticity, fine to medium gravels, pale grey with red and orange		H	SPT 17, 15+ for 60mm N>15	XW BEDROCK
				4.0							
			4.5								

Logged By : JS Date : 17/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH6**
Sheet	2 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

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

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	AUGERING		5.0 6.0			**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY; low plasticity, fine to medium gravels, pale grey with red and orange				XW BEDROCK
			6.5	7.0			**SILTY CLAY & SHALE**; highly weathered (HW), medium plasticity, grey with brown and orange-brown, alternating bands of clay and shale				RESIDUAL/XW BEDROCK
			7.5				**SHALE**; highly weathered (HW), very fine grained, dark grey to black				WEATHERED BEDROCK
			8	8.0			**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey to black				
			8.6				CORE LOSS				
				9.0							

Logged By : JS	Date : 17/11/23	Checked By :	Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	BH6
Sheet	3 of 5
Job No.	S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

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

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
							CORE LOSS				
			9.2				**SHALE**; moderately weathered shale (MW), dark grey, very fine grained				
				10.0							
				11.0							
	None Encountered	NMLC CORING	11.2				**SHALE**; moderately to slightly weathered shale (MW/SW), dark grey, very fine grained				
			11.65				**SHALE**; slightly weathered shale (SW), dark grey, very fine grained				
				12.0							
			12.75				**SHALE**; moderately to slightly weathered shale (MW/SW), dark grey, very fine grained				
				13.0							
			13.5								

Logged By : JS Date : 17/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	BH6
Sheet	4 of 5
Job No.	S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

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

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	NMLC CORING		14.0			**SHALE**; moderately to slightly weathered shale (MW/SW), dark grey, very fine grained				
			14.3				**SHALE**; slightly weathered shale (SW), dark grey, very fine grained				
				15.0							
				16.0							
				17.0							
			17.5				**SHALE**; moderately to slightly weathered shale (MW/SW), dark grey, very fine grained				
			17.8				**SHALE**; slightly weathered shale (SW), dark grey, very fine grained				
			18.0								

Logged By : JS Date : 17/11/23 Checked By : Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Borehole Log

Borehole No.	BH6
Sheet	5 of 5
Job No.	S1998

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Equipment Type : BG Drilling CE180 Drill Rig
Hole Diameter : 100mm

Location : See Report

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

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered	NMLC CORING		19.0			**SHALE**; slightly weathered shale (SW), dark grey, very fine grained				
			19.85				BOREHOLE TERMINATED AT 19.85m At Target				
				20.0							
				21.0							
				22.0							
			22.5								

Logged By : JS	Date : 17/11/23	Checked By :	Date :

BOREHOLE/EXCAVATION LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No.	BH6
	1 of 5

CLIENT:	Reditus Consulting	Job No.	S1998
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood	Location : See Report	
Drill Type : Barrel Type, Length, Drilling fluid :		Collar Level : Not Known Angle From Horizontal : 90° Bearing : N.A.	

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
AUGERING			0.2			**SANDY SILT/ SILTY SAND**; fine to medium grained, dark brown, trace fine to medium gravels, grass roots at surface						
			0.4			**SANDY CLAY/ CLAYEY SAND**; fine to coarse grained, low to medium plasticity, brown trace grey, trace anthropogenic material (bricks),						
			0.8	1.0		**SANDY CLAY**; medium to high plasticity, fine grained, orange to brown mottled orange, trace fine gravels						
			1.2			**SANDY CLAY**; medium to high plasticity, fine to medium grained, pale grey mottled red trace orange, trace fine gravels						
				2.0		**SILTY CLAY trace SAND**; medium plasticity, fine grained, pale grey mottled red trace orange, some iron staining pale grey trace red and orange						
				3.0		**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY; low plasticity, fine to medium gravels, pale grey with red and orange	EW					
				4.0								
			4.5									

Logged By : JS	Date : 17/11/23	Checked By :	Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH6**

Job No. S1998

CLIENT: Reditus Consulting

PROJECT Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
AUGERING				5.0, 6.0		**SILTSTONE**; extremely weathered (XW), excavates as GRAVELLY SILTY CLAY; low plasticity, fine to medium gravels, pale grey with red and orange	EW					
			6.5	7.0		**SILTY CLAY & SHALE**; highly weathered (HW), medium plasticity, grey with brown and orange-brown, alternating bands of clay and shale	HW					
			7.5			**SHALE**; highly weathered (HW), very fine grained, dark grey to black						
			8	8.0		**SHALE**; highly to moderately weathered (HW/MW), very fine grained, dark grey to black	MW/HW					
			8.6			CORE LOSS		CORE		LOSS		
			9.0									

Logged By : JS Date : 17/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH6**

Job No. S1998

CLIENT: Reditus Consulting

PROJECT: Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range	Is(50) MPa (D = diaxial, A = axial)	Core Length (mm)	Defects	Defect Description
						CORE LOSS		CORE		LOSS		
NMLC CORING	47% / 100%		9.2	10.0		**SHALE**; moderately weathered shale (MW), dark grey, very fine grained	MW/SW		D = 6.2, A = 26.4; D = 3.8, A = 7.4			3 joints, joint,80,0°, irregular, rough, , -; joint, parting,80°, planar, rough, , -; joint, joint,0°, planar, rough, , -; joint, joint,90,80°, irregular, rough, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, -, CO, XW infill; joint, parting,0°, planar, rough, , -; joint, joint,90,80°, undulating, rough, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, rough, , -; joint, joint,70,90,45°, irregular, rough, , -; joint, parting,0°, planar, rough, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, rough, , -; Fractured and fragmented, -
	24% / 100%		11.2	11.0		**SHALE**; moderately to slightly weathered shale (MW/SW), dark grey, very fine grained	MW					joint, parting,0°, planar, rough, , -; 7 joints, parting,0°, planar, rough, , -; 2 joints, parting,0°, planar, rough, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, rough, , -; 5 joints, parting,0°, planar, smooth, , -; 3 joints, parting,0°, planar, smooth, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, smooth, , -
			11.65	12.0		**SHALE**; slightly weathered shale (SW), dark grey, very fine grained	SW		D = 17.3, A = 31.0			joint, joint,0,45°, planar, rough, , -; joint, parting,0°, planar, rough, , -; joint, joint,45°, planar, smooth, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, rough, , -
			12.75	13.0		**SHALE**; moderately to slightly weathered shale (MW/SW), dark grey, very fine grained	MW/SW		D = 34.6, A = 40.3			2 joints, parting,0°, planar, smooth, , -; - joints, extremely weathered seam,-°, -, -, -, -; joint, parting,0°, planar, smooth, , -; - joints, extremely weathered seam,-°, -, -, -, -; - joints, extremely weathered seam,-°, -, -, -, -; 2 joints, parting,0°, planar, rough, , -; - joints, extremely weathered seam,-°, -, -, -, -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, rough, , -; joint, parting,0°, planar, rough, , -; joint, parting,80°, planar, rough, , -; joint, parting,0°, planar, smooth, , -; joint, parting,0°, planar, smooth, , -; 4 joints, joint,0,90°, irregular, rough, , -
				13.5								

Logged By : JS Date : 17/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

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Cored Borehole Log

Borehole No.	BH6
	4 of 5

CLIENT:	Reditus Consulting
PROJECT	Proposed Mixed Use Development 849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Job No. S1998

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range	Is(50) MPa (D = diaxial A = axial)	Core Length (mm)	Defects	Defect Description
NMLC CORING	24% 100%					**SHALE**; moderately to slightly weathered shale (MW/SW), dark grey, very fine grained	MW/SW					5 joints, joint,90,0°, irregular, rough, , - joint, parting,0°, planar, smooth, , - - joints, extremely weathered seam,-°, -, -, , - 2 joints, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, , - - joints, extremely weathered seam,-°, -, -, , - joint, parting,0°, planar, smooth, , - Fractured and fragmented, -
				14.0					D = 29.8 A = 33.4			
			14.3			**SHALE**; slightly weathered shale (SW), dark grey, very fine grained						joint, joint,0,60°, irregular, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - - joints, extremely weathered seam,-°, -, -, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , -
	22% 100%			15.0								joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , -
									D = 1.4 A = 15.8			joint, joint,80,90,0°, irregular, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, joint,0,80°, irregular, rough, , -
				16.0								joint, parting,0°, planar, smooth, , - joint, joint,90°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, joint,60°, planar, smooth, , - 4 joints, joint,0,30,80°, irregular, rough, , -
	21% 100%			17.0					D = 1.2 A = 25.2			joint, parting,0°, planar, rough, , - joint, joint,45°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, veneer, clay veneer joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, slickensided, , - joint, parting,0°, planar, slickensided, , - Fractured and fragmented, -
			17.5			**SHALE**; moderately to slightly weathered shale (MW/SW), dark grey, very fine grained	MW/SW					joint, joint,60,10,0°, irregular, rough, , - Fractured and fragmented, -
	51% 100%		17.8				SW					joint, joint,20,0°, irregular, rough, , - 3 joints, joint,30,0°, irregular, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , -
			18.0									

Logged By : JS Date : 17/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

FORTIFY GEOTECH

Cored Borehole Log

Borehole No. **BH6**

Job No. S1998

CLIENT: Reditus Consulting

PROJECT Proposed Mixed Use Development
849, 853, 859 Pacific Hwy, & 2 & 8 Wilson St, Chatswood

Location : See Report

Collar Level : Not Known
Angle From Horizontal : 90°
Bearing : N.A.

Drill Type :
Barrel Type, Length, Drilling fluid :

Method/Casing	R.Q.D./Lift	Water	RL (m)	Depth (m)	Graphic Log	Soil or Rock Substance Description	Degree of Weathering	Estimated Strength Range (VL L M H VH EH)	Is(50) MPa (D = diaxial A = axial)	Core Length (mm) (30 100 300 1000 3000)	Defects	Defect Description
NMLC CORING	51% 100%			19.0		**SHALE**; slightly weathered shale (SW), dark grey, very fine grained	SW		D = 9.8 A = 34.3 D = 26.9 A = 52.3			joint, parting,0°, planar, smooth, , - 2 joints, parting,5°, planar, rough, , - joint, joint,45,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, joint,60°, planar, rough, , - joint, parting,0°, planar, smooth, , - joint, parting,0°, planar, rough, , - joint, parting,5°, planar, smooth, , - joint, parting,5°, planar, rough, , - joint, parting,0°, planar, rough, , - 2 joints, joint,30°, planar, rough, , - joint, joint,0,60°, planar, rough, , - joint, joint,0,85°, stepped, smooth, , - joint, joint,60°, planar, rough, , - joint, parting,0°, planar, rough, , - joint, joint,45°, planar, rough, , - joint, parting,5°, planar, smooth, , - joint, parting,5°, planar, smooth, , -
			19.85									
				20.0		BOREHOLE TERMINATED AT 19.85m At Target						
				21.0								
				22.0								
			22.5									

Logged By : JS Date : 17/11/23 Checked By : Date :

CORED BOREHOLE LOG S1998.GPJ EXC.GDT 5/12/23

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Appendix B

Point Load Test Results

Diametrial

BH Number	Test No.	Depth	Diameter (cm)	Gauge Reading (kN)	(Is)50	UCS (Mpa)	Weathering	Strength
4	A	7.05	5.2	0.01	0	0	EW	EL
4	B	8.17	5.2	0.03	0.01	0.24	EW	EL
4	C	9.5	5.2	0.62	0.23	5.52	HW	L
4	D	10.25	5.2	1.69	0.63	15.12	HW/MW	M
4	D	11.3	5.2	1.25	0.46	11.04	HW/MW	M
4	D	12.1	5.2	2.92	1.08	25.92	MW	H
4	D	13.7	5.2	0.31	0.11	2.64	HW	L
4	D	14.95	5.2	2.58	0.95	22.8	HW/MW	M
4	D	16.05	5.2	2.07	0.77	18.48	HW/MW	M
4	D	17.2	5.2	5.98	2.21	53.04	MW	H
4	D	18.65	5.2	3.08	1.14	27.36	MW	H
4	D	19.7	5.2	1.41	0.52	12.48	HW/MW	M
1	D	9.35	5.2	0.01	0	0	EW	EL
1	D	12.3	5.2	0.01	0	0	EW	EL
1	D	13.55	5.2	0.02	0.01	0.24	EW	EL
1	D	14.75	5.2	2.24	0.83	19.92	HW/MW	M
1	D	15.35	5.2	1.09	0.4	9.6	HW/MW	M
1	D	16.4	5.2	1.45	0.54	12.96	HW/MW	M
1	D	17.9	5.2	4.31	1.59	38.16	MW	H
1	D	19.4	5.2	1.35	0.5	12	HW/MW	M
1	D	20.2	5.2	3.26	1.21	29.04	MW	H
6	D	9.8	5.2	0.69	0.26	6.24	HW	L
6	D	10.7	5.2	0.44	0.16	3.84	HW	L
6	D	11.9	5.2	1.96	0.72	17.28	HW/MW	M
6	D	13.1	5.2	3.89	1.44	34.56	MW	H
6	D	14.1	5.2	3.36	1.24	29.76	MW	H
6	D	15.85	5.2	0.17	0.06	1.44	EW	VL
6	D	17.1	5.2	0.13	0.05	1.2	EW	VL
6	D	18.9	5.2	1.12	0.41	9.84	HW/MW	M
6	D	19.7	5.2	3.02	1.12	26.88	MW	H
5	D	9.1	5.2	1.44	0.53	12.72	HW/MW	M
5	D	10.9	5.2	0.38	0.14	3.36	HW	L
5	D	11.7	5.2	0.18	0.07	1.68	EW	VL
5	D	12.9	5.2	2.03	0.75	18	HW/MW	M
5	D	14.2	5.2	0.53	0.2	4.8	HW	L
5	D	15.15	5.2	3.61	1.34	32.16	MW	H
5	D	16.35	5.2	1.84	0.68	16.32	HW/MW	M
5	D	17.7	5.2	2.7	1	24	HW/MW	M
5	D	18.75	5.2	1.27	0.47	11.28	HW/MW	M
5	D	10.1	5.2	0.45	0.17	4.08	HW	L
2	D	9.5	5.2	0.23	0.09	2.16	EW	VL
2	D	10.9	5.2	0.01	0	0	EW	EL
2	D	11.8	5.2	0.01	0	0	EW	EL
2	D	13.15	5.2	1.99	0.74	17.76	HW/MW	M
2	D	14.9	5.2	0.01	0	0	EW	EL
2	D	16.5	5.2	1.95	0.72	17.28	HW/MW	M
2	D	18.6	5.2	7.61	2.81	67.44	MW	H
3	D	9.3	5.2	1.13	0.42	10.08	HW/MW	M
3	D	10.7	5.2	0.93	0.34	8.16	HW/MW	M
3	D	12.1	5.2	4.1	1.52	36.48	MW	H
3	D	13.95	5.2	0.13	0.05	1.2	EW	VL
3	D	15.2	5.2	0.25	0.09	2.16	EW	VL
3	D	17.2	5.2	3.09	1.14	27.36	MW	H
3	D	18.7	5.2	1.42	0.53	12.72	HW/MW	M

Axial

BH Numbe	Test No.	Depth	Diameter (c	Equivalent Diameter (c	Gauge Reading (I	(Is)50	UCS (Mpa	Weatherin	Strength
4	A	7.05	3.6	4.88	0.15	0.06	1.44	EW/HW	VL
4	B	8.17	4.5	5.46	0.14	0.05	1.2	EW/HW	VL
4	C	9.5	4	5.15	0.41	0.15	3.6	HW	L
4	D	10.25	4.6	5.52	0.45	0.15	3.6	HW	L
4	D	11.3	4	5.15	2.96	1.12	26.88	MW	H
4	D	12.1	5	5.75	4.00	1.32	31.60	MW	H
4	D	13.7	4.5	5.46	2.93	0.98	23.52	HW/MW	M
4	D	14.95	3.6	4.88	3.35	1.41	33.84	MW	H
4	D	16.05	4.6	5.52	6.15	2.02	48.48	MW	H
4	D	17.2	4.1	5.21	6.08	2.24	53.76	MW	H
4	D	18.65	4	5.15	6.05	2.28	54.72	MW	H
4	D	19.7	4.5	5.46	8.26	2.77	66.48	MW	H
1	D	9.35	5.2	5.87	0.24	0.07	1.68	EW/HW	VL
1	D	12.3	5.2	5.87	0.04	0.01	0.24	EW	EL
1	D	13.55	4.5	5.46	0.39	0.13	3.12	HW	L
1	D	14.75	3.4	4.74	1.55	0.69	16.56	HW/MW	M
1	D	15.35	3.8	5.02	1.74	0.69	16.56	HW/MW	M
1	D	16.4	3.8	5.02	2.35	0.93	22.32	HW/MW	M
1	D	17.9	4.7	5.58	6.58	2.11	50.64	MW	H
1	D	19.4	3.4	4.74	5.71	2.54	60.96	MW	H
1	D	20.2	3.4	4.74	7.94	3.53	84.72	SW	VH
6	D	9.8	4	5.15	2.92	1.1	26.4	MW	H
6	D	10.7	4	5.15	0.83	0.31	7.44	HW/MW	M
6	D	11.9	4	5.15	3.42	1.29	30.96	MW	H
6	D	13.1	4	5.15	4.46	1.68	40.32	MW	H
6	D	14.1	5	5.75	4.6	1.39	33.36	MW	H
6	D	15.85	3.7	4.95	1.61	0.66	15.84	HW/MW	M
6	D	17.1	4.2	5.27	2.92	1.05	25.2	MW	H
6	D	18.9	4	5.15	3.8	1.43	34.32	MW	H
6	D	19.7	4.5	5.46	6.49	2.18	52.32	MW	H
5	D	9.1	4.2	5.27	1.27	0.46	11.04	HW/MW	M
5	D	10.9	4	5.15	1.35	0.51	12.24	HW/MW	M
5	D	11.7	4	5.15	2.90	1.12	26.00	MW	H
5	D	12.9	3.6	4.88	3.67	1.54	36.96	MW	H
5	D	14.2	4.2	5.27	0.9	0.32	7.68	HW/MW	M
5	D	15.15	3.8	5.02	3.93	1.56	37.44	MW	H
5	D	16.35	3.8	5.02	2	0.79	18.96	HW/MW	M
5	D	17.7	3.2	4.6	2.07	0.98	23.52	HW/MW	M
5	D	18.75	3.9	5.08	2.55	0.99	23.76	HW/MW	M
5	D	10.1	5	5.75	0.5	0.15	3.6	HW	L
2	D	9.5	3.7	4.95	0.62	0.25	6	HW	L
2	D	10.9	4.3	5.34	0.85	0.3	7.2	HW	L
2	D	11.8	3.8	5.02	1.57	0.62	14.88	HW/MW	M
2	D	13.15	4.6	5.52	5.39	1.77	42.48	MW	H
2	D	14.9	3.7	4.95	0.57	0.23	5.52	HW	L
2	D	16.5	3.5	4.81	7.11	3.07	73.68	SW	VH
2	D	18.6	4.8	5.64	11.73	3.69	88.56	SW	VH
3	D	9.3	3.2	4.6	1.83	0.86	20.64	HW/MW	M
3	D	10.7	5	5.75	1.08	0.33	7.92	HW/MW	M
3	D	12.1	3.8	5.02	1.4	0.56	13.44	HW/MW	M
3	D	13.95	3.7	4.95	2.52	1.03	24.72	MW	H
3	D	15.2	4.5	5.46	4.85	1.63	39.12	MW	H
3	D	17.2	4	5.15	3.98	1.5	36	MW	H
3	D	18.7	4	5.15	9.07	3.42	82.08	SW	VH

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Appendix C

Aggressivity & sPOCAS Laboratory Test Results

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 338265

Client Details

Client	Fortify Geotech
Attention	Jerome Sami
Address	Unit 2 / 538 Gardneners Rd, ALEXANDRIA, NSW, 2015

Sample Details

Your Reference	**Chatswood - 51998**
Number of Samples	6 Soil
Date samples received	21/11/2023
Date completed instructions received	21/11/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	28/11/2023
Date of Issue	28/11/2023

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diego Bigolin, Inorganics Supervisor
Priya Samarawickrama, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Soil Aggressivity						
Our Reference		338265-1	338265-2	338265-3	338265-4	338265-5
Your Reference	UNITS	Chatswood- BH1	Chatswood- BH4	Chatswood- BH3	Chatswood- BH6	Chatswood- BH2
Depth		4.8m	1.2m	2.5m	2.0m	4.0m
Date Sampled		20/11/2023	15/11/2023	21/11/2023	17/11/2023	14/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
pH 1:5 soil:water	pH Units	5.2	4.5	5.1	4.9	4.5
Electrical Conductivity 1:5 soil:water	µS/cm	80	65	72	180	44
Chloride, Cl 1:5 soil:water	mg/kg	<10	10	<10	130	<10
Sulphate, SO4 1:5 soil:water	mg/kg	83	63	63	100	34

Soil Aggressivity		
Our Reference		338265-6
Your Reference	UNITS	Chatswood- BH5
Depth		1.7m
Date Sampled		16/11/2023
Type of sample		Soil
pH 1:5 soil:water	pH Units	4.7
Electrical Conductivity 1:5 soil:water	µS/cm	67
Chloride, Cl 1:5 soil:water	mg/kg	10
Sulphate, SO4 1:5 soil:water	mg/kg	70

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-064	sPOCAS determined using titrimetric and ICP-AES techniques. Ideally samples should be received in the laboratory at <6oC. Please refer to SRA for sample temperature on receipt. Net acidity including ANC has a safety factor of 1.5 applied. Neutralising value (NV) of 100% is assumed for liming rate The recommendation that the SHCL concentration be multiplied by a factor of 2 to ensure retained acidity is not underestimated, has not been applied in the SHCL result. However, it has been applied in the SNAS calculation: SNAS % = (SHCL-SKCL)x2
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

QUALITY CONTROL: Soil Aggressivity						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	338265-2
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	5.2	5.1	2	101	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	1	80	77	4	104	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	<10	<10	0	111	102
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	83	75	10	111	105

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

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Appendix D

Atterberg Limit Test Results

IdealCorp Pty Ltd t/as
Ideal Geotech
16-18 Sammut Street Smithfield NSW 2164
PO Box 2270 Smithfield NSW 2164
Ph: (02) 9725 5522 Fax: (02) 87866300

Liquid Limit and Linear Shrinkage Test Results

Customer:	**Fortify Geotech Pty Ltd**	Ideal Job No:	**67317**
Address:	**Chatswood Project, CHATSWOOD, NSW, 2067**	Test Date:	**29/11/23**

BH No	Sample No	Depth (m)	Material Description (visual)	Codes	Liquid Limit %	Linear Shrinkage %
3	L1	1-1.5	Light brown CLAY	1,6,**	68	15.5
4	L1	1.8	Light brown CLAY	1,6,**	59	14
5	L1	1.5-1.8	Light brown CLAY	1,6,**	57	13.5
6	L1	0.5-0.8	Light brown CLAY	1,6,**	59.0	14.5

CODES/LEGEND

NO - Not Obtainable

1 - Air Dried 2 - Low Temperatures (<50C) Oven Dried 3 - Oven (105C) Dried 4 - Unknown 5 - Natural

Method of Preparation

6 - Dry Sieved 7 - Wet Sieved

Shrinkage sample

(CR) - Crumbled (CU) - Curled

** Mould Length is 125mm *** Mould Length is 150mm

Test Methods

Linear Shrinkage AS1289.3.4.1 & Liquid Limit AS1289.3.1.2

Accredited for compliance
with ISO/IEC 17025
Accreditation No 19226

Checked By M. Opacic
Dated 30-Nov-23

Approved Signatory M. Opacic

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Appendix E

Groundwater Inflow Estimates – Reditus Consulting

MEMO

02 9521 6567

Unit 1A, 29-33 Waratah St
Kirrawee NSW 2232

Reditus Consulting Pty Ltd
ABN: 34 631 168 502

reditus.com.au

To: - oscar.brady@billbergia.com.au
From: natashapasley@reditusconsulting.com
Cc: jerome@fortifygeotech.com.au, jthangarajah@cadigalgroup.com.au
Date: 13 December 2023
Re: Wilson Street Chatswood – Groundwater Inflow Estimates

Hi Oscar,

We have completed the preliminary groundwater inflow calculations which are detailed below. It should be noted that the groundwater inflow estimate is preliminary only, and is considered to be a conservative estimate. The groundwater inflow estimates will be further refined once we collect the additional groundwater data and prepare the Dewatering Management Plan (DMP) in the new year.

Groundwater Inflow Estimate	Best Case	Worst Case
Total during construction (assumes 12 month dewatering period)	2.22 ML/year	12.538 ML/year
Post construction – Long Term Groundwater Inflow (steady state groundwater inflows from a permanent/ongoing Drained Basement)	1.77 ML/year	12.11 ML/year

Kind Regards,

Natasha Pasley

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Appendix F

Engineering Terms and Definitions

DESCRIPTION AND CLASSIFICATION OF SOILS

The methods of description and classification of soils used in this report are based on the Australian Standard 1726 – 1993, Geotechnical site investigations. In general, descriptions cover the following properties – soil type, colour, secondary grain size, structure, inclusions, strength or density and geological description.

Soil types are described according to the predominating particle size, qualified by the grading of other particles present (e.g. sandy clay) on the following basis:

Classification	Particle Size
Clay	Less than 0.002mm
Silt	0.002mm to 0.06mm
Sand	0.06mm to 2.00mm
Gravel	2.00mm to 60.00mm
Cobbles	60mm (63mm) to 200mm
Boulders	>200mm

Soils are also classified according to the Unified Soil Classifications System which is included in this Appendix. Rock types are classified by their geological names.

Cohesive soils are classified on the basis of strength either by laboratory testing or engineering examination. The terms are defined as follows:

Consistency	Shear Strength su(kPa) (Representative Undrained Shear)	
Very soft	< 12	<2 (~SPT "N")
Soft	12 - 25	2-4
Firm	25 - 50	4-8
Stiff	50 – 100	8-15
Very Stiff	100 – 200	15-30
Hard	> 200	>30

Non-cohesive soils are classified on the basis of relative density, generally from the results of in-situ standard penetration tests as below:

Term	Relative Density (%)	SPT Blows/300mm 'N'
Very loose	< 15	<4
Loose	15-35	4-10
Medium dense	35-65	10-30
Dense	65-85	30-50
Very Dense	>85	>50

SAMPLING

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are generally taken by one of two methods:

1. Driving or pushing a thin walled sample tube into the soil and withdrawing with a sample of soil in a relatively undisturbed state.

2. Core drilling using a retractable inner tube (R.I.T.) core barrel.

Such samples yield information on structure and strength in additions to that obtained from disturbed samples and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling are given in the report.

PENETRATION TESTING

The relative density of non-cohesive soils is generally assessed by in-situ penetration tests, the most common of which is the standard penetration test. The test procedure is described in Australian Standard 1289 “Testing Soils for Engineering Purposes” Testing Soils for Engineering Purposes” – Test No. F3.1.

The standard penetration test is carried out by driving a 50mm diameter split tube penetrometer of standard dimensions under the impact of a 63 kg hammer having a free fall of 750mm.

The “N” value is determined as the number of blows to achieve 300mm of penetration (generally after disregarding the first 150mm penetration through possibly disturbed material). The results of these tests can be related empirically to the engineering properties of the soil.

The test is also used to provide useful information in cohesive soils under certain conditions, a good quality disturbed sample being recovered with each test. Other forms of in situ testing are used under certain conditions and where this occurs, details are given in the report.

DEFINITIONS OF ROCK, SOIL, AND DEGREES OF CHEMICAL WEATHERING

GENERAL DEFINITIONS – ROCK AND SOIL

ROCK In engineering usage, rock is a natural aggregate of minerals connected by strong and permanent cohesive forces.

Note: Since “strong” and “permanent” are subject to different interpretations, the boundary between rock and soil is necessarily an arbitrary one.

SOIL In engineering usage, soil is a natural aggregate of mineral grains which can be separated by such gentle mechanical means as agitation in water, can be remoulded and can be classified according to the Unified Soil Classification System. Three principal classes of soil recognized are:

Residual soils: soils which have been formed in-situ by the chemical weathering of parent rock. Residual soil may retain evidence of the original rock texture or fabric or, when mature, the original rock texture may be destroyed.

Transported soils: soils which have been moved from their places of origin and deposited elsewhere. The principal agents of erosion, transport and deposition are water, wind and gravity. Two important types of transported soil in engineering geology and materials investigations are:

Colluvium – a soil, often including angular rock fragments and boulders, which has been transported downslope predominantly under the action of gravity assisted by water. The principle forming process is that of soil creep in which the soil moves after it has been weakened by saturation. It may be water borne for short distances.

Alluvium – a soil which has been transported and deposited by running water. The larger particles (sand and gravel size) are water worn.

Lateritic soils: soils which have formed in situ under the effects of tropical weathering include all reddish residual and non residual soils which genetically form a chain of material ranging from decomposed rock through clay to sesqui-oxide rich crusts. The term does not necessarily imply any compositional, textural or morphological definition; all distinctions useful for engineering purposes are based on the differences in geotechnical characteristics.

ROCK WEATHERING DEFINITIONS

Extremely Weathered (EW)	Rock substance affected by weathering to the extent that the rock exhibits soil properties, i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.
Highly Weathered (HW)	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of the chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original fresh rock substance is no longer recognisable.
Moderately Weathered (MW)	Rock substance affected by weathering to the extent that staining extends throughout the whole of the rock substance and the original colour of the fresh rock is no longer recognisable.
Slightly Weathered (SW)	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance, usually by limonite, has taken place. The colour and texture of the fresh rock is recognisable.
Fresh (Fr)	Rock substance unaffected by weathering.

The degrees of rock weathering may be gradational. Intermediate stages are described by dual symbols with the prominent degree of weathering first (e.g. EW-HW).

The various degrees of weathering do not necessarily define strength parameters as some rocks are weak, even when fresh, to the extent that they can be broken by hand across the fabric, and some rocks may increase in strength during the weathering process.

Fresh drill cores of some rock types, such as basalt and shale may disintegrate after exposure to the atmosphere due to slaking, desiccation, expansion or contraction, stress relief or a combination of any of these factors.

AN ENGINEERING CLASSIFICATION OF SEDIMENTARY ROCKS

This classification system provides a standardised terminology for the engineering description of the sandstone and shales in the Sydney area, but the terms and definitions may be used elsewhere when applicable. Where other rock types are encountered, such as in dykes, standard geological descriptions are used for rock types and the same descriptions as below are used for strength, fracturing and weathering.

Under this system rocks are classified by Rock Type, Strength, Stratification Spacing, Degree of Fracturing and Degree of Weathering. These terms do not cover the full range of engineering properties. Descriptions of rock may also need to refer to other properties (e.g. durability, abrasiveness, etc) where these are relevant.

ROCK TYPE DEFINITIONS

ROCK TYPE	DEFINITION
Conglomerate:	More than 50% of the rock consists of gravel sized (greater than 2mm) fragments.
Sandstone:	More than 50% of the rock consists of sand sized (0.06 to 2mm) grains.
Siltstone:	More than 50% of the rock consists of silt-sized (less than 0.06mm) granular particles and the rock is not laminated.
Claystone:	More than 50% of the rock consists of silt or clay sized particles and the rock is not laminated.
Shale:	More than 50% of the rock consists of silt or clay sized particles and the rock is laminated.

Rocks possessing characteristics of two groups are described by their predominant particle size with reference also to the minor constituents, e.g. clayey sandstone, sandy shale.

STRATIFICATION SPACING

Term	Separation of Stratification Planes
Thinly Laminated	< 6mm
Laminated	6mm to 20mm
Very thinly bedded	20mm to 60mm
Thinly bedded	60mm to 0.2m
Medium bedded	0.2m to 0.6m
Thickly bedded	0.6m to 2m
Very thickly bedded	> 2m

DEGREE OF FRACTURING

This classification applies to diamond drill cores and refers to the spacing of all types of natural fractures along which the core is discontinuous. These include bedding plane partings, joints and other rock defects, but exclude known artificial fractures such as drilling breaks.

Term	Description
Fragmented:	The core is comprised primarily of fragments of length less than 20mm, and mostly of width less than the core diameter
Highly Fractured:	Core lengths are generally less than 20mm – 40mm with occasional fragments.
Fractured:	Core lengths are mainly 30mm – 100mm with occasional shorter and longer section.
Slightly Fractured:	Core lengths are generally 300mm – 1000mm with occasional longer sections and occasional sections of 100mm – 300mm.
Unbroken:	The core does not contain any fracture.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Society of Rock Mechanics.

Term	Point Load Index Is(50) MPa	Field Guide	Approx qu MPa*
Extremely Weak:	0.03	Easily remoulded by hand to a material with soil properties.	0.7
Very Weak:	0.1	May be crumbled in the hand. Sandstone is “sugary” and friable.	2.4
Weak:	0.3	A piece of core 150mm long x 50mm dia. May be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.	7
Medium Strong:	1	A piece of core 150mm long x 50mm dia. can be broken by hand with considerable difficulty. Readily scored with knife.	24
Strong: (SW)	3	A piece of core 150mm long x 50mm dia. core cannot be broken by unaided hands, can be slightly scratched or scored with knife.	70
Very Strong (SW)	10	A piece of core 150mm long x 50mm dia. may be broken readily with hand held hammer. Cannot be scratched with pen knife.	240
Extremely Strong (Fr)	>10	A piece of core 150mm long x 50mm dia. is difficult to break with hand held hammer. Rings when struck with a hammer.	>240

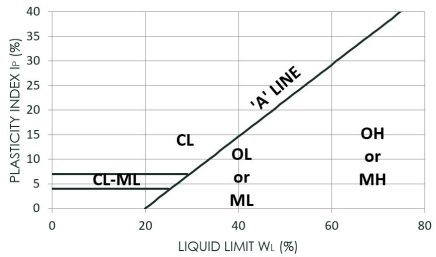
The approximate unconfined compressive strength (qu) shown in the table is based on an assumed ration to the point load index of 24:1. This ratio may vary widely.

Unified Soil Classification System (Metricated)
Data for Description Indentification and Classification of Soils

MAJOR DIVISIONS				DESCRIPTION: Group Symbol	Graphic Symbol	TYPICAL NAME	DESCRIPTIVE DATA
COARSE GRAINED SOILS	More than 50% by dry mass, less than 60mm is greater than 0.06mm.	GRAVELS	More than 50% of coarse grains are greater than 2.0mm	GW		Well graded gravels and gravel-sand mixtures, little or no fines	Give typical name, indicate approximate percentages of sand and gravel, maximum size, angularity, surface condition and hardness of the coarse grains, local or geological name and other pertinent descriptive information, symbols in parenthesis. For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics. EXAMPLE: Silty Sand, gravelly, about 20% hard, angular gravel particles, 10mm maximum size, rounded and sub angular sand grains coarse to fine, about 15% non-plastic fines with low dry strength, well compacted and moist in place, light brown alluvial sand, (SM)
				GP		Poorly graded gravels and gravel sand mixtures, little or no fines	
		GRAVELLY SOILS		GM		Silty gravels, gravel-sand-silt mixtures	
				GC		Clayey gravels gravel-sand-clay mixtures	
		SANDS	More than 50% of coarse grains are greater than 2.0mm	SW		Well graded sands and gravelly sands, little or no fines	
				SP		Poorly graded sands and gravelly sands, little or no fines	
		SANDY SOILS		SM		Silty sand, sand-silt mixtures	
				SC		Clayey sands, sand-clay mixtures	
FINE GRAINED SOILS	More than 50% by dry mass, less than 60mm is less than 0.06mm	Liquid Limit less than 50%		ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.	Give typical name, indicate degree and character of plasticity, amount and maximum size of coarse grains, colour in wet condition, odour if any, local or geological name and r pertinent descriptive information, symbols in parenthesis. For undisturbed soil add information on structure, stratification, consistancy in undisturbed and remoulded states, moisture and drainage conditions. EXAMPLE Clayey Silt, brown, low plasticity, small percentage of fine sand, numerous vertical root-holes, firm and dry in place, fill, (ML).
				CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	
				OL		Organic silts and organic silty clays of low plasticity	
		Liquid Limit more than 50%		MH		Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts.	
				CH		Inorganic clays of high plasticity, fat clays.	
				OH		Organic clays of medium to high plasticity.	
				Pt		Peat muck and other highly organic soils.	

FIELD IDENTIFICATION						
			GRAVELS AND SANDS: GRADATIONS	NATURE OF FINES	DRY STRENGTH	Group Symbol
Determine approximate percentages of material over 60mm size, maximum size, shape, surface texture, hardness of material, geological description, identify on estimated percentage mass of the various fractions.	COARSE GRAINED SOILS: More than half of the material less than 60mm is larger than 0.06mm	0.06mm is about the smallest particle visible to the naked eye	GOOD	Wide range in grain size	"Clean" materials (not enough fines to band coarse grains)	None	GW
			POOR	Predominantly one size or range of sizes			GP
			GOOD TO FAIR	"Dirty" materials (Excess of fines)	Fines are non-plastic (1)	None to medium	GM
					Fines are plastic (1)		GC
			GOOD	Wide range in grain size	"Clean" materials (not enough fines to band coarse grains)	None	SW
			POOR	Predominantly one size or range of sizes			SP
			GOOD TO FAIR	"Dirty" materials (Excess of fines)	Fines are non-plastic (1)	None to medium	SM
					Fines are plastic (1)		SC
	FINE GRAINED SOILS: More than half of the material less than 50mm is less than 0.06mm		SILT AND CLAY FRACTION: Fraction smaller than 0 20mm AS sieve size: DRY STRENGTH	DILATANCY	TOUGHNESS	
			None to low	Quick to slow	None		ML
			Medium to high	None to very slow	Medium		CL
			Low to medium	Slow	Low		OL
			Low to medium	Slow to none	Low to medium		MH
			High to very high	None	High		CH
			Medium to high	None to very slow	Low to medium		OH
Readily identified by colour, odour, spongy feel and generally by fibrous texture							Pt*

LABORATORY CLASSIFICATION					
	% [2] < 0.06mm	PLASTICITY OF FINE FRACTION			NOTES
Use the gradation curve of material passing 60mm for classification of fractions according to criteria given under "Major Division".	0-5	-	>4	Between 1 and 3	1. Identify Fines by the method given for fine grained soils. 2. Borderline classifications occur when the percentage of fines (fraction smaller than 0.06mm size) is greater than 5% and less than 12%. Borderline classifications require the use of dual symbols eg SP-SM GW-GC
	0-5	-	Fails to comply with above		
	12-50	Below 'A' line and Ip >7	-	-	
	12-50	Above 'A' line and Ip > 7	-	-	
	0-5	-	>6	between 1 and 3	
	0-5	-	Fails to comply with above		
	12-50	Below 'A' line or Ip < 4	-	-	
	12-50	Above 'A' line and Ip > 7	-	-	
More than 50% passing 0.06mm		Below 'A' line			
		Above 'A' line			
		Below 'A' line			
		Below 'A' line			
		Above 'A' line			
		Below 'A' line			
*Effervescence with H2O2					



PLASTICITY CHART
FOR CLASSIFICATION OF FINE GRAINED SOILS

FORTIFY GEOTECH

Limitations in the Use and Interpretation of this Geotechnical Report

Our Professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The geotechnical report was prepared for the use of the Owner in the design of the subject facility and should be made available to potential contractors and/or the Contractor for information on factual data only. This report should not be used for contractual purposes as a warranty of interpreted subsurface conditions such as those indicated by the interpretive boring and test pit logs, cross- sections, or discussion of subsurface conditions contained herein.

The analyses, conclusions and recommendations contained in the report are based on site conditions as they presently exist and assume that the exploratory borings, test pits, and/or probes are representative of the subsurface conditions of the site. If, during construction, subsurface conditions are found which are significantly different from those observes in the exploratory borings and test pits, or assumed to exist in the excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, this report should be reviewed to determine the applicability of the conclusions and the recommendations considering the changed conditions and time lapse.

The Summary Boring Logs are our opinion of the subsurface conditions revealed by periodic sampling of the ground as the borings progressed. The soil descriptions and interfaces between strata are interpretive and actual changes may be gradual.

The boring logs and related information depict subsurface conditions only at the specific locations and at the particular time designated on the logs. Soil conditions at the other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the soil conditions at these boring locations.

Groundwater levels often vary seasonally. Groundwater levels reported on the boring logs or in the body of the report are factual data only for the dates shown.

Unanticipated soil conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking soil samples, borings or test pits. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. It is recommended that the Owner consider providing a contingency fund to accommodate such potential extra costs.

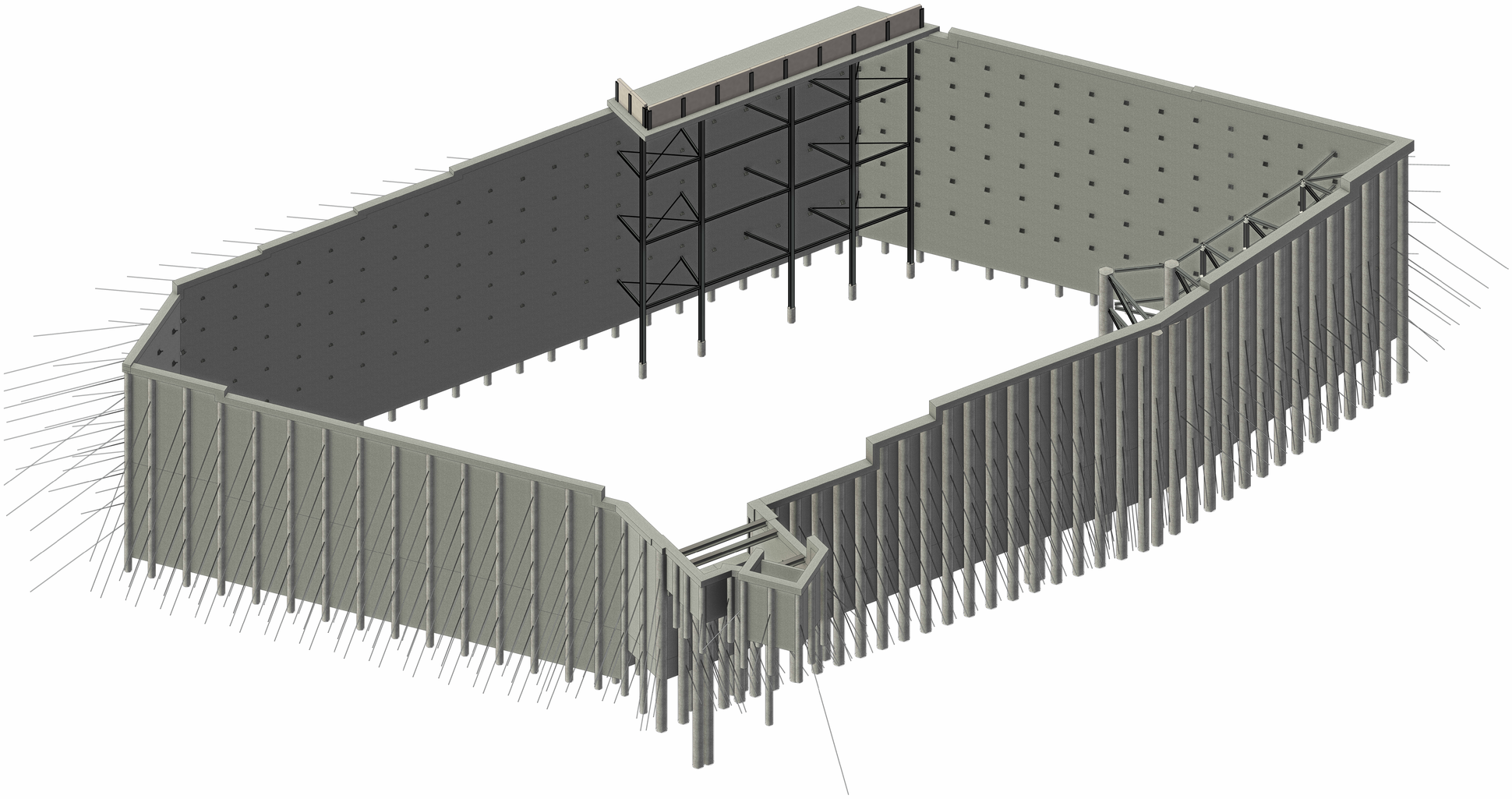
This firm cannot be responsible for any deviation from the intent of this report including, but not restricted to, any changes to the scheduled time of construction, the nature of the project or the specific construction methods or means indicated in this report: nor can our firm be responsible for any construction activity on sites other than the specific site referred to in this report.

Annexure B: Shoring wall drawings issued by Cadigal Group

NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.: DRAWING TITLE:		BODY CORP REG TAG:		
COVER SHEET & DRAWING LIST		DA No: DRAWING No: S00001		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO

MIXED USE DEVELOPMENT

849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.



SHORING (SOLDIER PILE SYSTEM)

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
H	ISSUED FOR INFORMATION ONLY	25.05.09	RT	NAA
G	ISSUED FOR INFORMATION ONLY	25.04.03	RT	NAA
F	ISSUED FOR INFORMATION ONLY	25.03.25	RT	NAA
E	ISSUED FOR INFORMATION ONLY	25.03.11	RT	NAA
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	25.02.18	RM	JT

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Project: **849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.**

Developer: Billbergia creating communities®

Contractor:

Architect : pbd architects

Design Consultant: CADIGAL GROUP

1002, 22-24 Market Street,
Sydney, NSW 2000
Australia
T: +61 2 8630 8559
info@cadigalgroup.com.au

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Drawing Title:

COVER PAGE

STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Modelled:	RT	JT	24.05.15	
Scale:		Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10000	H

NON DECLARED DESIGN				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.				
PROJECT TITLE: CHADSWOOD				
CONSENT No.:			BODY CORP REG TAG:	
DRAWING TITLE: SPECIFICATION NOTES - SH1			DA No: S00010	
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO

STRUCTURAL NOTES

STANDARD NOTES:

GENERAL:

G1. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ARCHITECTURAL AND OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS OR SKETCHES AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE SUPERINTENDENT BEFORE PROCEEDING WITH WORK.

G2. MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE SPECIFICATION, CURRENT SAA CODES, BUILDING REGULATIONS AND THE REQUIREMENTS OF ANY OTHER RELEVANT STATUTORY AUTHORITIES.

G3. MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE SPECIFICATION, CURRENT SAA CODES, BUILDING REGULATIONS AND THE REQUIREMENTS OF ANY OTHER RELEVANT STATUTORY AUTHORITIES.

G4. THE CONSULTING ENGINEER HAS DESIGNED THE PERMANENT STRUCTURE. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN, IMPLEMENTATION AND CERTIFICATION OF ALL TEMPORARY WORKS, PROPPING, NEEDLING, FALSE WORK, BRACING, BACK-PROPPING, AND SO FORTH, NECESSARY TO COMPLETE THE WORK.

G5. DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. THE CONTRACTOR SHALL ALLOW TO ENGAGE A CHARTERED (NPER-3) ENGINEER TO DESIGN, INSPECT THE TEMPORARY WORKS AND VERIFY THE TEMPORARY STABILITY OF THE STRUCTURE.

G6. THE APPROVAL OF A SUBSTITUTION SHALL BE SOUGHT FROM THE SUPERINTENDENT BUT IS NOT AN AUTHORIZATION OF A COST VARIATION. THE SUPERINTENDENT MUST APPROVE ANY COST VARIATION INVOLVED BEFORE ANY WORK STARTS.

G7. THESE DRAWINGS SHALL NOT BE USED FOR CONSTRUCTION UNTIL ISSUED AS "FOR CONSTRUCTION" BY THIS OFFICE.

G8. THE CONTRACTOR RETAINS RESPONSIBILITY OF THE WORKS EVEN IF THE ENGINEER HAS INSPECTED THE WORKS DURING CONSTRUCTION.

G9. WHERE ADDITIONAL CONSTRUCTION LOADS, SUCH AS TEMPORARY SHORING, MOBILE CRANES, ETC. ARE TO BE IMPOSED ON THE STRUCTURE, THE CONTRACTOR SHALL SUBMIT FULL DETAILS OF THE PROPOSED TEMPORARY SUPPORTS TO THE ENGINEER FOR REVIEW. SUCH INFORMATION MUST BE PROVIDED A MINIMUM OF 7 WORKING DAYS PRIOR TO THE PROPOSED WORKS COMMENCING.

G10. IF THE CONTRACTOR INTENDS TO VARY THE SCOPE OR METHOD OF WORKS OR MATERIALS USED, THE CONTRACTOR SHALL SUBMIT FULL DETAILS OF THE PROPOSAL TO THE DESIGN SUPERINTENDENT FOR DESIGN CHECK.

G11. ALL PROPRIETARY PRODUCTS SHALL BE INSTALLED STRICTLY IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

G12. ALL REQUIRED TESTS TO COMPLETE THE WORKS SHALL BE AT THE CONTRACTOR'S EXPENSE.

HEALTH AND SAFETY:

H1. THE OBLIGATION OF CADIGAL GROUP PTY LTD [OR OTHER RELEVANT CADIGAL ENTITY] (CADIGAL) AS THE DESIGN ENGINEER IS LIMITED TO ENSURING THAT THOSE PARTS OF THE STRUCTURE THAT ARE TO BE USED AS A WORKPLACE ARE, AS FAR AS REASONABLY PRACTICABLE, DESIGNED TO BE SAFE AND WITHOUT RISKS TO THE HEALTH OF THOSE PERSONS USING THE STRUCTURE AS A WORKPLACE FOR THE PURPOSE FOR WHICH IT WAS DESIGNED IN ACCORDANCE WITH SECT. 28 OF THE OCCUPATIONAL HEALTH AND SAFETY ACT 2004 (VIC).

H2. CADIGAL IS NOT RESPONSIBLE FOR THE OCCUPATIONAL HEALTH AND SAFETY OF PERSONS AT THE SITE AS THOSE OBLIGATIONS RESIDE WITH THE CONTRACTORS AND/OR SUBCONTRACTORS WHO OCCUPY OR HAVE CONTROL OF THE SITE IN ACCORDANCE WITH APPLICABLE OCCUPATIONAL HEALTH AND SAFETY LEGISLATION, CODES OR PRACTICE, GUIDANCE NOTES, AUSTRALIAN STANDARDS AND OTHER RELEVANT DOCUMENTATION.

H3. ANY ADVICE OR GUIDANCE CONCERNING OCCUPATIONAL HEALTH AND SAFETY ISSUES ARISING AT THE SITE SHOULD BE DIRECTED TO THE HEALTH AND SAFETY EXECUTIVE OR OFFICER NOMINATED FOR THE PROJECT.

FOUNDATIONS:

F1. REFER TO THE GEOTECHNICAL REPORT FOR A DESCRIPTION OF THE ANTICIPATED SITE CONDITIONS. THE BUILDER IS TO STUDY THE REPORT AND MAKE HIS OWN EVALUATION ON THE SITE CONDITIONS. ANY ADDITIONAL COSTS INCURRED SHALL BE BORNE BY THE BUILDER.

F2. ALL FOOTINGS SHALL BE FOUNDED AT THE RECOMMENDED DEPTH AND INTO THE APPROPRIATE MATERIAL AS SPECIFIED IN THE GEOTECHNICAL REPORT. THE ALLOWABLE BEARING CAPACITY SHALL BE AS SPECIFIED IN THE FOOTING SCHEDULE. THE TOPS OF FOOTINGS SHALL BE A MINIMUM OF 300mm BELOW THE LOWEST ADJACENT STRUCTURAL FLOOR LEVEL UNLESS NOTED OTHERWISE.

F3. THE ALLOWABLE BEARING CAPACITY SHALL BE VERIFIED BY GEOTECHNICAL ENGINEER, WHO SHALL BE EMPLOYED BY THE BUILDER, BEFORE ANY CONCRETE IS PLACED. WHEREVER THE BEARING CAPACITY AT THE FOOTING BASE IS INADEQUATE, EXCAVATION SHALL CONTINUE UNTIL SUITABLE MATERIAL IS FOUND OR THE FOOTING IS ENLARGED TO THE ENGINEER DETAILS.

F4. BASES OF ALL FOOTINGS SHALL BE CLEANED OF ALL LOOSE MATERIAL PRIOR TO POURING OF CONCRETE. IN WET CONDITIONS, A 300 x 300 x 300 PIT SHALL BE DUG AT THE CORNER OF THE FOOTING FOR DEWATERING THE EXCAVATION BEFORE CONCRETING. A 50mm MINIMUM BLINDING LAYER OF N15 GRADE CONCRETE SHALL BE USED, UNLESS OTHERWISE APPROVED BY THE ENGINEER.

F5. WHENEVER A FOOTING IS LOCATED CLOSE TO A BATTER , AN EXISTING FOOTING, EXISTING OR NEW SERVICES, A LINE DRAWN AT THE BOTTOM OF THE FOOTING AT 40 DEGREES TO THE HORIZONTAL SHALL FALL BELOW THE BATTER, EXISTING FOOTING OR SERVICES. IF THIS DOES NOT HAPPEN THE FOOTING BASE SHALL BE DEEPENED AS REQUIRED TO ACHIEVE THE FORMER.

F6. THE OVER BREAK BETWEEN THE APPROVED FOUNDING LEVEL AND THE UNDERSIDE OF THE FOOTING SHALL BE FILLED WITH GRADE N15 CONCRETE. ANY OVER BREAK AT THE SIDES OF THE FOOTING SHALL BE FILLED WHEN CONCRETING THE FOOTING.

F7. THE BUILDER SHALL REMOVE ALL SPOIL FROM THE SITE, AND DEWATER THE EXCAVATION AS REQUIRED.

BULK EXCAVATION NOTES :

B1. THE CONTRACTOR IS TO NOTIFY ALL SERVICE AUTHORITIES AND ARRANGE FOR DISCONNECTION OF SERVICES OR SUPPLY AS APPLICABLE INCLUDING ALL CUTTING, DISCONNECTION OR SEALING OFF OF SERVICES AND DRAINS AS REQUIRED. SERVICES OR SUPPLY LINES THAT ARE TO BE RETAINED SHALL REMAIN UNDAMAGED AND GIVEN ALL NECESSARY PROTECTION.

B2. THE BULK EXCAVATION SHALL BE CARRIED OUT TO THE BULK EXCAVATION PROFILE ON THE DRAWINGS OR TO THE UNDERSIDE OF THE STRUCTURE, INCLUSIVE OF SUBBASE MATERIALS. THE CONTRACTOR SHALL VERIFY ANY LEVELS SHOWN ON THE STRUCTURAL DOCUMENTS WITH THE ARCHITECTURAL DOCUMENTS. ANY DISCREPENCY SHALL BE REFERRED TO THE ENGINEER FOR DIRECTION.

B3. UNLESS AUTHORISED BY THE ENGINEER OVER- EXCAVATIONS SHALL NOT BE CLAIMED AS VARIATION. SUCH EXCESS EXCAVATIONS SHALL BE FILLED WITH 3% CEMENT STABILISED SAND UNLESS COMPACTED BACKFILLING IS APPROVED BY THE ENGINEER.

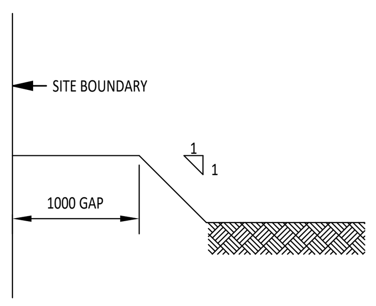
B4. THE CONTRACTOR SHALL PROVIDE ALL BRACING NECESSARY TO RETAIN EARTH BANKS, ROADS, PAVEMENTS, WALLS AND FOOTINGS OF ADJOINING PROPERTIES AND PREVENT CAVING AND DISPLACEMENT OF ADJACENT SOIL OR STRUCTURES. THE CONTRACTOR SHALL PROVIDE AND DESIGN ALL NECESSARY COMPONENTS OF SUCH BRACING.

B5. EXCAVATED MATERIAL SHALL BE REMOVED FROM THE SITE. THIS MATERIAL SHALL NOT BE USED FOR LEVELLING, FILLING EXCESS EXCAVATIONS OR BACKFILLING BEHIND RETAINING WALLS UNLESS WRITTEN APPROVAL HAS BEEN OBTAINED FROM THE ENGINEER. CONTAMINATED MATERIAL SHALL BE RETAINED AND USED AS NON-ENGINEERED FILL UNDER THE BUILDING.

B6. EXCAVATED MATERIAL SHALL BE REMOVED FROM THE SITE. THIS MATERIAL SHALL NOT BE USED FOR LEVELLING, FILLING EXCESS EXCAVATIONS OR BACKFILLING BEHIND RETAINING WALLS UNLESS WRITTEN APPROVAL HAS BEEN OBTAINED FROM THE ENGINEER. CONTAMINATED MATERIAL SHALL BE RETAINED AND USED AS NON-ENGINEERED FILL UNDER THE BUILDING.

B7. ALL GROUND UNSUITABLE FOR THE PURPOSES OF THE WORKS, SHALL BE REMOVED AND FILLED WITH 3% CEMENT STABILISED SAND OR APPROVED COMPACTED BACKFILLING AS NOMINATED BY THE GEOTECHNICAL ENGINEER.

B8. BULK EXCAVATION BATTERS AROUND THE PERIMETER OF THE SITE ARE TO BE AS SHOWN BELOW UNLESS NOTED OTHERWISE ON THE DRAWINGS OR GEOTECHNICAL REPORT.



PILING NOTES:

BP1. THE WORK TO BE CARRIED OUT BY THE PILING CONTRACTOR COMPRISES OF THE DESIGN AND CONSTRUCTION OF THE BORED PILES TO THE REQUIREMENTS OF AS2159. PILE DETAILS ON THESE DOCUMENTS ARE TO BE USED AS A GUIDE.

BP2. THE PILING CONTRACTOR SHALL DESIGN THE PILES FOR THE REQUIRED SAFE WORKING LOADS AS NOTED ON THESE DRAWINGS AND THE RECOMMENDATIONS OF THE GEOTECHNICAL REPORT.

BP3. PILE DESIGN COMPUTATIONS CERTIFICATION AND DOCUMENTATION SHALL BE SUBMITTED TO THE ENGINEER FOR COMMENT PRIOR TO CONSTRUCTION.

BP4. THE PILING CONTRACTOR IS FULLY RESPONSIBLE FOR THE PILE PERFORMANCE.UNDER THE SCHEDULED PILE LOADS, THE PILE SETTLEMENTS SHALL NOT EXCEED:
TOTAL LONG TERM SETTLEMENT = 10mm DIFFERENTIAL SETTLEMENT BETWEEN ADJACENT PILES = 5mm OR DISTANCE/1000, WHICH EVER IS LESS

BP5. FOUNDING LEVELS OF THE BORED PILE BASES ARE TO BE DETERMINED ON SITE AND APPROVED BY THE GEOTECHNICAL ENGINEER.

BP6. THE TRIMMED TOP OF THE PILES SHALL BE WITHIN ± 25mm OF THE UNDERSIDE OF THE FOUNDATION WORKS.

BP7. THE PILE LOCATION NOMINATED ON THE DOCUMENTS ARE TO BE WITHIN 75mm IN ANY DIRECTION OF THE POSITION SHOWN ON THESE DRAWINGS. TOLERANCE ON DEPARTURE FROM TRUE VERTICAL SHALL BE LESS THAN 4%.

BP8. THE SOCKET IS THE BOTTOM LENGTH OF THE SHAFT OF THE PILE THAT IS ENTIRELY IN THE FOUNDING MATERIAL. THE SURFACE OF THE SOCKET SHALL BE ROUGHENED BY SPIRAL GROOVING. IT MUST BE FREE FROM LOOSE MATERIAL AND/OR CLAY SMEAR.

THE PILING CONTRACTOR IS TO MAKE ADJUSTMENTS TO THE LENGTH OF THE SOCKET AS NECESSARY TO SUIT THE ACTUAL FOUNDING MATERIAL ENCOUNTERED DURING BORING OPERATIONS.

BP9. TEMPORARY LINING OF SHAFTS SHALL BE PROVIDED BY THE CONTRACTOR TO PREVENT COLLAPSE DUE TO THE PRESENCE OF UNSTABLE MATERIAL, GROUND WATER OR OTHER UNFORESEEN CIRCUMSTANCES. THE PLACEMENT AND REMOVAL OF TEMPORARY LINERS.
PERMANENT LINING IF USED SHALL BE CONSIDERED IN THE DESIGN AND SHALL BE DETAILED ON THE PILE DOCUMENTS BY THE CONTRACTOR.

BP10. THE SHAFT BASES SHALL BE CLEANED OUT AND RECEIVE APPROVAL FROM THE GEOTECHNICAL ENGINEER BEFORE REINFORCEMENT CAGES ARE SET IN POSITION AND CONCRETE PLACED. THE CONTRACTOR SHALL RECORD THE PILE LENGTH AND LOG THE EXCAVATED MATERIAL. BOTH THE CONTRACTOR AND GEOTECHNICAL ENGINEER SHALL PROVIDE A STATEMENT REGARDING THE COMPLIANCE OF THE MATERIAL TO THE ASSUMED DESIGN CONDITIONS AND SOIL REPORT.
CLEARING OUT THE BASE MEANS THAT ALL LOOSE AND SOFTENED MATERIAL SHALL BE REMOVED.

BP11. SHOULD GROUND WATER BE ENCOUNTERED, THE CONTRACTOR SHALL SUPPLY AND INSTALL A PUMP OF ADEQUATE CAPACITY TO DIVERT WATER TO A PROPERLY SITED SUMP. A STANDBY PUMP OF SIMILAR CAPACITY SHALL ALSO BE AVAILABLE.

BP12. ALL REINFORCEMENT SHALL COMPLY WITH AS4671 AND AS3600.

BP13. REINFORCEMENT SHALL BE FREE OF LOOSE MILL SCALE, RUST, OIL, PAINT, GREASE AND OTHER. IT SHALL BE FREE OF SUCH MATTER UNTIL CONCRETE IS PLACED.

BP14. REINFORCEMENT SHALL BE PROPERLY FABRICATED INTO CAGES THAT SHALL BE INSTALLED IMMEDIATELY AT THE BASE OF ANY SHAFT THAT HAS BEEN APPROVED. REINFORCEMENT SHALL BE SECURELY FIXED SO THAT NO VERTICAL MOVEMENT OCCURS WHILST CONCRETE IS BEING PLACED. APPROVED SPACERS SHALL BE PROVIDED AT 2 METERS MAXIMUM CENTRES ALONG THE LENGTH OF THE PILE TO MAINTAIN ADEQUATE COVER.

BP15. CONCRETE SHALL BE PLACED USING A TREMIE CONTINUOUSLY TO THE TOP OF THE SHAFT. WHERE PERMITTED BY THE ENGINEER, CONCRETE MAY BE PLACED UNDERWATER. THE POUR SHALL PROCEED WITH THE TREMIE DISCHARGE AT ALL TIMES 1.5 METRES BELOW THE SURFACE OF THE CONCRETE.

BP16. PILES SHALL BE POURED TO NO LESS THAN 75mm ABOVE THE REQUIRED CUT OFF LEVEL OR HIGHER IF NECESSARY TO ALLOW FOR CONTAMINATED CONCRETE REMOVAL. THE PILE SHALL BE TRIMMED TO THE REQUIRED LEVEL REMOVING ALL WEAK CONCRETE AND LAITENCE. CARE SHALL BE TAKEN THAT THE FULL CROSS SECTION OF THE PILE IS LEVEL AND THE REINFORCEMENT IS UNDAMAGED.

BP17. EXCAVATED MATERIAL SHALL BE REMOVED FROM THE SITE.

SLAB ON GROUND NOTES:

SOG1. ALL CONCRETE WORK TO COMPLY WITH AS 3600 CONCRETE CODE, AND BCA SECTIONS 3.1 AND 3.2

SOG2. CONCRETE GRADE N20 MINIMUM (RESIDENTIAL)
CONCRETE GRADE N32 MINIMUM (ALL OTHER STRUCTURES)

SOG3. ALL VEGETATION SHALL BE STRIPPED TO A MINIMUM DEPTH OF 150mm. ANY SOFT SPOTS OR DELETERIOUS MATERIAL SHALL BE REMOVED AND REPLACED WITH APPROVED GRANULAR FILLING COMPACTED TO 100% AS. STANDARD COMPACTION. MINOR FILLING (800 MAXIMUM) SHALL BE PROVIDED WHERE REQUIRED TO BRING SUB GRADE TO REQUIRED LEVEL IN ACCORDANCE WITH LIMITS STATED IN AS 2870 AND BCA. FILLING SHALL BE APPROVED GRANULAR MATERIAL PLACED IN 150mm AND COMPACTED TO 100% AS. STANDARD COMPACTION.

SOG4. A 0.2mm VAPOUR BARRIER SHALL BE USED, LAPPED A MINIMUM OF 200mm AT JOINTS AND TAPED AROUND SERVICES FITTINGS WITH ADHESIVE TAPE NOT INFERIOR TO DOUBLE SIDED BUTYL ADHESIVE TAPE. THE VAPOUR BARRIER SHALL BE PLACED ON A 50mm MINIMUM SAND BED OR SIMILAR APPROVED MATERIAL. PROTECT MEMBRANE FROM DAMAGE.

SOG5. TRENCH MESH IN BEAMS SHALL BE OVERLAPPED BY THE WIDTH OF FABRIC AT 'T' AND 'L' INTERSECTIONS AND SPLICED WITH A LAP OF 500mm. RANDOM LAP N12 BARS BY 500mm STAGGERED. THE OUTER BAR AT 'L' INTERSECTION MUST BE BENT AND CONTINUED FOR 500mm AROUND THE CORNER.

SOG6. SLAB FABRIC TO BE LAPPED SUCH THAT THE TWO OUTERMOST TRANSVERSE WIRE OF ONE SHEET OF MESH OVERLAP THE TWO OUTERMOST TRANSVERSE WIRES OF THE SHEET BEING LAPPED BY A MINIMUM OF 25mm AND BE SUPPORTED ON BAR CHAIRS AT 800mm MAXIMUM CENTERS.

SOG7. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE SITE INVESTIGATION REPORT TO DETERMINE FOUNDING DEPTHS.

SOG8. SITE CLASSIFICATION TO AS 2870 CLASS H ENGINEERING PRINCIPLES TO SECTIONS 4 OF AS 2870.

SOG9. LOAD BEARING EXTERNAL AND INTERNAL BEAMS AND LOAD SUPPORT THICKENINGS ARE TO BE FOUNDED ON NATURAL SOIL WITH AN ALLOWABLE BEARING PRESSURE OF NOT LESS THAN 100 kPa.

SOG10. SLAB PANELS ARE TO BE FOUNDED ON NATURAL SOIL WITH AN ALLOWABLE BEARING PRESSURE OF NOT LESS THAN 50 kPa.

SOG11. TOP OF SLAB SHALL BE 150mm MINIMUM ABOVE THE FINAL GROUND LEVEL.

SOG12. DRAINAGE AND GRADING AWAY FROM SLAB SHALL BE PROVIDED TO PREVENT WATER COLLECTING ADJACENT TO SLAB. TREATMENT OF AREAS SURROUNDING SLAB SHALL ALSO BE IN ACCORDANCE WITH RECOMMENDATIONS BY THE HOUSING GUARANTEE FUND AND THE OWNER/OCCUPIER SHALL BE PROVIDED WITH A COPY OF CSIRO INFORMATION SHEET No. 10-19.

SOG13. BRICKWORK CONTROL JOINTS ARE TO BE PROVIDED ON SIDES EXCEEDING 6000mm IN LENGTH OR THROUGH LARGE OPENINGS FROM EAVES TO SLAB OR THROUGH FULL HEIGHT WINDOWS AND DOORS.

SOG14. WHERE REQUIRED BY COUNCIL PROTECT THE STRUCTURE FROM SUBTERRANEAN TERMITES IN ACCORDANCE WITH AS 3660 AND BCA

SUSPENDED SLAB ON GROUND NOTES:

SSG1. ALL CONCRETE WORK TO COMPLY WITH AS 3600 CONCRETE CODE, AND BCA VOLUME 1, SECTIONS 3.1 AND 3.2

SSG2. CONCRETE GRADE N32 MINIMUM

SSG3. ALL VEGETATION SHALL BE STRIPPED TO A MINIMUM DEPTH OF 150mm.

SSG4. ALLOW FOR COMPACTION OF EXISTING GROUND SURFACE OR FILL SUFFICIENT TO SUPPORT WET WEIGHT OF SUSPENDED SLAB ON GROUND PLUS FORMWORK AND PROPPED STRUCTURE ABOVE, AS ADVISED BY GEOTECHNICAL CONSULTANT

SSG5. ANY SOFT SPOTS OR DELETERIOUS MATERIAL SHALL BE REMOVED AND REPLACED WITH SELECTED FILL COMPACTED IN ACCORDANCE WITH NOTE SSG4.

SSG6. PROVIDE SELECTED FILL TO ACHIEVE REQUIRED SUB-GRADE R.L., COMPACTED IN ACCORDANCE WITH NOTE SSG4.

SSG7A. 0.2mm VAPOUR BARRIER SHALL BE USED, LAPPED A MINIMUM OF 200mm AT JOINTS AND TAPED AROUND SERVICES FITTINGS WITH ADHESIVE TAPE NOT INFERIOR TO DOUBLE SIDED BUTYL ADHESIVE TAPE. THE VAPOUR BARRIER SHALL BE PLACED ON A 50mm MINIMUM SAND BED OR SIMILAR APPROVED MATERIAL TO PROTECT MEMBRANE FROM DAMAGE.

SSG8. TOP OF SLAB SHALL BE 150mm MINIMUM ABOVE THE FINAL GROUND LEVEL.

SSG9. DRAINAGE AND GRADING AWAY FROM SLAB SHALL BE PROVIDED TO PREVENT WATER COLLECTING ADJACENT TO SLAB.

SSG10. WHERE REQUIRED BY COUNCIL PROTECT THE STRUCTURE FROM SUBTERRANEAN TERMITES IN ACCORDANCE WITH AS 3660 AND BCA.

SSG11. BAR CHAIR BASES ARE TO BE PROVIDED BENEATH ALL REINFORCING BAR CHAIRS TO ENSURE NO SETTLEMENT TO REINFORCEMENT OR DAMAGE TO VAPOUR BARRIER.

SSG12. SUB-GRADE AND SAND LAYER TO BE PREPARED SUCH THAT A STABLE AND LEVEL PLATFORM IS CONSTRUCTED ENSURING UNIFORM COVER TO REINFORCEMENT IS ACHIEVED ACROSS THE ENTIRE EXTENT OF THE SLAB.

POST TENSIONED CONCRETE: SHALL COMPLY T0 AS3600 AND AS3610

PT1. FULL COMPUTATIONS AND DETAILS OF PROPOSED SYSTEM SHALL BE SUBMITTED TO THE ENGINEERS FOR APPROVAL, INCLUDING DEAD, LIVE ANCHORAGE DETAILS AND LOSSES OCCURRING THROUGHOUT THE ANCHOR AND ATTACHMENTS. ANY POST TENSIONING MATERIALS AND OPERATIONS SHALL COMPLY WITH THE REQUIREMENTS OF THE SPECIFICATION AND WITH AS 3600.

PT2. CONCRETE: f'c = 32 MPa
SLUMP = 60mm ± 15mm
BASIC SHRINKAGE STRAIN = 700 x 10^{-6}/ AT 56 DAYS

PT3. TENDONS SHALL COMPRISE OF A NUMBER OF STRANDS AS NOTED ON THE DRAWINGS. STRANDS SHALL BE 7 WIRE STRESS RELIEVED LOW RELAXATION 12.7mm DIAMETER SUPERGRADE STRAND OF 184kN MINIMUM BREAKING LOAD. WHERE 15.2mm DIAMETER STRANDS ARE SPECIFIED THEY SHALL BE SUPERGRADE STRANDS OF 250kN MINIMUM BREAKING LOAD. STEEL PRESTRESSING MATERIALS FOR CONCRETE SHALL COMPLY WITH AS/NZS 4672. WHERE APPLICABLE, MATERIALS SHALL BE CUT AND BENT IN ACCORDANCE WITH AS 3600, AS 5100 OR AS 2870. ACCEPTABLE MANUFACTURERS AND PROCESSORS OF STEEL REINFORCING AND PRESTRESSING MATERIALS MUST ALSO HOLD A VALID CERTIFICATE OF APPROVAL, ISSUED BY THE AUSTRALIAN CERTIFICATION AUTHORITY FOR REINFORCING STEELS LTD (ACRS). MATERIALS CERTIFIED TO AN ALTERNATIVE SYSTEM SHALL NOT BE USED WITHOUT DEMONSTRATED EQUIVALENCE AND SUBSEQUENT WRITTEN APPROVAL FROM THE SPECIFIER. EVIDENCE OF COMPLIANCE WITH THIS CLAUSE MUST BE OBTAINED WHEN CONTRACT BIDS ARE RECEIVED.

PT4. THE CONTRACTOR MUST SUBMIT FOR APPROVAL OF SHOP DRAWINGS OF THE TENDON LAYOUT SHOWING TENDON PROFILES, ANCHOR DETAILS AND PROPOSED STRESSING SEQUENCE.

PT5. THE CONTRACTOR SHALL SUBMIT FOR APPROVAL CALIBRATION DATA FOR EVERY JACK TO BE USED ON THE JOB.

PT6. THE POST TENSIONED STRUCTURE SHALL BE CAST AS INDICATED ON THE PLAN WITH 25% PARTIAL TENSIONING APPLIED AT NOT MORE THAN 24 HOURS AFTER CASTING. AND WHEN fcp = 7 MPa (FOR 12.7mm DIA. STRANDS), OR WHEN fcp = 9 MPa (FOR 15.2mm DIA. STRANDS).

PT7. FINAL TENSIONING SHALL BE APPLIED NOT LESS THAN 4 DAYS AFTER FINAL CASTING AND WHEN fcp = 20 MPa (BY TEST). THE NEW FLOOR OVER SHALL NOT BE POURED UNTIL FINAL TENSIONING HAS BEEN APPLIED TO THE FLOOR BELOW.

PT8. TENDONS SHALL BE STRESSED TO A MAXIMUM OF 85 % OF THE TENSILE STRENGTH OF THE STRAND. RESTRESSING OF TENDON (AFTER INITIAL STRESSING) SHALL BE CARRIED OUT WHERE NECESSARY TO MAINTAIN "DESIGN" PRESTRESSING FORCES AT ANCHORAGES AT THE LEVELS SPECIFIED.

PT9. THE FLOOR DESIGN ASSUMES A 75mm WIDE x 19mm DEEP DUCT OF ZINC COATED STEEL HAVING A CURVATURE COEFFICIENT (u) = 0.20 AND AN ANGULAR COEFFICIENT (B) = 0.02

PT10. DRAPED DIMENSIONS ARE MEASURED FROM THE CONCRETE SOFFIT TO UNDERSIDE OF DUCT. ANCHORAGE DIMENSIONS ARE FROM CONCRETE SOFFIT TO CENTRE LINE OF DUCT. TENDON DRAPE BETWEEN POINTS NOMINATED ARE PARABOLIC WITH SHALLOW CURVATURE AT CHANGE OF GRADE AS REQUIRED. THE SLAB TENDON PROFILES SHALL BE KEPT HORIZONTAL ACROSS THE WIDTH OF THE BEAMS UNLESS OTHERWISE NOTED. THE TOLERANCE ON THE TENDON PROFILE IS TO BE ± 3mm. TENDON SETOUTS SHALL TAKE PRECEDENCE OVER NON-TENSIONED REINFORCEMENT.

PT11. ENSURE MINIMUM 50mm SPACING BETWEEN BARS AND TENDONS FOR CONCRETE PLACING. PROVIDE SPECIAL CARE TO ENSURE PLACEMENT AND PROPER COMPACTION OF CONCRETE AROUND TENDONS AND ANCHORAGES.

PT12. ALL STRESSING EXTENSIONS RESULTS ARE TO BE SUBMITTED FOR APPROVAL BEFORE ANY STRANDS ARE CUT. TENDONS SHALL BE FULLY GROUTED AFTER APPROVAL OF STRAND EXTENSION RESULTS AND WITHIN 4 WEEKS OF POURING IN A MANNER APPROVED BY THE ENGINEER.

CONCRETE: SHALL COMPLY T0 AS3600 AND AS3610

C1. CONCRETE SIZES DO NOT INCLUDE FINISHES.

C2. NO HOLES, CHASES OR EMBEDMENTS OTHER THAN THOSE SHOWN ON DRAWINGS SHALL BE MADE IN CONCRETE ELEMENTS WITHOUT ENGINEER'S APPROVAL.

C3. DEPTHS OF BEAMS ARE GIVEN FIRST AND INCLUDE SLAB THICKNESS, SLABS AND BEAMS SHALL BE CAST TOGETHER UNLESS OTHERWISE NOTED.

C4. CONCRETE SHALL BE KEPT FREE OF SUPPORTING MASONRY WITH TWO LAYERS OF SUITABLE MEMBRANE (MALTHOID OR EQUAL). VERTICAL FACES SHALL BE SEPARATED BY 12mm BITUMINOUS CANEITE. ALL NON - LOAD BEARING WALLS SHALL BE KEPT 20 mm CLEAR OF THE UNDERSIDE OF SLABS AND BEAMS UNLESS NOTED OTHERWISE.

C5. CONSTRUCTION JOINTS SHALL BE PROPERLY FORMED AND LOCATED TO THE SATISFACTION OF THE ENGINEER. BUILDER SHALL ALLOW FOR ALL NECESSARY CONSTRUCTION JOINTS.

C6. WHERE NOTED ON DRAWINGS CAMBER TO SUSPENDED SLABS AND BEAMS SHALL BE 5 FOR EVERY 2500 OF SPAN UNLESS OTHERWISE NOTED. WHERE THE CONCRETE SOFFITS ARE CAMBERED, THE UPPER SURFACE SHALL BE SIMILARLY CAMBERED. DEPTH GAUGES SHALL BE USED TO VERIFY THE SLAB THICKNESS.

C7. REINFORCEMENT IS SHOWN DIAGRAMATICALLY AND IS NOT NECESSARILY IN TRUE PROJECTION. SPLICES TO REINFORCEMENT SHALL BE MADE ONLY AT THE LOCATION SHOWN OR AS OTHERWISE APPROVED BY THE ENGINEER. WELDING OF REINFORCEMENT SHALL BE CARRIED OUT BY A QUALIFIED WELDER IN ACCORDANCE WITH AS/NZS 1554 AND THE REINFORCEMENT SUPPLIER RECOMMENDATIONS. THE INTERPASS TEMPERATURE SHALL BE LESS THAN 200 DEGREES IN ACCORDANCE WITH AS/NZS 1554 PART 3.

C8. THE REINFORCEMENT SYMBOLS ARE:
N NORMAL DUCTILITY CLASS HOT ROLLED 500N DEFORMED BARS WITH fsy = 500 MPa.
R NORMAL DUCTILITY CLASS 250N PLAIN ROUND BARS WITH fsy = 250 MPa.
L LOW DUCTILITY CLASS HARD DRAWN 500L WIRE REINFORCING MESH WITH fsy = 5OOMPa.
DO NOT USE LOW DUCTILITY CLASS L REINFORCEMENT UNLESS SHOWN ON THE DRAWINGS.
THE NUMBER FOLLOWING THE REINFORCEMENT SYMBOL IS THE NOMINAL BAR DIAMETER IN MILLIMETERS. ALL REINFORCEMENT SHALL COMPLY WITH AS/NZS 4671.
STEEL REINFORCING MATERIALS FOR CONCRETE SHALL COMPLY WITH AS/NZS 4671. WHERE APPLICABLE, MATERIALS SHALL BE CUT AND BENT IN ACCORDANCE WITH AS 3600, AS 5100 OR AS 2870.
ACCEPTABLE MANUFACTURERS AND PROCESSORS OF STEEL REINFORCING AND PRESTRESSING MATERIALS MUST ALSO HOLD A VALID CERTIFICATE OF APPROVAL, ISSUED BY THE AUSTRALIAN CERTIFICATION AUTHORITY FOR REINFORCING STEELS LTD (ACRS). MATERIALS CERTIFIED TO AN ALTERNATIVE SYSTEM SHALL NOT BE USED WITHOUT DEMONSTRATED EQUIVALENCE AND SUBSEQUENT WRITTEN APPROVAL FROM THE SPECIFIER. EVIDENCE OF COMPLIANCE WITH THIS CLAUSE MUST BE OBTAINED WHEN CONTRACT BIDS ARE RECEIVED.

C9. HOOKS AND COGS SHALL COMPLY WITH AS3600 UNLESS NOTED OTHERWISE. ALL PULL OUT BARS SHALL BE TEMPCORE BARS OR APPROVED EQUIVALENT. BENDING AND REBENDING OF BARS SHALL BE CARRIED OUT IN ACCORDANCE WITH AS3600, AS/NZS 4671, THE SPECIFICATIONS AND THE REINFORCEMENT SUPPLIER RECOMMENDATIONS. BARS SHALL NOT BE HEATED ABOVE 400 DEGREES WITHOUT THE ENGINEER'S WRITTEN APPROVAL. THERMAL CRAYONS SHALL BE USED TO ENSURE COMPLIANCE WITH THIS TEMPERATURE LIMIT.

C10. COVER TO REINFORCEMENT (IN mm) AND CONCRETE GRADES SHALL BE AS FOLLOWS UNLESS NOTED OTHERWISE: THE COVER SHALL NOT BE LESS THAN THE BAR DIAMETER AND:

ELEMENT	FORMED INTERNAL	FORMED AND EXPOSED TO WEATHER (1.)	NOT FORMED CAST AGAINST GROUND (2.)
FOOTINGS, PILE CAPS	-	60	75
COLUMNS, PEDESTALS	40	50	75
SLABS, BAND BEAMS	20	40	60
BEAMS	30	40	60
WALLS			
HORIZONTAL	30	40	60
VERTICAL	40	50	60

1. FOR EXPOSURE CLASSIFICATION B2 ADD 5mm TO THE COVER AND THE CONCRETE GRADE SHALL BE N40 MINIMUM.
2. IF THE ELEMENT IS CAST ON A DAMP PROOF MEMBRANE, DECREASE THE COVER BY 20mm.
3. FOR PRESTRESSING TENDONS THE MINIMUM COVER SHALL BE 25mm.
4. IN CORROSIVE SOILS AND WATER: N50

NOTES:

(i) COVER IS THE CLEAR DISTANCE BETWEEN ANY REINFORCING (INCLUDING FITMENTS) AND THE FACE OF THE STRUCTURAL ELEMENT.

(ii) FOR ALL EXTERNAL SURFACES, PROVIDE FULLY PLASTIC BAR CHAIRS. TIE WIRE SHALL NOT BE NAILED TO THE FORMS, REINFORCING BARS SHALL NOT BE USED TO KEEP FORMS APART AND A THROUGH TIE SYSTEM SHALL BE USED TO TIE FORMS.

(iii) PROVIDE AN APPROVED VAPOUR BARRIER FOR SLABS, BEAMS AND THICKENING CAST AGAINST THE GROUND.

(iv) THE COVERS SHALL BE MAINTAINED USING APPROVED BAR CHAIRS. BAR CHAIRS SUPPORTING MESH SHALL BE AT 800 x 800mm MAXIMUM CENTRES. BAR CHAIRS SUPPORTING BARS SHALL BE AT 60 BAR DIAMETERS OR 1500 MAXIMUM CENTRES WHICHEVER IS THE LESSER. BAR CHAIRS SHALL BE PROVIDED ALONG THE EDGES OF ALL CONSTRUCTION JOINTS. STOP ENDS SHALL NOT BE USED TO MAINTAIN THE COVERS.

(v) EXTERNAL ELEMENTS ARE THOSE EXPOSED TO WEATHER, RAIN AND WATER PENETRATION AND ARE CLASSIFIED B1 UNLESS NOTED OTHERWISE.

C11. EXTERNAL CONCRETE ELEMENTS ABOVE GROUND SHALL MEET THE FOLLOWING REQUIREMENTS: MINIMUM PORTLAND CEMENT CONTENT 330 kg/m3/, MAXIMUM WATER/CEMENT RATIO 0.5, AND THE CHLORIDE CONTENT RESTRICTED AS PER CLAUSE 4.9 OF AS3600.

C12. ALL CONCRETE SUPPLIED SHALL HAVE A SLUMP OF 80mm AND A MAXIMUM NOMINAL AGGREGATE SIZE OF 20mm. VARIATIONS FROM THESE SHALL BE APPROVED BY THE ENGINEER.

C13. THE MIX DESIGN WITH THE 7 AND 28 DAYS TARGET STRENGTHS AND THE BASIC SHRINKAGE STRAIN AT 56 DAYS SHALL BE SUBMITTED FOR REVIEW PRIOR TO POURING ANY CONCRETE. ALL CONCRETE IN CONTACT WITH AGGRESSIVE SOIL SHALL HAVE SULPHATE RESISTING CEMENT. THE C3A CONTENT OF THE CEMENT SHALL BE LESS THAN 5%.

C14. CONDUITS AND PIPES WHEN CAST IN SLABS OR WALLS ARE TO BE PLACED BETWEEN THE TWO REINFORCEMENT LAYERS. WHERE THERE IS ONLY ONE LAYER OF REINFORCEMENT, PROVIDE 50mm COVER TO CONDUIT. THE CONDUIT LOCATIONS ARE TO BE APPROVED BY THE ENGINEER.

C15. WHERE DISTRIBUTION BARS TO MAIN REINFORCEMENT ARE NOT SHOWN ON DRAWINGS PROVIDE MINIMUM N16 AT 400 CENTRES, LAPPED 500mm AT SPLICES.

C16. FORMWORK SHALL BE DESIGNED, CONSTRUCTED AND SUPPLIED IN ACCORDANCE WITH AS 3610. REFER TO ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR CLASSES OF SURFACE FINISHES.

C17. STRIPPING AND BACKPROPPING OF SOFFITS SHALL NOT OCCUR UNTIL CONCRETE HAS REACHED 75% OF SPECIFIED STRENGTH. BACK PROPPING (OR A SECOND SET OF TABLE FORMS) IS TO EXTEND DOWN SO THAT EACH NEW FLOOR IS SUPPORTED BY AT LEAST 3 FINISHED FLOORS OR AS CALCULATED. DO NOT STRIP BAYS ADJACENT TO CONSTRUCTION JOINTS UNTIL THE ADJACENT BAYS ARE AT LEAST 3 DAYS OLD. CALCULATIONS ON THE BACKPROPPING REQUIREMENTS SHALL BE SUBMITTED FOR APPROVAL.

C18. CURING OF THE CONCRETE ELEMENTS SHALL BE STARTED AS SOON AS THE CONCRETE HAS HARDENED AND SHALL COMPLY WITH THE SPECIFICATIONS.

C19. PROVIDE A 25mm x 25mm CHAMFER TO ALL CORBELS, UNLESS OTHERWISE INDICATED ON THE DRAWING. ENSURE THAT POLYSTYRENE IS PLACED AROUND THE BEARING, SO THAT THE CONCRETE SURFACES ARE NOT IN CONTACT. SUBMIT CONFIRMATION OF THE SPECIFICATIONS OF ALL BEARING MATERIALS TO THE ENGINEER.

C20. ENSURE ALL MOVEMENT JOINTS ARE INSTALLED WITH THE SPECIFIED ARCHITECTURAL FINISH, INCLUDING SEALANT, FILLERS, EXPANSION MATERIALS AND REBATES AS REQUIRED.

C21. THE CHARACTERISTIC COMPRESSIVE STRENGTH (F'c) AT 28 DAYS OF IN PLACE CONCRETE SHALL BE AS NOTED ON THE DRAWINGS.

CONCRETE STRENGTH GRADE FOR PARTICULAR ELEMENTS SHALL BE AS FOLLOWS, UNLESS NOTED OTHERWISE:

BORED PILES	N40 MIN (AT TOP OF PILE)
PILE CAPS	N40
GROUND BEAMS	N32
SLAB ON GROUND	N25
SUSPENDED SLABS	N32
SUSPENDED PT SLABS	S40
STAIRS	N32
WALLS (BELOW L3 SLAB)	N50
COLUMNS (BELOW L2 SLAB)	N50
COLUMNS (ABOVE L2 SLAB)	N40

ALL 'S' CLASS CONCRETE TO HAVE A MINIMUM SHRINKAGE STRAIN OF 600 MICROSTRAIN AT 56 DAYS. MINIMUM CONCRETE STRENGTH REQUIREMENTS FOR STRESSING TO BE ACHIEVED AS OUTLINED IN THE POST-TENSIONING NOTES.

C22. ALL CONCRETE SURFACES ARE TO BE CURED FOR SEVEN DAYS AFTER CASTING USING A METHOD APPROVED BY THE STRUCTURAL ENGINEER.

PRECAST CONCRETE:

PC1 THE DIMENSIONS, LOCATIONS AND PROFILES OF THE PRECAST ELEMENTS, SHALL BE OBTAINED FROM THE RELEVANT ARCHITECTURAL DRAWINGS.

PC2 THE MINIMUM ELEMENT THICKNESS SHALL BE 150mm STRUCTURAL, UNLESS NOTED OTHERWISE. THE DIMENSIONS ARE THE FINAL STRUCTURAL SIZES. ADDITIONAL CONCRETE MUST BE PROVIDED TO ALLOW FOR LOSS OF STRUCTURAL THICKNESS DUE TO ARCHITECTURAL REBATES AND SURFACE TREATMENT.

PC3 THE MINIMUM CONCRETE STRENGTH SHALL BE f'c = 40 MPa, NORMAL WEIGHT, WITH A MINIMUM CEMENT CONTENT OF 330 kg/m3, UNLESS NOTED OTHERWISE. THE PRECAST CONTRACTOR SHALL SUBMIT THE PROPOSED MIX DESIGN FOR REVIEW BY THE ENGINEER. REFER TO THE CONCRETE NOTES.

PC4 CALCIUM CHLORIDE AND OTHER ADMIXTURES WILL NOT BE PERMITTED WITHOUT THE WRITTEN CONSENT OF THE ENGINEER AND THEN ONLY IF THEY ARE WITHIN THE RESTRICTIONS OF AS3600 CLAUSE 4.9.

PC5 ACID ETCHING AND OTHER SURFACE TREATMENTS ARE TO BE SUBMITTED TO THE ENGINEER FOR WRITTEN APPROVAL WITH THE APPROPRIATE METHODS OF APPLICATION. THE MANUFACTURER SHALL OBTAIN THE SPECIFIED FINISH IN ACCORDANCE WITH THE SPECIFICATIONS AND TO THE ARCHITECT'S APPROVAL.

PC6 THE COVER TO THE REINFORCEMENT SHALL BE:
35mm TO THE EXTERNAL FACE.
25mm TO THE INTERNAL FACE.
50mm TO THE EDGES.
THE MINIMUM COVER TO THE VERTICAL BARS SHALL BE 40mm. THE TOLERANCE SHALL BE -0, +5 mm.

PC7 THE REINFORCEMENT IN THE PRECAST ELEMENTS SHALL BE AS DETAILED. FABRIC SHALL BE ONE SHEET WHERE POSSIBLE. IF LAPPING IS REQUIRED IT SHALL BE IN ACCORDANCE WITH AS 3600 CLAUSE 13.2.4. THE SPLICES SHALL NOT OCCUR WITHIN 2000mm OF THE MID SPAN OF THE PRECAST ELEMENT. WHERE TWO LAYERS OF MESH ARE USED, THE SPLICES SHALL BE STAGGERED BY 1000 mm UNLESS OTHERWISE APPROVED BY THE ENGINEER. STEEL REINFORCING MATERIALS FOR CONCRETE SHALL COMPLY WITH AS/NZS 4671. WHERE APPLICABLE, MATERIALS SHALL BE CUT AND BENT IN ACCORDANCE WITH AS 3600, AS 5100 OR AS 2870. ACCEPTABLE MANUFACTURERS AND PROCESSORS OF STEEL REINFORCING AND PRESTRESSING MATERIALS MUST ALSO HOLD A VALID CERTIFICATE OF APPROVAL, ISSUED BY THE AUSTRALIAN CERTIFICATION AUTHORITY FOR REINFORCING STEELS LTD (ACRS). MATERIALS CERTIFIED TO AN ALTERNATIVE SYSTEM SHALL NOT BE USED WITHOUT DEMONSTRATED EQUIVALENCE AND SUBSEQUENT WRITTEN APPROVAL FROM THE SPECIFIER. EVIDENCE OF COMPLIANCE WITH THIS CLAUSE MUST BE OBTAINED WHEN CONTRACT BIDS ARE RECEIVED.

PC8 ALL CAST-IN PLATES, CONNECTION MEMBERS, AND FIXINGS ARE TO BE HOT DIPPED GALVANISED TO AS 1650, OR STAINLESS STEEL, REFER TO DETAILS. PROJECTING REINFORCEMENT FROM PRECAST ELEMENTS FORMING JOINTS IN EXPOSED FINAL CONDITIONS, SHALL BE GALVANISED.

PC9 THE PRECAST CONTRACTOR SHALL SUPPLY AND FIT GALVANISED LIFTING AND ERECTION FERRULES AS REQUIRED TO SUIT THE CALCULATED REQUIREMENTS. THESE FERRULES SHALL NOT BE LOCATED ON EXTERNAL EXPOSED FACES AND AFTER USE SHALL BE PROTECTED TO AVOID CORROSION AND STAINING. ARCHITECTURAL FIXING FERRULES SHALL BE LOCATED TO SUIT THE ARCHITECTURAL DETAILS.

PC10 THE FORMWORK SHALL BE CLEAN AND RIGID ENOUGH TO RESIST THE EFFECTS OF VIBRATION AND MEET THE SURFACE FINISH CLASS REQUIRED. THE FINISH AND COLOUR CONTROL SHALL MEET THE ARCHITECT'S SPECIFICATIONS.

PC11 CONSTRUCTION JOINTS IN PRECAST ELEMENTS ARE NOT PERMITTED. ALL CORBELS TO THE PRECAST ELEMENTS ARE TO BE POURED MONOLITHICALLY WITH THE PANEL. ALL FACES IN CONTACT WITH CAST-INSITU CONCRETE SHALL HAVE ROUGHENED SURFACES TO A DEPTH OF 5mm.

PC12 THE PRECAST ELEMENTS HAVE BEEN DESIGNED FOR THE IN-SERVICE CONDITIONS (i.e. THE LOADS THE ELEMENTS ARE SUBJECTED TO AFTER ERECTION ON SITE). THE CONTRACTOR MUST ASSESS WHETHER ANY ADDITIONAL REINFORCEMENT IS REQUIRED TO SUIT THE PROPOSED METHOD OF HANDLING, TRANSPORTATION AND ERECTION. ANY ADDITIONAL MATERIAL COSTS WILL BE BORNE BY THE PRECAST CONTRACTOR.

PC13 IT IS THE RESPONSIBILITY OF THE PRECAST CONTRACTOR TO DESIGN ALL ELEMENTS FOR THE STRIPPING, LIFTING, STORAGE, TRANSPORTATION AND ERECTION STAGES. THE CONCRETE STRESSES DURING THESE STAGES SHALL NOT CAUSE CRACKING. STACKING SHALL NOT CAUSE WARPING GREATER THAN THE CODE LIMITS. THE CONTRACTOR SHALL SUBMIT DETAILS AND COMPUTATIONS PERFORMED BY A QUALIFIED (NPER-3) ENGINEER EXPERIENCED IN PRECAST CONCRETE TO THE ENGINEER FOR REVIEW. THE LOCATION AND SIZES OF THE INSERTS WITH TESTS PROVING THE INSERT'S CAPACITY SHALL BE INCLUDED.

PC14 THE PRECAST CONTRACTOR SHALL PROVIDE FULLY DETAILED SHOP DRAWINGS OF ALL PRECAST ELEMENTS SHOWING INSERTS, FIXINGS, ANCHORS, BOLTS, FERRULES AND LIFTING DEVICES ETC. THE PRECAST CONTRACTOR AND BUILDER SHALL COORDINATE ADDITIONAL FERRULE LOCATIONS FOR TEMPORARY BRACING OF THE PRECAST ELEMENTS DURING CONSTRUCTION AND ANY OTHER FIXINGS, INSERTS AND OPENINGS REQUIRED BY OTHER TRADES.

PC15 THE CONCRETE STRENGTH AT STRIPPING FROM THE MOULDS SHALL BE DETERMINED BY THE CONTRACTOR BUT SHALL NOT BE LESS THAN f'c = 25 MPa THE PROPOSED CURING METHODS SHALL BE SUBMITTED FOR APPROVAL. THE CURING MUST BE EQUIVALENT TO KEEPING WET FOR SEVEN DAYS.

PC16 SHEAR STUD CONNECTORS SHALL CONFORM WITH AS 2327. WELDING OF THE STUDS SHALL BE IN ACCORDANCE WITH AS1554. THE SHEAR STUDS ARE TO BE DRAWN FROM COLD DRAWN STOCK TO AS 1443 GRADES 1010 TO 1020 WITH A MINIMUM TENSILE STRENGTH AFTER MANUFACTURE OF 410 MPa.

PC17 PACKERS SHALL BE NON FERROUS AND SHALL BE PROVIDED WITH 50mm MINIMUM COVER EXTERNALLY OR WHERE IN VIEW.

PC18 ALL GAPS BETWEEN PRECAST ELEMENTS SHALL BE PROPERLY SEALED PRIOR TO GROUTING THE JOINTS, TO STOP THE GROUT FILLING THE REQUIRED GAPS BETWEEN THE PRECAST AND THE STRUCTURE AND TO AVOID SPOILING THE FACE OF THE PRECAST.

PC19 GROUTING OF DOWELS AND JOINTS SHALL BE DONE WITH A WATERPROOF PRE-PACKED CEMENT-BASED PRODUCT, WHICH SHALL BE MIXED WITH WATER ON SITE TO THE RECOMMENDED CONSISTENCY. THE COMPRESSIVE STRENGTH OF GROUT MUST EXCEED 40 MPa AT 7 DAYS AND 60 MPa AT 28 DAYS, BUT NOT LESS THAN THE CONCRETE STRENGTH OF THE PANEL. THE PRODUCT SHALL BE STORED, HANDLED AND PLACED STRICTLY IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS AND RECOMMENDATIONS. WHERE THE PRECAST ELEMENTS CARRY MORE THAN SEVEN STORIES, MAKE A PROTOTYPE OF THE JOINT USING THE PROPOSED METHOD OF CONSTRUCTION, POUR THE JOINT AND SPLIT THE JOINT AFTER THREE DAYS SO THAT THE GROUTED JOINT CAN BE INVESTIGATED. THE DOWEL BAR NEED NOT BE USED.

PC20 WHERE SITE WELDING OF METAL FIXINGS IS REQUIRED IN EXPOSED AREAS, DEGREASE THE WELDED AREAS, CHIP OR GRIND OFF THE WELD SPATTER, GRIND THE WELD AREA DOWN AND COAT WITH AN APPROVED ZINC RICH PAINT TO THE MANUFACTURE'S RECOMMENDATIONS.

PC21 PROVIDE FIRE RATING TO ALL PRECAST CONNECTIONS TO THE APPROVAL OF THE BUILDING SURVEYOR AND ARCHITECT.

PC22 FOR DETAILS OF FIRE BARRIERS AND WEATHERPROOFING OF JOINTS, REFER ARCHITECTURAL DRAWINGS.

PC23 CLIP ON PRECAST ELEMENTS SHALL NOT BE ERECTED UNTIL ALL PROPS ARE REMOVED FROM THE SUPPORTING FLOOR STRUCTURE.

PC24 NO HOLES SHALL BE CORED AND NO INSERTS SHALL BE "SHOT" OR DRILLED INTO THE PRECAST ELEMENTS WITHOUT THE ENGINEER'S APPROVAL.

PC25 THE CONTRACTOR SHALL SUBMIT WRITTEN EVIDENCE OF DETAILED INSPECTION OF GROUTED JOINTS TO ALL LOAD-BEARING PRECAST CONCRETE ELEMENTS.

STRUCTURAL MASONRY:

M1 ALL BLOCKWORK WALLS SHALL BE CONSTRUCTED IN UNITS WITH A MINIMUM CHARACTERISTIC UNCONFINED COMPRESSIVE STRENGTH f'cu = 15 MPa.
ALL BRICKS SHALL HAVE A MINIMUM CHARACTERISTIC UNCONFINED COMPRESSIVE STRENGTH f'cu = 25 MPa.
THE MAXIMUM UNRESTRAINED FIVE YEAR EXPANSION OF BRICKS SHALL BE 0.7mm/m IN ACCORDANCE WITH NATA REGISTERED TEST BO1.

M2 UNLESS NOTED OTHERWISE THE NOMINAL PROPORTIONS BY VOLUME OF MORTAR SHALL BE CLASS M3 AND HAVE NOMINAL PROPERTIES OF 1 : 1 : 6 OF CEMENT, LIME, SAND. NO PLASTICISERS SHALL BE USED IN THE MIX.

M3 GROUT USED TO FILL CAVITIES AND CORES IN REINFORCED MASONRY SHALL HAVE A MINIMUM 28 COMPRESSIVE STRENGTH f'c OF 20 MPa AND A SLUMP OF 225 ±25mm. MAXIMUM AGGREGATE SHALL BE OF 10mm ROUNDED GRAVEL. NOMINAL PROPORTIONS SHALL BE 1 : 0.1 : 3 : 2 OF CEMENT, LIME, SAND, AGGREGATE AND 3 WITH A MINIMUM CEMENT CONTENT OF 300 kg/m3/ . PROVIDE CLEAN OUT HOLES AT BASE OF PILASTERS AND EVERY CORE OF REINFORCED WALLS. CLEAN OUT AND WET DOWN CORES BEFORE GROUTING. ALL CORES CONTAINING VERTICAL AND HORIZONTAL REINFORCEMENT ARE TO BE GROUTED.

M4 HORIZONTAL JOINT REINFORCEMENT CONSISTING OF GALVANISED WOVEN WIRE MESH OR WELDED WIRE SHALL BE PROVIDED. THE WIDTH SHALL BE SUCH THAT 15mm COVER FROM THE MORTAR FACE IS PROVIDED. THE MESH SHALL BE PLACED IN THE FIRST THREE COURSES AT THE TOP AND BOTTOM OF THE WALL AND AT A MAXIMUM 600 mm VERTICAL SPACING IN BETWEEN, FOR ALL CONCRETE BLOCKWORK, CONCRETE BRICKWORK AND CALCIUM SILICATE BRICKWORK. THE MESH SHALL BE LAPPED 450mm AT SPLICES AND FOLDED AND BENDED AT THE CORNERS SO THAT THE LONGITUDINAL WIRES ARE CONTINUOUS. THE MESH IS STOPPED 100mm SHORT OF CONTROL JOINTS OR ENDS OF WALLS.

M5 FULLY BED FACE SHELLS AND CROSS WEBS IN HOLLOW BLOCK WALLS. SOLID OR CORED UNITS SHALL BE LAID ON A FULL BED OF MORTAR.

M6 HOLLOW BLOCKWORK OPENINGS GREATER THAN 600mm VERTICALLY OR HORIZONTALLY SHALL BE TRIMMED AT THE SIDES AND BOTTOM BY FILLING ONE CORE AND REINFORCED WITH 1N12 EXTENDING 600mm PAST OPENING. THE TOP OF THE OPENING SHALL HAVE A REINFORCED LINTEL BEAM, ARCH BAR OR STEEL ANGLE SUPPORT AS DETAILED.

M7 ALL TIES AND REINFORCEMENT SHALL HAVE MINIMUM CLEAR COVER OF 50mm TO EXTERNAL FACE OF MASONRY. TIES SHALL CONFORM TO AS 2699. ALL TIES SHALL BE BY "CERRA METALWORKS" OR APPROVED EQUIVALENT. THE TIES SHALL BE FIXED TO THE MANUFACTURER'S RECOMMENDATIONS BUT WITH A MINIMUM OF 2 No. RAMSET 3.8mm DIAMETER DRIVE PINS. ALL TIES SHALL BE AT 400mm MAXIMUM CENTRES UNLESS NOTED OTHERWISE.

M8 NO CAVITY OR CORE SHALL BE FILLED TO A HEIGHT GREATER THAN 12OOmm WITHOUT SUITABLE SHORING.

M9 NO CHASES OR HOLES SHALL BE MADE WITHOUT PRIOR APPROVAL OF THE ENGINEER. CONDUITS AND THE LIKE SHALL NOT BE PLACED INSIDE CORES CONTAINING REINFORCEMENT.

M10 VERTICAL JOINTS SHALL BE AT THE LESSER OF 6000mm OR TWICE THE HEIGHT OF THE WALL AND AT THE FOLLOWING LOCATIONS:
- AT MAJOR CHANGES IN WALL HEIGHT
- AT CHANGES IN WALL THICKNESSES OTHER THAN PIERS OR BUTTRESSES
- AT CONTROL JOINTS IN THE ADJACENT STRUCTURAL ELEMENTS
- AT CHASES AND RECESSES FOR PIPING, COLUMNS FIXTURES ETC.
- AT ONE OR BOTH SIDES OF WALL OPENINGS
- NEAR WALL INTERSECTIONS
- NEAR RETURN ANGLES IN L, T AND U SHAPED STRUCTURES
- WHERE SHOWN IN THE ARCHITECTURAL DRAWINGS
THE CONTRACTOR IS TO OBTAIN APPROVED DRAWINGS SHOWING THE CONTROL JOINTS PRIOR TO BUILDING ANY WALLS.

M11 ALL INTERSECTIONS THAT DON'T HAVE A CONTROL JOINT SHALL BE OF BONDED CONSTRUCTION OR TIED WITH HEAVY DUTY TIES AT 400mm MAXIMUM VERTICAL CENTRES.

M12 ALL CAVITY WALLS ARE TO BE CONSTRUCTED USING MEDIUM DUTY MASONRY TIES AT 600mm MAXIMUM CENTRES BOTH WAYS AND 300mm AVERAGE CENTRES EACH SIDE OF OPENINGS. THE TIES SHALL BE EMBEDDED 50mm MINIMUM INTO EACH LEAF, WITH A 30mm COVER TO THE EXPOSED FACES.

M13 WHERE A CONCRETE SLAB IS SUPPORTED ON MASONRY WALLS, THE TOP COURSE OF BLOCKS SHALL BE SOLID OR HOLLOW BLOCKS WITH CAVITIES FILLED TO A SMOOTH SURFACE OR A REINFORCED BOND BEAM. IN THE CASE OF BRICKS THE UPPER COURSE SHALL BE FROGS DOWN, OR HOLES FILLED WITH MORTAR TO A SMOOTH SURFACE. FOR NON-LOAD BEARING WALLS, LEAVE A 20mm GAP TO THE UNDERSIDE OF THE STRUCTURE.

M14 BONDING SHALL BE STRETCHER BOND UNLESS NOTED OTHERWISE.

M15 WHEN CONSTRUCTING MASONRY WALLS ON SUSPENDED SLABS, ALL MASONRY UNITS SHALL BE STACKED NEAR THE FINAL LOCATION BEFORE BUILDING THE WALL. THE SUPPORTING ELEMENT MUST NOT BE PROPPED AND MUST HAVE ACHIEVED ITS DESIGN STRENGTH.

M16 FOR AREAS OF THE STRUCTURAL FLOOR SYSTEM WHICH SUPPORT MASONRY WALLS/ PARTITIONS OR OTHER SENSITIVE ATTACHMENTS AT THE TIME OF THE INITIAL DESIGN, THE FLOOR SYSTEM HAS BEEN DESIGNED FOR NOT LESS THAN THE REQUIREMENTS OF AS 3600 TABLE 2.4.2 " WHERE PROVISION IS MADE TO MINIMISE THE EFFECT OF MOVEMENT".

M17 GENERIC JOINT DETAILS ARE INDICATED ON THESE DRAWINGS FOR INFORMATION, BUT IT IS THE ARCHITECT'S RESPONSIBILITY TO IDENTIFY JOINT LOCATIONS AND TYPES WHERE APPROPRIATE ON ARCHITECTURAL DRAWINGS, AND TO PROVIDE DETAILS OF NON-STANDARD ELEMENTS TO ACCOMMODATE ANTICIPATED MOVEMENTS.

M18 OBSERVATION OF CONSTRUCTION OF NON-LOAD BEARING MASONRY WALLS/PARTITIONS AND OTHER NON-LOAD BEARING ELEMENTS IS NOT INCLUDED IN THE STRUCTURAL ENGINEER'S SCOPE OF WORKS.

M19 STACKING OF BLOCKWORK:
GENERALLY, ON SUSPENDED SLABS AND SLABS ON GROUND, BLOCKS SHALL BE STACKED ONE PALLET HIGH (MAXIMUM PALLET MASS 1300kg) WITH 1200mm CLEARANCE BETWEEN ADJACENT PALLETS ON ALL SIDES. THE WEIGHT OF STACKED BLOCKS SHALL NOT EXCEED THE DESIGN LIVE LOAD FOR THE FLOOR. REFER PLANS FOR DESIGN LOADS.

AUTOCLAVED AERATED CONCRETE BLOCKWORK:

A1 WHERE SPECIFIED, ALL BLOCKS ARE TO CONSIST OF THERMOBLOCK GRADE 1 BLOCKS.

A2 INSTALLATION OF ALL AAC WALLS SHALL BE IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND SPECIFICATION.

A3 ATTACHMENT OF FIXINGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATION.

A4 WHERE AAC BLOCKWORK IS CONSTRUCTED ADJACENT TO PRECAST / CONCRETE BLOCKWORK OR CONCRETE SLABS THEY SHALL BE FIXED IN ACCORDANCE TO MANUFACTURERS RECOMMENDATIONS. THE MINIMUM REQUIREMENTS SHALL BE AS PER THE TYPICAL BLOCKWORK DETAILS WITH TIES AT 600mm MAX. CTRS INTERNALLY AND AT 400mm MAX. CTRS EXTERNALLY

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
E	ISSUED FOR INFORMATION ONLY	25.03.11	RT	NAA
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	25.02.18	RM	JT
C	ISSUED FOR INFORMATION ONLY (DD 30%)	25.01.17	RM	JT
B	ISSUED FOR INFORMATION ONLY	24.08.05	RM	JT
A	ISSUED FOR INFORMATION ONLY	24.05.15	RM	JT

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Project:
849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.

Developer:
Billbergia creating communities®

Contractor:

Architect :
pbd architects

Design Consultant:
CADIGAL GROUP
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Drawing Title:
SPECIFICATION NOTES -SH1

STRUCTURAL DRAWINGS

Designed: NAA	Project Director Approved		Date	North
Drawn: RT	JT		04/12/24	
Scale	Project Ref.		Drawing No.	Rev
Sheet A1	01-100084		S00010	E

NON DECLARED DESIGN				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.				
PROJECT TITLE: CHADSWOOD				
CONSENT No.:			BODY CORP REG TAG:	
DRAWING TITLE: SPECIFICATION NOTES - SH2			DA-No: S00011	
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO

DESIGN CRITERIA NOTES:

DC1. THE SUPERIMPOSED DEAD AND LIVE LOADS SHALL BE CALCULATED IN ACCORDANCE WITH AS1170.1 AND AS1170.0. REFER TO THE GENERAL ARRANGEMENT DRAWINGS FOR SPECIFIC LOAD CRITERIA.

DC2. THE WIND LOADS SHALL BE CALCULATED IN ACCORDANCE WITH AS1170.2 AND AS1170.0. THE FOLLOWING CRITERIA APPLY:

TERRAIN CATEGORY	3
PROBABILITY OF EXCEEDANCE	1/1000
REGION	A2

DC3. THE EARTHQUAKE LOADING SHALL BE CALCULATED IN ACCORDANCE WITH AS1170.4. THE FOLLOWING CRITERIA APPLY:

IMPORTANCE LEVEL	3
PROBABILITY OF EXCEEDANCE	1/1000
PROBABILITY FACTOR	1.3
HAZARD FACTOR	0.08
SITE SUBSOIL CLASS	Ce
EARTHQUAKE DESIGN CATEGORY	III

DC4. THE MINIMUM LATERAL RESISTANCE LOAD OF 2.5% OF (G# c Q) FOR EACH LEVEL, SHALL BE APPLIED SIMULTANEOUSLY AT EACH LEVEL FOR A GIVEN DIRECTION, IN ACCORDANCE WITH AS1170.0.

DC5. THE CADIGAL GROUP PTY STRUCTURAL DESIGN BASIS RECORD SHALL FORM PART OF THE DESIGN CRITERIA FOR ANY PROJECT ASSOCIATED DESIGN COMPLETED AND IS AVAILABLE UPON REQUEST.

DC6. THE GENERAL DEFLECTION LIMITS ARE AS FOLLOWS:

ELEMENT	SERVICEABILITY PARAMETER	ELEMENT RESPONSE
TOTAL DEFLECTION	MIDSPAN	SPAN / 250
TOTAL DEFLECTION	CANTILEVER	SPAN / 125
MEMBERS SUPPORTING BRITTLE PARTITIONS	MIDSPAN (AFTER ADDITION OF PARTITIONS)	SPAN / 500
MEMBERS SUPPORTING BRITTLE PARTITIONS	CANTILEVER (AFTER ADDITION OF PARTITIONS)	SPAN / 250
WIND LOAD STEEL BUILDING WITH BRITTLE (MASONRY) FINISHES	DEFLECTION AT TOP	HEIGHT / 240
WIND LOAD BUILDING CLAD IN STEEL / ALUMINIUM (NO BRITTLE INTERNAL FINISHES)	DEFLECTION AT TOP	HEIGHT / 150
WIND LOAD MULTISTOREY CONCRETE BUILDING SWAY	DEFLECTION AT TOP	HEIGHT / 600
HORIZONTAL DEFLECTION OF HANDRAIL HORIZONTALS	MIDSPAN	SPAN / 240
HORIZONTAL DEFLECTION OF HANDRAIL STANCHIONS	DEFLECTION AT TOP	HEIGHT / 60
GLAZING SUPPORT FRAME	MIDSPAN	MAX OF SPAN / 240 OR 20mm
GLAZING SYSTEM (BOWING)	MIDSPAN	SPAN / 400

DESIGN FOR SAFER WORKPLACES:

DS1. THIS PROPOSED BUILDING OR STRUCTURE, OR PART OF IT, HAS BEEN DESIGNED TO BE USED AS A WORKPLACE UNDER THE COMMON DEFINITION OF THE RESPECTIVE OHS ACT.

DS2. THE ABOVE HAS BEEN DETERMINED VIA ARCHITECTURAL DRAWINGS. REFER TO THE ARCHITECTURAL DRAWINGS FOR ALL WALKWAY, BALUSTRADE AND ACCESS SYSTEM DETAILS.

DS3. THE PURPOSE, OR FORESEEABLE PURPOSE OF THE PROPOSED BUILDING / STRUCTURE IS A MIXED-USE DEVELOPMENT.

DS4. THE BELOW TABLE IS PROVIDED TO THE CLIENT FOR THEIR RECORDS. THE RISKS IDENTIFIED ARE CURRENT AT THE TIME THIS DOCUMENT WAS CREATED, WITH WHAT INFORMATION WAS AVAILABLE. THE CLIENT MAY WISH TO SEEK FURTHER ADVICE FROM CADIGAL GROUP OR A SPECIALIST OHS PROFESSIONAL ON HOW TO FURTHER REDUCE THEIR RESIDUAL RISKS.

DS5. ALL FALL ARREST AND FALL RESTRAINT SYSTEMS SHALL BE DESIGNED, DOCUMENTED AND CERTIFIED BY THE CONTRACTOR. THE CONTRACTOR SHALL ALLOW PROVISION OF ADDITIONAL SUPPORT STRUCTURE FOR ALL CONNECTION POINTS OF THE FALL ARREST OR RESTRAINT SYSTEM.

HAZARD CATEGORY	HAZARD / ISSUES IDENTIFIED	IDENTIFIED LEVEL OF RISK (MEDIUM / HIGH)	RISK CONTROL MEASURES	RESIDUAL RISKS
SITING	CHANGES IN LEVEL	LOW (TRIP HAZARD)	BCA REQUIREMENT REFER ARCHITECT DRAWINGS FOR STEP TREATMENT	NONE
HIGH CONSEQUENCE	NONE	N / A	N / A	N / A
SYSTEM OF WORK	ROOF / CEILING MOUNTED SERVICE ACCESS FACADE ACCESS GUTTER ROOF MAINTENANCE	MEDIUM (FALL)	BCA REQUIREMENT REFER ARCHITECT DRAWINGS FOR ALL ACCESS SYSTEMS	CLIENT TO MAINTAIN ALL ACCESS SYSTEMS
INCIDENT MITIGATION	NONE	N / A	N / A	N / A

SITE SUPERVISION AND INSPECTION NOTES:

SI1. THE CONTRACTOR SHALL ENSURE A SUITIBLY QUALIFIED, REGISTERED BUILDING PRACTITIONER CARRIES OUT ALL THE REQUIRED INSPECTIONS, AS SPECIFIED BY THE BUILDING SURVEYOR, TO ENABLE IT TO PROVIDE A CERTIFICATE OF COMPLIANCE - CONSTRUCTION AT THE CONCLUSION OF THE WORKS.

SI2. CADIGAL GROUP PTY LTD HAVE ALLOWED FOR STRUCTURAL INSPECTIONS TO SATISFY OUR PROFESSIONAL OBLIGATIONS IN ASSISTING THE CONTRACTOR TO FOLLOW THE DESIGN INTENT OF OUR DOCUMENTS BUT NOT NECESSARILY TO INSPECT ALL ELEMENTS.

SI3. THE CONTRACTOR SHALL GIVE A MINIMUM OF TWO (2) WORKING DAYS NOTICE PRIOR TO INSPECTIONS BEING REQUIRED. SCHEDULED INSPECTIONS SHOULD BE CANCELLED A MINIMUM OF FOUR (4) WORKING HOURS PRIOR TO THE SCHEDULED TIME IF WORK WILL NOT BE READY FOR INSPECTION.

IF AN AREA OF WORK IS NOT COMPLETED AT THE SCHEDULED TIME OF INSPECTION, OR IT IS DEFECTIVE AND REQUIRES RE-INSPECTION, THE RE-INSPECTION SHALL BE AT THE CONTRACTORS EXPENSE.

INSPECTION TIMES SHALL BE BETWEEN THE ENGINEERS WORKING HOURS OF 9AM TO 4PM MONDAY TO FRIDAY (EXCLUDING PUBLIC HOLIDAYS). GENERALLY NO INSPECTIONS SHALL BE CARRIED OUT ON SATURDAYS, SUNDAYS OR PUBLIC HOLIDAYS EXCEPT IN EMERGENCY SITUATIONS AND BY SPECIAL BOOKING ARRANGEMENTS (INCLUDING PROVISION FOR ADDITIONAL FEES FOR THE ENGINEER).

SI4. THE CONTRACTOR SHALL ALLOW IN THEIR PROGRAMME A MINIMUM PERIOD OF TEN (10) WORKING DAYS FROM RECEIPT OF THE SHOP DRAWINGS BY THE ENGINEER TO APPROVAL OF THE DRAWINGS.

UNLESS OTHERWISE ARRANGED, THE DRAWINGS SHALL BE SUBMITTED PROGRESSIVELY IN COMPLETED PACKAGES (RELATING TO MARKING PLANS) SO AS TO ALLOW THE ENGINEER TO CHECK THE DRAWINGS IN A TIMELY MANNER.

WATERPROOFING:

1. REFER TO ARCHITECTS DOCUMENTATION FOR WATERPROOFING DETAILS AND PRODUCT SPECIFICATIONS GENERALLY.
2. WHILE THE SELECTION AND DETAILING OF WATERPROOFING PRODUCTS IS OUTSIDE THE SCOPE OF THE STRUCTURAL DOCUMENTATION, THE FOLLOWING ITEMS MUST BE NOTED:

(i) REINFORCED CONCRETE AND REINFORCED CONCRETE BLOCKWORK ON THEIR OWN ARE NOT WATERPROOF.

(ii) CADIGAL GROUP RECOMMENDS WATERPROOFING MEASURES FOR ALL EXTERNAL SLABS OVER USABLE SPACES AND EXTERNAL SINGLE SKIN MASONRY.

(iii) FAILURE TO PROVIDE WATERPROOFING, OR INADEQUATE WATERPROOFING MEASURES MAY RESULT IN LEAKS.

(iv) PROLONGED LEAKS CAN LEAD TO PREMATURE DETERIORATION OF STRUCTURAL ELEMENTS.

(v) WATER LEAKING THROUGH CONCRETE STRUCTURES TYPICALLY CONTAINS CALCIUM WHICH CAN DAMAGE PAINTWORK.

REINFORCEMENT:

1. REINFORCEMENT IS TO BE IN ACCORDANCE WITH THE AS/NZS4671 AND TO BE FIXED AS SHOWN ON THE DRAWINGS.

MATERIAL IS INDICATED BY THE FOLLOWING SYMBOLS:

N- HOT ROLLED RIBBED REBAR (500 MPa)
R - HOT ROLLED PLAIN ROUND (250 MPa)
SL - SQUARE MESH
RL - RECTANGULAR MESH
TM - TRENCH MESH

THE BAR SIZE IS INDICATED BY A NUMBER AFTER THE ABOVE SYMBOL, WHICH INDICATES THE BAR DIAMETER IN MILLIMETRES.

2. CONCRETE STRENGTHS TO CONCRETE ELEMENTS AND LAP LENGTHS TO REINFORCEMENT BARS IN SLABS AND BEAMS IS TO BE AS NOTED ON THE RELEVANT DRAWINGS. IF RELEVANT INFORMATION IS NOT SUPPLIED THE CONTRACTOR IS TO CONTACT THE ENGINEER IMMEDIATELY.
3. COVER TO BE MAINTAINED DURING POURING BY USE OF PLASTIC TIPPED METAL CHAIRS, PLASTIC CHAIRS AND/OR MORTAR BLOCKS. COVER SHALL BE AS NOTED ON DRAWINGS. CHAIRING SHALL BE SPACED SUCH THAT THE FOLLOWING TOLERANCES ARE ACHIEVED DURING CONCRETE POUR

ABOVE GROUND - +10 mm/-5 mm
BELOW GROUND - +40 mm/-20 mm

4. SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN THE POSITION SHOWN. WRITTEN APPROVAL BY THE STRUCTURAL ENGINEER SHALL BE OBTAINED FOR ANY OTHER SPLICES.
5. WELDING OF REINFORCEMENT WILL BE PERMITTED ONLY AFTER APPROVAL BY THE STRUCTURAL ENGINEER.
6. REINFORCEMENT SHALL BE BENT COLD IN ACCORDANCE WITH AS3600 EXCEPT WHERE APPROVED BY THE STRUCTURAL ENGINEER. NO RE-BENDING SHALL BE PERMITTED UNLESS APPROVED BY THE STRUCTURAL ENGINEER.
7. ALL REINFORCEMENT SHALL BE SECURELY SUPPORTED IN ITS CORRECT POSITION DURING CONCRETING BY APPROVED PLASTIC BAR CHAIRS U.N.O. MAXIMUM CENTRES OF SUPPORTING CHAIRS SHALL BE 600mm FOR FABRIC, 600mm FOR BARS UP TO 12mm DIAMETER, 900mm FOR BARS 16mm AND GREATER.
8. ALL OPENINGS AND RE-ENTRANT CORNERS IN THE CONCRETE SHALL HAVE 2-N12 BARS x 1200 LONG TOP AND BOTTOM, CENTRED DIAGONALLY ACROSS THE CORNER.

ANCHORAGE / SPLICE LENGTH TABLE

SPLICE LENGTHS OF TENSION BARS IN SLABS AND BEAMS (mm)

BAR SIZE	LESS THAN 300mm OF CONCRETE BELOW BAR OR VERTICAL BAR				MORE THAN 300mm OF CONCRETE BELOW BAR			
	CONCRETE GRADE							
	N32		>=N40		N32		>=N40	
	SLAB	BEAM SLAB		BEAM	SLAB	BEAM	SLAB	BEAM
N10	400	400	400	400	500	450	500	400
N12	500	500	500	500	650	550	600	500
N16	750	650	700	650	1000	850	900	750
N20	1000	900	900	800	1300	1150	1150	1050
N24	1250	1150	1100	1050	1600	1500	1450	1350
N28	1500	1450	1350	1300	2000	1900	1750	1700
N32	1800	1750	1600	1600	2300	2300	2050	2050
N36	2100	2100	1900	1900	2700	2700	2400	2400
APPROXIMATE SPLICE RULE	55 db		50 db		75 db		65 db	
APPROXIMATE ANCHORAGE RULE	45 db		40 db		60 db		55 db	

1. THESE LENGTHS APPLY FOR ALL BARS IN BEAMS AND SLABS.
2. THE MINIMUM COVER TO THE BAR UNDER CONSIDERATION IS TO BE THE GREATER OF 20MM FOR SLABS, 35MM FOR BEAMS, OR THE BAR DIAMETER.
3. THE CLEAR SPACING BETWEEN SPLICED BARS MUST BE LESS THAN ONE BAR DIAMETER.
4. FOR HSC CONCRETE, MULTIPLY THE LENGTHS OF N32 CONCRETE BY 1.4.
5. UNLESS SHOWN ON THE DRAWINGS THE SPLICE LOCATIONS MUST BE APPROVED BY THE ENGINEER.
6. FOR ANCHORAGE LENGTHS OF BARS, MULTIPLY THE SPLICE LENGTHS BY 0.8
7. DB DENOTES BAR DIAMETER .
8. THE MINIMUM CLEAR SPACING OF BARS TO BE 120MM.

PILE SPLICES AND ANCHORAGES

THE PILE SPLICE LENGTH MAY BE REDUCED FROM 40 TO 32 BAR DIAMETER AND THE ANCHORAGE LENGTH MAY BE REDUCED FROM 22 TO 16.5 BAR DIAMETER , IF THE FOLLOWING TIES AND SPACINGS OCCUR WITHIN THE ANCHORAGE AND SPLICE LENGTHS.

LONGITUDINAL BAR SIZE (mm)	MINIMUM LIGATURE SIZE (mm)	MINIMUM LIGATURE SIZE (mm)	LAP LENGTH (mm)	ANCHORAGE LENGTH
20	10	250	650	350
24	10	170	800	400
24	12	240	800	400
28	10	120	900	500
28	12	170	900	500
32	12	130	1050	550
32	16	250	1050	550
36	12	100	1150	600
36	16	190	1150	600

FORMWORK:

1. FORMWORK SHALL BE DESIGNED BY A REGISTERED ENGINEER ENGAGED BY THE FORMWORK CONTRACTOR AND ERECTED IN ACCORDANCE WITH AS3610-1995 AND AS3610.1-2010.
2. MINIMUM DESIGN LOADS FOR THE FORMWORK SHALL INCLUDE AT LEAST THE FOLLOWING:

(a) THE WEIGHT OF CONCRETE DURING PLACING, PLUS AN ALLOWANCE FOR REINFORCING,
(b) LIVE LOADING OF 1.0 kPa GENERALLY, OR 3.0 kPa CONCENTRATED LOAD OVER AN AREA OF 1.6 m^2, WHICHEVER IS MORE SEVERE,
(c) A LOADING OF 4.0 kPa FROM STACKED MATERIALS.

3. MINIMUM STRIPPING TIMES ARE TO COMPLY WITH AS3610-1995, TABLE 5.4.1.
4. BACKPROPPING SHALL BE DESIGNED BY A REGISTERED ENGINEER ENGAGED BY THE FORMWORK CONTRACTOR TAKING INTO ACCOUNT THE VARIATION IN THE STRENGTH OF THE CONCRETE WITH AGE, THE DESIGN LOADINGS FOR THE SLABS, AND THE CONSTRUCTION CYCLE.
5. DESIGN LOADS FOR THE PERMANENT STRUCTURE ARE AS NOTED ON THE DRAWINGS AND CARE SHALL BE TAKEN TO ENSURE THAT THE DESIGN LOADS ARE NOT EXCEEDED DURING CASTING OF CONCRETE OR BY STACKED CONSTRUCTION MATERIALS.
6. PRECAMBER SHALL BE PROVIDED IN SLABS WHERE NOTED ON THE DRAWINGS.
7. THE CONTRACTOR SHALL SUBMIT THE PROPOSED POURING SEQUENCE TO THE ENGINEER FOR APPROVAL.

CHEMICAL & MECHANICAL ANCHORS:

1. "CHEMSET" DENOTES RAMSET GRADE 5.8 HOT DIPPED GALV. STUDS FIXED WITH RAMSET CHEMSET REO 502 WITH THE FOLLOWING MINIMUM EMBEDMENTS:

M12 CHEMSETS - 110mm EMBEDMENT U.N.O.
(MIN EDGE DISTANCE - 175)

M16 CHEMSETS - 125mm EMBEDMENT U.N.O.
(MIN EDGE DISTANCE - 190)

M20 CHEMSETS - 150mm EMBEDMENT U.N.O.
(MIN EDGE DISTANCE - 255)

M24 CHEMSETS - 160mm EMBEDMENT U.N.O.
(MIN EDGE DISTANCE - 315)

2. "CHEMSET MAXIMA CAPSULES" DENOTES RAMSET CHEMSET MAXIMA SPIN CAPSULES WITH STUDS AND EMBEDMENTS AS DEFINED IN NOTE 1.
3. "TRUBOLTS" DENOTES RAMSET TRUBOLT HOT DIPPED GALV. STUD ANCHORS WITH THE FOLLOWING MINIMUM EMBEDMENTS WITH MIN. EDGE DISTANCE OF 300mm:

M12 TRUBOLTS - 80mm EMBEDMENT U.N.O.
M16 TRUBOLTS - 110mm EMBEDMENT U.N.O.
M20 TRUBOLTS - 135mm EMBEDMENT U.N.O.

4. "CHEMSET 101 ANCHORS" DENOTES RAMSET GRADE 5.8 HOT DIPPED GALV. STUDS, FIXED WITH AN EFFECTIVE DEPTH OF 70mm INTO EXTRUDED BRICK OR HOLLOW CONCRETE BLOCK, USING THE MANUFACTURER'S SLEEVES/SIEVES AND RAMSET CHEMSET INJECTION 101.
5. ALL ANCHORS ARE TO BE FIXED IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN RECOMMENDATIONS.
6. REINFORCEMENT BARS FIXED INTO CONCRETE USING RAMSET CHEMSET REO 502 EPOXY ARE TO HAVE THE FOLLOWING MINIMUM EMBEDMENTS:

N12 (500 MPa) BARS - 110mm EMBEDMENT U.N.O.
(MIN EDGE DISTANCE - 175)

N16 (500 MPa) BARS - 125mm EMBEDMENT U.N.O.
(MIN EDGE DISTANCE - 190)

N20 (500 MPa) BARS - 175mm EMBEDMENT U.N.O.
(MIN EDGE DISTANCE - 255)

N24 (500 MPa) BARS - 400mm EMBEDMENT U.N.O.
(MIN EDGE DISTANCE - 315)

N GRADE BAR DIAMETERS GREATER THAN THE ABOVE ARE TO BE REFERRED TO THE STRUCTURAL ENGINEER FOR ASSESSMENT. MINIMUM EDGE DISTANCE FOR ALL EPOXIED BARS TO BE 150mm UNO.

STEELWORK:

1.(a) FABRICATE & ERECT THE STRUCTURAL STEELWORK IN ACCORDANCE WITH CURRENT REVISIONS OF AS4100, AS1554 PARTS 1 & 2, AND AS1101 PART 3.

(b) AT LEAST 7 BUSINESS DAYS BEFORE FABRICATION COMMENCES, THE CONTRACTOR SHALL SUBMIT TWO COPIES OF SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL OF THE GENERAL ARRANGEMENT OF STRUCTURAL ELEMENTS.

(c) ALL DIMENSIONS RELEVANT TO SETTING OUT AND SITE WORK ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO WORK COMMENCING.

(d) DO NOT SCALE DRAWINGS.

(e) UNLESS NOTED OTHERWISE :-
(i) ALL BOLTS SHALL BE M20 8.8/S.
(ii) INSTALL ALL BOLTS IN ACCORDANCE WITH AS4100.
(iii) CONNECTION & STIFFENER PLATES SHALL BE 10mm THICK.
(iv) ALL WELDS TO BE 6 mm CONTINUOUS FILLET WELDS. MADE WITH E48XX MILD STEEL ELECTRODES.
(v) UNLESS NOTED OTHERWISE ALL STRUCTURAL STEEL SHALL BE :-
GRADE 250 HOT ROLLED PLATES & FLATS.
GRADE 300 PLUS UB, UC, PFC, TFB, EA & UA.
GRADE 300 WB, WC.
GRADE 350 RHS, SHS & CHS.

(f) TEMPORARY BRACING TO BE PROVIDED IN ACCORDANCE WITH AS4100.
(g) CHIP ALL WELDS FREE OF SLAG.
(h) UNLESS NOTED OTHERWISE, ALL STEELWORK SHALL BE PREPARED, PRIMED AND PAINTED IN ACCORDANCE WITH THE SPECIFICATION. ALL EXTERNAL STEELWORK TO BE HOT DIP GALVANISED.

(i) UNLESS NOTED OTHERWISE, ALL HOLDING DOWN BOLTS TO BE M20 H.D. BOLTS HOT DIP GALVANISED.

2. THE CONTRACTOR SHALL IDENTIFY SAFE WORKING PRACTICES FOR THE ERECTION OF STRUCTURAL STEEL AND INCORPORATE THEM INTO THE WORKPLACE HEALTH AND SAFETY PLAN FOR THE PROJECT. THE WORKING PRACTICES IDENTIFIED SHALL COVER AT LEAST THE FOLLOWING ITEMS:

(a) HANDLING, LIFTING, STORAGE, STACKING AND TRANSPORTATION OF STEEL COMPONENTS.
(b) SAFE ACCESS FOR ERECTION.
(c) THE ERECTION SEQUENCE.

3. ERECTION TOLERANCES FOR STRUCTURAL STEELWORK AS PER AS4100.
4. ALL BOLTS, NUTS, WASHERS AND OTHER FASTENERS SHALL COMPLY WITH THE CURRENT EDITIONS OF THE FOLLOWING STANDARDS, AS APPROPRIATE: AS/NZS1110, AS/NZS1111, AS/NZS1112, AS/NZS1252, AS1275, AS/NZS1559 AND AS4291.
5. FOR GRADE 8.8 BOLTS, COPIES OF MANUFACTURER'S TEST CERTIFICATES & STATEMENTS OF COMPLIANCE BASED ON LOCAL NATA ACCREDITED TESTING TO THE CURRENT AUSTRALIAN STANDARDS SPECIFIC TO THE BATCH OF BOLTS BEING USED SHALL BE PROVIDED TO THE ENGINEER.
6. WHERE FABRICATION INVOLVES FULL PENETRATION BUTT WELDS, THE FABRICATOR SHALL CARRY OUT NON-DESTRUCTIVE TESTING BY ULTRASONIC, RADIOGRAPHIC OR OTHER METHODS APPROVED BY THE ENGINEER. NON-DESTRUCTIVE TESTING SHALL BE CARRIED OUT AT A RATE IN ACCORDANCE WITH AS1554 PART 1, BUT SHALL BE NOT LESS THAN 5% OF BUTT WELDS, UNLESS NOTED OTHERWISE ON THE DRAWINGS. ACCEPTANCE OF WELDS SHALL BE IN ACCORDANCE WITH SECTION 6 OF AS1554 PART 1.
7. COLD FORMED SECTIONS SHALL BE WELDED WHERE REQUIRED WITH A 2mm CONTINUOUS FILLET WELD USING AN E70 OR E80 LOW HYDROGEN COATED ELECTRODE OR MIG. EQUIVALENT. ALL WELDS SHALL BE TOUCHED UP WITH AN APPROVED ZINC RICH PRIMER.
8. BOLT TYPES (AND DESIGNATIONS, WHERE USED) SHALL BE AS FOLLOWS:

• 4.6/S - COMMERCIAL BOLTS TO AS1111 AND AS1112 SNUG TIGHTENED.

• 8.8/S - HIGH STRENGTH STRUCTURAL BOLTS, NUTS AND HARDENED WASHERS TO AS1252, SNUG TIGHTENED.

• 8.8/TF - HIGH STRENGTH STRUCTURAL BOLTS AS ABOVE, FULLY TENSIONED TO AS1511 IN FRICTION TYPE JOINT AND UNLESS NOTED OTHERWISE, WITH CONTACT SURFACE LEFT UNCOATED.

• 8.8/TB - HIGH STRENGTH STRUCTURAL BOLTS AS ABOVE, FULLY TENSIONED IN BEARING TYPE JOINT.

9. ALL BOLTS, NUTS AND WASHERS INCLUDING H.D. BOLTS ARE TO BE HOT DIP GALVANISED. ALL CAST IN FERRULES AND MASONRY ANCHORS TO BE PASSIVATED ZINC COATED. ALL GALVANISED COMPONENTS TO BE CAST INTO CONCRETE MUST BE PASSIVATED.
10. THE FOLLOWING STEELWORK SHALL BE HOT DIP GALVANISED:

• PLATE/ANCHOR ROD ASSEMBLIES CAST INTO CONCRETE.
• ALL MEMBERS BUILT INTO BLOCKWORK OR BRICKWORK.
• ALL EXTERNAL EXPOSED STEELWORK.

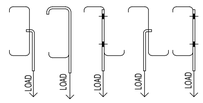
11. ALL STRUCTURAL STEEL FIXING DETAILS ARE TO BE BASED ON A.S.I. STANDARDISED STRUCTURAL CONNECTIONS, UNLESS NOTED OTHERWISE.

• ALL BOLT HOLES 2mm OVERSIZE U.N.O.
• HOLES FOR H.D. BOLTS 6mm OVERSIZE U.N.O. OVERSIZE HOLES FOR H.D. BOLTS WILL REQUIRE OVER SIZE WASHERS UNDER NUTS.
• BOLT HOLES IN STEELWORK CONNECTING TIMBER SHALL PROVIDE A SNUG FIT, i.e. NO GREATER THAN 0.5 mm LARGER THAN BOLT DIA.

12. STIFFENER PLATES WHERE DETAILED ARE TO BE PLACED ON BOTH SIDES OF WEB TO U.B.'S AND U.C.'S.
13. THE ENDS OF ALL TUBULAR MEMBERS ARE TO BE SEALED WITH 6mm THICK PLATES AND CONTINUOUS SEAL WELDS, UNLESS DETAILED OTHERWISE.
14. CLEANING AND PAINTING OF STRUCTURAL STEELWORK:

ABRASIVE BLAST CLEAN TO CLASS 2 AND 1/2.
ONE COAT PRIMER (GREY) MINIMUM DRY FILM THICKNESS OF 0.05 mm.
ONE COAT OF (SELECTED COLOUR) TO A DRY FILM THICKNESS OF 0.04 mm.
ASPECTS OF THE PREPARATION AND APPLICATION OF THE PAINT SYSTEM ARE TO BE CARRIED OUT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S WRITTEN SPECIFICATION.

15. THE CONTRACTOR SHALL PROVIDE TEMPORARY BRACING AND LEAVE IN PLACE UNTIL PERMANENT BRACING ELEMENTS ARE CONSTRUCTED. SUCH TEMPORARY BRACING AS IS NECESSARY TO STABILISE THE STRUCTURE DURING ERECTION.
16. ALL FLOOR JOISTS USED TO SUPPORT CEILINGS, PIPES, MECHANICAL DUCTS ETC. SHALL BE SUPPORTED USING ONLY THE METHODS SHOWN IN THE DIAGRAMS BELOW:



IF IN DOUBT, OBTAIN APPROVAL FROM THE ENGINEER PRIOR TO PROCEEDING WITH ANY WORKS.

ALTERATIONS AND ADDITIONS:

1. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT.
2. ALL DISCREPANCIES SHALL BE REFERRED TO THE ARCHITECT FOR DECISION BEFORE PROCEEDING WITH THE WORK.
3. THE WORK SHOWN ON THESE DRAWINGS IS BASED ON INFORMATION DERIVED FROM AN INSPECTION OF THE EXISTING BUILDING. ON OPENING UP, SHOULD THE BUILDER ASCERTAIN THAT CONDITIONS ARE NOT AS HAVE BEEN ASSUMED, HE SHALL INFORM THE CONSULTING ENGINEER AND OBTAIN INSTRUCTIONS BEFORE PROCEEDING FURTHER.
4. THE BUILDER SHALL BE RESPONSIBLE AT ALL TIMES FOR MAINTAINING THE BUILDING IN A STABLE AND SAFE CONDITION. DETAILS OF PROPOSED TEMPORARY WORKS, METHODS AND PROCEDURES SHALL BE SUBMITTED TO THE CONSULTING ENGINEER FOR APPROVAL PRIOR TO COMMENCING WORK.
5. THE BUILDER SHALL SECURELY NEEDLE, TOM, PROP AND BRACE ALL EXISTING BRICKWORK, BEAMS AND OTHER STRUCTURE AS NECESSARY TO PREVENT ANY MOVEMENT AND TO ENSURE SAFETY OF PERSONS DURING BUILDING OPERATIONS.
6. TOMMING AND PROPPING OF THIS STRUCTURE SHALL BE DETERMINED BY A CHARTERED STRUCTURAL ENGINEER TO THE APPROVAL OF THE ENGINEER.
7. NEW BEAMS INCLUDED TO PROVIDE SUPPORT TO EXISTING BRICKWORK OR SLAB SHALL BE WEDGED DOWN FROM THAT BRICKWORK OR SLAB AFTER SECURELY BEDDING AT ENDS AND GROUTING UP ACCORDINGLY.
8. WEDGES TO BE OF MILD STEEL AND POSITIONED AT 1200mm MAXIMUM CENTRES. WHEN IN FINAL POSITION WEDGES TO BE SPOT WELDED TO BEAM TO AVOID MOVEMENT DURING GROUTING PROCESS.
9. CONTRACTOR IS TO ALLOW TO FIRE RATE ALL EXISTING (INCLUDING REPLACEMENT OF ANY FIRE RATING MATERIAL FOR THE PURPOSES OF COMPLETING THE WORKS) AND NEW STRUCTURE INCLUDING BUT NOT LIMITED TO STRUCTURAL STEEL, RISERS, PENETRATIONS ETC. IN ACCORDANCE WITH THE REQUIRED CODES AND STANDARDS.

PROPPING AND TOMMING:

1. THE BUILDER SHALL SECURELY NEEDLE, TOM, PROP AND BRACE ALL EXISTING RETAINING WALLS, BRICKWORK, BEAMS AND OTHER STRUCTURE AS NECESSARY TO PREVENT ANY MOVEMENT AND TO ENSURE SAFETY OF PERSONS DURING BUILDING OPERATIONS.
2. TOMMING AND PROPPING OF THIS STRUCTURE SHALL BE DETERMINED BY A CHARTERED STRUCTURAL ENGINEER TO THE APPROVAL OF THE ENGINEER.
3. NEW BEAMS INCLUDED PROVIDED TO PROVIDE SUPPORT TO EXISTING BRICKWORK OR SLAB SHALL BE WEDGED DOWN FROM THAT BRICKWORK OR SLAB AFTER SECURELY BEDDING AT ENDS AND GROUTING UP ACCORDINGLY.
4. WEDGES TO BE OF MILD STEEL AND POSITIONED AT 1200mm MAXIMUM CENTRES WHEN IN FINAL POSITION WEDGES TO BE SPOT WELDED TO BEAM TO AVOID MOVEMENT DURING THE GROUTING PROCESS.
5. IF WHEN THE JOB IS OPENED UP, IT IS FOUND THAT THE EXISTING CONDITIONS DIFFER FROM THAT ASSUMED, THE BUILDER IS TO INFORM THE BUILDERS ENGINEER IMMEDIATELY, SINCE ADDITIONAL DESIGN MAY BE NECESSARY. THIS SHALL BE DONE TO THE APPROVAL OF THE ENGINEER.

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
E	ISSUED FOR INFORMATION ONLY	25.03.11	RT	NAA
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	25.02.18	RM	JT
C	ISSUED FOR INFORMATION ONLY (DD 30%)	25.01.17	RM	JT
B	ISSUED FOR INFORMATION ONLY	24.08.05	RM	JT
A	ISSUED FOR INFORMATION ONLY	24.05.15	RM	JT

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Project:
849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.

Developer:
Billbergia creating communities®

Contractor:

Architect :
pbd architects

Design Consultant:
CADIGAL GROUP STRUCTURAL • CIVIL • FACADE

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Drawing Title:

SPECIFICATION NOTES -SH2

STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Drawn:	RT	JT	24.05.15	
Scale	AS SHOWN	Project Ref.	Drawing No.	Rev
Sheet	A1	01-100084	S00011	E

NON DECLARED DESIGN				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.				
PROJECT TITLE: CHADSWOOD				
CONSENT No.:			BODY CORP REG TAG:	
DRAWING TITLE: SPECIFICATION NOTES - SH3			DA-No: S00012	
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO

DEMOLITION NOTES:

1. SOFT STRIP OUT OF FLOOR CAN OCCUR SIMULTANIOUSLY ON ALL LEVELS.
2. ONCE ALL STRIP OUT HAS OCCURED, A VISUAL INSPECTION OF ALL STRUCTURE TO BE CARRIED OUT BY STRUCTURAL ENGINEER.
3. VISUAL INSPECTION OF STRUCTURE AND REPORT / RECORDING TO OCCUR PRIOR TO DEMOLITION, DURING AND AFTER DEMOLITION. TO BE COMPLETED AND CROSS REFERENCED AGAINST DILAPIDATION REPORT.
4. DEMOLTION SHALL BE CARRIED OUT IN A MANNER TO ENSURE THAT STRUCTURE TO BE RETAINED IS MAINTAINED IN AN UNDAMAGED CONDITION.
5. CONTRACTOR TO ALLOW FOR TREATMENT OF EXPOSED REINFORCEMENT WITH CONCRESSIVE 2525 OR APPROVED EQUIVALENT.
6. THE STRUCTURAL ENGINEER IS RESPONSIBLE FOR THE STRENGTH AND STABILITY OF THE PRIMARY STRUCTURE IN ITS COMPLETED FORM.
7. THE CONTRACTOR IS RESPONSIBLE FOR:
   - COORDINATING DETAILS AND ACCURACY OF THE WORK
   - CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS
   - SELECTING FABRICATION PROCESSES
   - PERFORMING WORK IN A SAFE AND SECURE MANNER
8. THE CONTRACTOR IS RESPONSIBLE FOR THE MEANS AND METHODS OF DEMOLITION AND ALL JOBS RELATED TO SAFETY STANDARDS TO MEET LEGISLATIVE REQUIREMENTS.
9. THE CONTRACTOR SHALL AT THEIR DISCRETION EMPLOY A REGISTERED PROFESSIONAL ENGINEER FOR THE DESIGN OF ANY TEMPORARY BRACING AND SHORING REQUIRED DURING DEMOLITION.
10. THE CONTRACTOR IS RESPONSIBLE FOR THE STRENGTH AND STABILITY OF THE STRUCTURE DURING DEMOLITION AND CONSTRUCTION AND SHALL PROVIDE TEMPORARY SHORING, BRACING AND OTHER ELEMENTS REQUIRED TO MAINTAIN STABILITY UNTIL THE STRUCTURE IS COMPLETE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BE FAMILIAR WITH THE WORK REQUIRED IN THE CONSTRUCTION DOCUMENTATION AND THE REQUIREMENTS FOR EXECUTING IT PROPERLY.
11. LOADS ON THE STRUCTURE DURING CONSTRUCTION SHALL NOT EXCEED THE DESIGN LOADS AS NOTED.
12. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AT THE SITE INCLUDING EXISTING STRUCTURE. CONFLICTS BETWEEN THE DRAWINGS AND ACTUAL SITE CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT / ENGINEER PRIOR TO PROCEEDING WITH THE WORKS.
13. THE CONTRACTOR SHALL DETERMINE THE LOCATION OF ALL ADJACENT UNDERGROUND UTILITIES PRIOR TO EARTHWORKS, FOUNDATIONS, SHORING AND EXCAVATION. ANY UTILITIES INFORMATION SHOWN ON THE DRAWINGS AND DETAILS IS APPROXIMATE AND NOT NECESSARILY COMPLETE.
14. ALTERNATE PRODUCTS OF SIMILAR STRENGTH, NATURE AND FORM FOR SPECIFIED ITEMS MAY BE SUBMITTED WITH ADEQUATE TECHNICAL DOCUMENTATION TO THE ARCHITECTS / ENGINEER FOR REVIEW. ALTERNATE MATERIALS THAT ARE SUBMITTED WITHOUT ADEQUATE TECHNICAL DOCUMENTATION OR THAT SIGNIFICANTLY DEVIATE FROM THE DESIGN INTENT OF MATERIALS SPECIFIED MAY BE RETURNED WITHOUT REVIEW. ALTERNATES THAT REQUIRE SUBSTANTIAL EFFORT TO REVIEW WILL NOT BE REVIEWED UNLESS AUTHORIZED BY THE OWNER.
15. ALL SCABBLING OF EXISTING STRUCTURES TO BE MINIMUM CSP 8 REFERENCED IN GUIDELINE No. 310-2R-2013 (PUBLISHED BY INTERNATIONAL CONCRETE REPAIR INSTITUTE) UNLESS NOTED OTHERWISE.

CONTRACTOR SUBMISSIONS:

1. THE REINFORCEMENT, PRESTRESSING AND STRUCTURAL STEEL MATERIAL SUPPLIER MUST BE CERTIFIED BY ACRS (AUSTRALIAN STANDARDS CERTIFICATION AND VERIFICATION OF REINFORCING, PRESTRESSING AND STRUCTURAL STEELS) FOR THE SUPPLY OF REINFORCEMENT, PRESTRESSING AND STRUCTURAL STEEL.
2. SUBMIT CURRENT CERTIFICATES.

SHORING GENERAL NOTES:

G1. THESE DRAWINGS AND NOTES SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANT'S DRAWINGS, REPORTS, SPECIFICATIONS AND ANY OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF CONSTRUCTION. ALL DISCREPANCIES SHALL BE REFERRED TO THE ENGINEER FOR CLARIFICATION OR DECISION BEFORE PROCEEDING WITH THE WORK.

G2. CONSTRUCTION FROM THESE DRAWINGS SHALL NOT COMMENCE UNTIL THEY ARE APPROVED BY THE RELEVANT AUTHORITIES.

G3. DIMENSIONS SHALL NOT BE OBTAINED FROM THE STRUCTURAL DRAWINGS BY WAY OF SCALING (OR DETERMINING UNDIMENSIONED MEASUREMENTS FROM THE ELECTRONIC DRAWING), WALL, PIER, AND COLUMN THICKNESS', AND STRUCTURAL MEMBER SIZES SHOWN ON THESE DRAWINGS SHALL TAKE PRECEDENCE OVER THOSE SHOWN ON THE ARCHITECT'S DRAWINGS. THE BUILDER SHALL VERIFY ALL DIMENSIONS ON SITE AND BE RESPONSIBLE FOR THE SETTING OUT OF THE BUILDING.

G4. ELEMENTS INDICATED ON THESE DRAWINGS ARE SHOWN IN THEIR INTENDED COMPLETE STATE. THE BUILDER SHALL PROVIDE ANY TEMPORARY WORKS INCLUDING PROPPING, BRACING, SHORING AND ANY OTHER REQUIREMENTS NECESSARY TO MAINTAIN THE STRUCTURE, OR ANY PART OF IT, IN A STABLE CONDITION DURING CONSTRUCTION. IF THE BUILDER IS IN ANY DOUBT AS TO HOW TO ACHIEVE THIS HE SHALL OBTAIN ADVICE FROM APPROPRIATELY QUALIFIED AND EXPERIENCED PERSONNEL. UNLESS STATED OTHERWISE TEMPORARY WORKS SHALL BE THE BUILDERS RESPONSIBILITY.

G5. THE BUILDING SHALL NOT BE ERECTED ON OR ADJACENT TO ANY OF THE FOLLOWING HAZARDS UNLESS THE HAZARD IS INDICATED ON THE STRUCTURAL DRAWING:- EMBANKMENTS, BATTERS, WATER RETAINING STRUCTURES, RETAINING WALLS, PITS, SEWERS, SERVICE TRENCHES, DRAINAGE CHANNELS, STREAMS OR ANY POTENTIAL SOURCE OF DAMAGE TO THE STRUCTURE. IF ANY SUCH HAZARDS ARE ENCOUNTERED THE ENGINEER SHALL BE NOTIFIED AND HIS APPROVAL OBTAINED BEFORE PROCEEDING.

G6. THE BUILDER SHALL LOCATE ALL EXISTING AND PROPOSED SERVICES AND EASEMENTS, ON AND ADJACENT TO THE SITE. THE APPROVAL OF THE RELEVANT STATUTORY AUTHORITY AND THE ENGINEER SHALL BE OBTAINED BEFORE BUILDING ON OR OVER ANY SERVICES OR EASEMENTS.

G7. THE BUILDER SHALL NOT EXCAVATE BELOW THE LEVEL OF THE FOOTINGS TO ANY EXISTING BUILDINGS WITHOUT THE WRITTEN CONSENT OF THE ENGINEER.

G8. THE WRITTEN CONSENT OF ADJOINING PROPERTY OWNERS SHALL BE OBTAINED BEFORE INSTALLATION OF UNDERPINNING, ANCHORING WORK, DRAINAGE LINES OR ANY OTHER WORK BEYOND THE PROPERTY BOUNDARY.

G9. ADJACENT STRUCTURE ON BOUNDARY. THE FOUNDATION TYPE AND FOUNDING LEVEL OF THE FOOTING OF THE ADJACENT BUILDING NEIGHBOURING STRUCTURE MUST BE EXPOSED AND CONFIRMED PRIOR TO CONSTRUCTION SO THAT CADIGAL GROUP PTY LTD MAY INSPECT AND CONFIRM THE APPROPRIATE UNDERPINNING AND RETENTION SOLUTION.

G10. NO HOLES OR CHASES SHALL BE MADE IN ANY STRUCTURAL ELEMENT, UNLESS SHOWN ON THESE DRAWINGS OR WRITTEN APPROVAL OF THE ENGINEER.

G11. A FULL DEPTH 'V' JOINT SHALL BE STRUCK IN RENDER WHERE TWO DIFFERING STRUCTURAL MATERIALS ABUT. i.e. AT THE JUNCTION OF MASONRY WITH CONCRETE.

G12. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE RELEVANT AUSTRALIAN STANDARDS, THE BUILDING CODE OF AUSTRALIA, AND THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES. ALL WORKMANSHIP SHALL BE CONSISTENT WITH GOOD TRADE PRACTICE.

G13. AUSTRALIAN STANDARDS REFERRED TO ON THESE DRAWINGS SHALL BE THE LATEST REVISIONS OF THE NOMINATED STANDARD.

G14. APPROVAL OF A SUBSTITUTION OR ALTERNATIVE FROM THE ENGINEER IS NOT, IN ITSELF AUTHORISATION FOR A VARIATION.

G15. THE ENGINEER SHALL BE GIVEN 48 HOURS NOTICE FOR INSPECTIONS.

G16. THE WORD ENGINEER AS USED IN THESE NOTES REFERS TO AN EMPLOYEE OR NOMINATED REPRESENTATIVE OF CADIGAL GROUP PTY LTD.

G17. UNLESS OTHERWISE NOTED, ALL LEVELS ARE GIVEN IN METRES AND ALL DIMENSIONS ARE IN MILLIMETERS. REDUCED LEVELS (RL'S) ARE REFERENCED TO AUSTRALIAN HEIGHT DATUM.

G18. A DILAPIDATION SURVEY OF ADJACENT PROPERTIES AND STRUCTURES IS REQUIRED IMMEDIATELY PRIOR TO THE COMMENCEMENT OF THE WORKS.
COMPARISON DILAPIDATION SURVEY IS REQUIRED TO BE UNDERTAKEN AT THE COMPLETION OF THE WORKS.

G19. ALL SITE RECORDS RELATED TO THE WORKS SHALL BE SUBMITTED TO CADIGAL GROUP PTY LTD ON A WEEKLY BASIS FOR REVIEW.

G20. THE CONTRACTOR SHALL ENSURE A SERVICES SEARCH HAS BEEN CARRIED OUT, AND THAT ALL EXISTING STRUCTURES, SERVICES (INCLUDING REDUNDANT SERVICES) AND UTILITIES ARE LOCATED PRIOR TO COMMENCEMENT OF WORKS. THE ACCURACY OF THIS INFORMATION SHOULD BE VERIFIED AS NECESSARY BEFORE WORK COMMENCES ON SITE.

G21. CONTRACTOR TO REVIEW LOCATIONS OF SERVICES AND UTILITIES AND TO IMPLEMENT PROTECTION AND AVOIDANCE METHODS TO ENSURE NO DAMAGE OCCURS IN THE PROCESS OF CARRYING OUT THE WORKS.

G22. CADIGAL GROUP PTY LTD HAS RELIED ON THE ACCURACY OF THE GEOTECHNICAL INVESTIGATION CONDUCTED BY GEOTECHNICAL ENGINEER FOR DETERMINING SUBSURFACE CONDITIONS.

G23. CADIGAL GROUP PTY LTD SHALL BE NOTIFIED IMMEDIATELY IF SUBSURFACE GROUND CONDITIONS ENCOUNTERED ON SITE DIFFER FROM THE GEOTECHNICAL INVESTIGATION, DESIGN REPORT OR DRAWINGS AND/OR FOR ANY REASON THE REQUIRED DESIGN DEPTH CANNOT BE ACHIEVED.

G24. UNDER NO CIRCUMSTANCES SHALL ANY OF THE WORKS BE DAMAGED BY ANY PLANT/MACHINERY OR DURING WORKS BY OTHER TRADES. IN THE EVENT THAT DAMAGE DOES OCCUR, CADIGAL GROUP PTY LTD SHALL BE NOTIFIED IMMEDIATELY.

G25. WHERE TRIMMING IS REQUIRED, CARE SHALL BE TAKEN TO PREVENT CRACKING OR OTHERWISE DAMAGING THE STRUCTURAL ELEMENTS BELOW CUT-OFF LEVEL OR DAMAGING THE STEEL REINFORCEMENT. ADOPTED METHODOLOGY FOR TRIMMING SHALL BE PRESENTED TO CADIGAL GROUP PTY LTD FOR APPROVAL PRIOR TO COMMENCEMENT OF TRIMMING WORKS.

G26. AT THE COMPLETION OF THE WORKS, THE CONTRACTOR SHALL PROVIDE A CERTIFICATE STATING THAT ALL WORKS HAVE BEEN COMPLETED IN ACCORDANCE WITH CADIGAL GROUP PTY LTD DRAWINGS AND THE RELEVANT AUSTRALIAN STANDARDS.

SAFETY IN DESIGN INFORMATION

ARE THERE ANY ADDITIONAL HAZARDS / RISKS NOT NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING?

☒ NO ☐ YES

DO NOT SCALE FROM THIS DRAWING

WORKING PLATFORM NOTES:

WP1. WORKING PLATFORM TO BE DESIGNED BY OTHERS TO MEET MINIMUM STABILITY AND BEARING REQUIREMENTS AS PROVIDED BY THE PILING CONTRACTOR.

WP2. INDEPENDENT VERIFICATION OF PILING PLATFORM AND ISSUE OF PLATFORM CERTIFICATE REQUIRED PRIOR TO COMMENCEMENT OF WORKS.

WP3. NO OVER-EXCAVATION FOR BASEMENT PLATFORM OR SUBGRADE HAS BEEN ALLOWED FOR IN THE SHORING DESIGN.

SHORING WALL NOTES:

SW1. SETOUT OF INDIVIDUAL PILES IS THE CONTRACTORS RESPONSIBILITY.

SW2. DESIGN EXCAVATION LEVELS SHOWN ON THE DRAWINGS ARE THE MAXIMUM EXCAVATION LEVELS ALLOWED FOR IN THE DESIGN. WRITTEN APPROVAL MUST BE OBTAINED FROM CADIGAL GROUP PTY LTD PRIOR TO ANY EXCAVATION (DETAIL OR OTHERWISE) BELOW THESE LEVELS.

SW3. THE SHORING WALL DESIGN HAS NOT CONSIDERED ANY UNPLANNED OVER-EXCAVATION. THE BUILDER AND CONTRACTOR SHALL ENSURE NO UNPLANNED OVER-EXCAVATION OCCURS. IF THIS REQUIREMENT CANNOT BE ADHERED TO, PLEASE ADVISE CADIGAL GROUP PTY LTD FOR REDESIGN OF THE SHORING WALL PRIOR TO THE COMMENCEMENT OF WORKS.

SW4. STABILITY OF ALL TEMPORARY BATTERS IS THE BUILDERS/CONTRACTORS RESPONSIBILITY.

SW5. A GEOTECHNICAL INSPECTION WILL BE REQUIRED FOR ANY UNSUPPORTED EXCAVATION IN ROCK.

SW6. THE MAXIMUM ESTIMATED DEFLECTION IS 15mm. CADIGAL GROUP PTY LTD HAVE MADE NO ASSESSMENT OF THE EFFECT OF ESTIMATED DEFLECTIONS ON ADJACENT STRUCTURES AND/OR SERVICES. IF THESE DEFLECTIONS AND THE ASSOCIATED RISK OF DAMAGE TO ADJACENT STRUCTURES AND/OR SERVICES IS NOT ACCEPTABLE, PLEASE NOTIFY CADIGAL GROUP PTY LTD FOR THE SHORING WALL TO BE REDESIGNED PRIOR TO THE COMMENCEMENT OF WORKS.

SW7. EXCAVATION BELOW GROUND ANCHOR LEVELS SHALL BE NO MORE THAN 500mm UNTIL GROUND ANCHORS ARE STRESSED AND CERTIFIED.

SW8. MAX 15kPa CONSTRUCTION SURCHARGE ALLOWANCE FOR THE SHORING WALL DESIGN. UNLESS NOTED OTHER WISE THESE SURCHARGES MUST NOT BE EXCEEDED AT ANY TIME. PRIOR WRITTEN APPROVAL FROM CADIGAL GROUP PTY LTD IS REQUIRED IF ANY SPECIFIED GENERAL SURCHARGES ARE REQUIRED TO BE EXCEEDED FOR TEMPORARY CONSTRUCTION REQUIREMENTS, SUCH AS MOBILE CRANES, BOOM PUMPS, MATERIALS STORAGE ETC.

SW9. CAPPING BEAM MUST BE INSTALLED PRIOR TO EXCAVATION, UNO.

SW10. FOR SOLDIER PILES, ENSURE THE LONGITUDINAL BARS OF THE PILE REINFORCEMENT CAGE ARE ALIGNED TO ALLOW FOR ANCHOR INSTALLATION THROUGH THE PILE AT THE SPECIFIED ANGLE.

SW11. A GEOTECHNICAL DESIGN AND INSPECTION IS REQUIRED FOR ANY PILING EMBEDMENT LENGTH WITHIN SOIL.

SHOTCRETE NOTES:

SC1. MINIMUM SHOTCRETE F'c = 40 MPa AT 28 DAYS, UNO.

SC2. LAPS NOT SHOWN ON DRAWINGS SHALL BE STAGGERED SO THAT NO MORE THAN 50% OF BARS ARE LAPPED IN ANY ONE CROSS SECTION.

SC3. MINIMUM LAP LENGTHS FOR N16 BARS = 500mm UNLESS NOTED OTHERWISE

SC4. MINIMUM COVER = 60mm FOR F'c = 40MPa, UNO.

SC5. ENSURE PILES HAVE BEEN CLEANED OF ALL SOIL/ROCK PRIOR TO SHOTCRETING TO ENSURE THERE IS NO CONTAMINATION OF THE COLD JOINT.

MONITORING REQUIREMENTS FOR SHORING:

BUILDER TO NOTE THE MONITORING REQUIREMENTS FOR ALL SHORING INSTALLATIONS AND THIS INCLUDES:

1. A DAILY WALK AROUND THE SITE AND REGULAR PHOTOGRAPH.
2. REGULAR, ACCURATE SURVEY OF MONITORING POINTS LOCATED BOTH ALONG AND DOWN THE FACE OF THE SHORING WALL.
3. REGULAR, ACCURATE READING OF OTHER MONITORING INSTRUMENTS. (i.e. SURVEY POINTS)
4. MONITORING RESULTS TO BE PROVIDED TO THE ENGINEER WITH 48 HOURS
5. PROPOSED TRIGGER LEVEL FOR THE LATERAL DEFORMATION OF THE SHORING WALL IS 15mm AT THE TOP OF CAPPING BEAM.
6. IN CASE OF DEFLECTION MORE THAN THE ABOVE MENTIONED LIMIT THE STRUCTURAL AND GEOTECHNICAL ENGINEER TO BE INFORMED IMMEDIATELY

THRESHHOLD VIBRATION LIMITS:

ASSET TYPE	THRESHOLD VALUES FOR VELOCITY (PPV) MEASURED ON THE ASSET IN MM/S
BRITTLE PIPE ASSETS- RC, VC/EW, CICL	MAXIMUM PPV FOR INTERMITTENT VIBRATIONS 10MM/S MAXIMUM PPV FOR CONTINUOUS VIBRATIONS 5MM/S
DUCTILE PIPE ASSETS- SCL, DI, PVC, PE, PP, GRP	MAXIMUM PPV FOR INTERMITTENT VIBRATIONS 20MM/S MAXIMUM PPV FOR CONTINUOUS VIBRATIONS 10MM/S
MASONARY	3 MM/S
UNREINFORCED CONCRETE	3 MM/S

NOTE: THIS IS APPLICABLE FOR BURIED ASSETS, IN SOUND CONDITION, AND LAID IN A TYPICAL SOIL TRENCH IN STABLE GROUND. ALTERNATIVE CRITERIA SHALL BE DEVELOPED FOR OTHER ASSET TYPES: ABOVE GROUND ASSETS, CONCRETE ENCASED PIPES, PIPES ON PILED SPECIAL SUPPORTS AND PIPES IN TUNNELS OR OF OTHER UNUSUAL CONSTRUCTION OR GROUND CONDITIONS.

MONITORING IS TO BE CARRIED OUT AT THE FOLLOWING STAGES FOR SHORING WALLS:

1. AFTER CONSTRUCTION OF THE RETAINING STRUCTURES, BUT BEFORE COMMENCEMENT OF EXCAVATION TO DETERMINE BASELINE READINGS, TWO INDEPENDENT SETS OF MEASUREMENTS MUST BE TAKEN CONFIRMING MEASUREMENTS CONSISTENCY.
2. AFTER EXCAVATION TO EACH ROW OF SUPPORTS, BUT PRIOR TO INSTALLATION OF SUPPORTS OR ANCHORS.
3. AFTER EXCAVATION TO THE BASE OF THE EXCAVATION.
4. AFTER COMPLETION OF THE EXCAVATIONS NOT LESS THAN A WEEK APART SHOWING NO FURTHER MOVEMENTS.
5. AFTER DE-STRESSING AND REMOVAL OF ANY ROW OF SUPPORTS.
6. ONE MONTH LATER COMPLETION OF THE PERMANENT RETAINING STRUCTURE OR AFTER THREE CONSECUTIVE MEASUREMENTS NOT LESS THAN A WEEK APART SHOWING NO FURTHER MOVEMENTS, WHICH EVER IS THE LATER.
7. ALL MONITORING DEVICES SHOULD BE KEPT IN OPERATIONAL CONDITION AT ALL TIMES. CONSTRUCTION WORKS SHOULD BE SUSPENDED WHERE MORE THAN 30% OF THE DEVICES MALFUNCTIONED.

INSTRUMENTATION AND MONITORING MUST BE CARRIED OUT BY A COMPETENT PERSON EXPERIENCED IN THE EQUIPMENT USED.
THE RESULTS OF EACH MONITORING STAGE MUST BE REPORTED TO THE DESIGN ENGINEER. BEFORE WORK PROCEEDS TO THE NEXT STAGE THE DESIGN ENGINEER MUST VERIFY THAT ON THE MONITORING RESULTS AND INSPECTION CARRIED OUT THE STRUCTURE IS PERFORMING IN ACCORDANCE WITH THE DESIGN INTENT AND THAT WHERE TRIGGER LEVELS HAVE BEEN EXCEEDED, ACTION HAS BEEN TAKEN IN ACCORDANCE WITH THE MONITORING PLAN. VERIFICATION BY THE DESIGN ENGINEER MUST CONSTITUTE A 'HOLD POINT' FOR EACH STAGE OF CONSTRUCTION.

TRIGGER CRITERIA:

ALERT (UNITS)	ACTION (UNITS)	ALARM (UNITS)
70% OF MAXIMUM PREDICTED	<100% OF MAXIMUM PREDICTED	>=100 OF MAXIMUM PREDICTED (BUT NOT GREATER THAN ASSET CAPACITY)

INCLINOMETER NOTE:

TAKE AT LEAST TWO BASELINE READINGS BEFORE THE COMMENCEMENTS OF EXCAVATIONS.

DILAPIDATION NOTE:

DILAPIDATION SURVEY INCLUDING THE PAVEMENT AND ROAD DRAINAGE SHOULD BE PREPARED PRIOR TO ANY EXCAVATION WORKS. A COPY OF THE REPORT SHOULD BE FORWARDED TO RMS PRIOR TO ANY EXCAVATION ACTIVITY ON SITE FOR RECORD PURPOSES

DIAL 1100 BEFORE DIG

BUILDER TO DETERMINE THE EXACT LOCATIONS OF EXISTING SERVICES PRIOR TO THE START OF ANY CONSTRUCTION WORK. BUILDER TO CONTACT 'DIAL BEFORE YOU DIG' AND THE AUTHORITIES CONCERNED TO CONFIRM THE ACTUAL LOCATIONS OF EXISTING SERVICES. IN THE EVENT THAT ANY OF THE SERVICES MIGHT BE AFFECTED BY STRUCTURAL WORK, STRUCTURAL ENGINEER IS TO BE NOTIFIED AND CONSULTED IMMEDIATELY TO REVIEW THE STRUCTURAL DETAILS AFFECTING THE SERVICES.

www.dialbeforeyoudig.com.au

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
E	ISSUED FOR INFORMATION ONLY	25.03.11	RT	NAA
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	25.02.18	RM	JT
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Project:
849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.

Developer:
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Contractor:

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Design Consultant:
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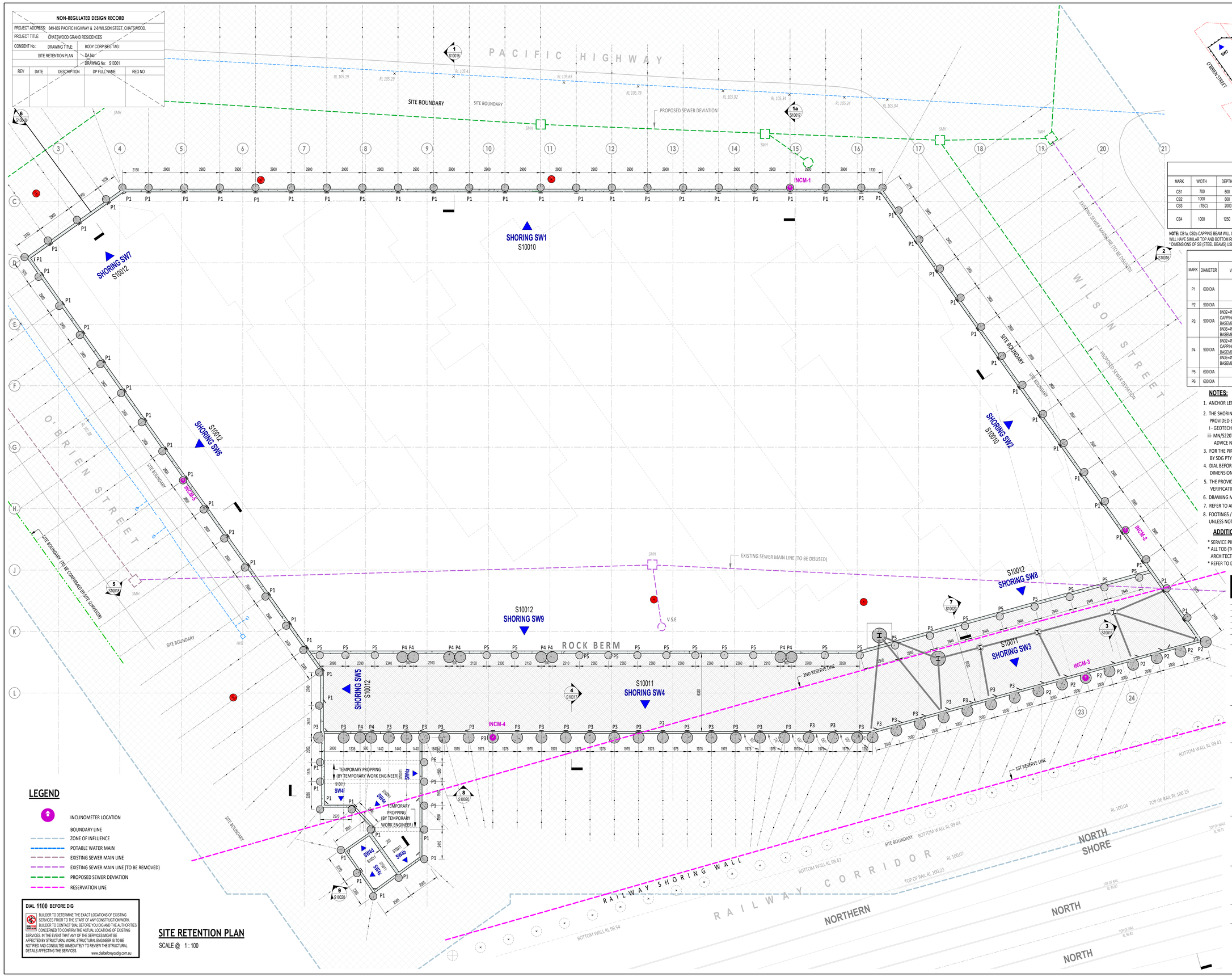
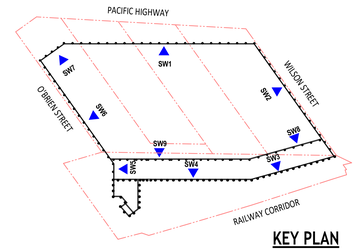
Drawing Title:
SPECIFICATION NOTES -SH3

STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Drawn:	RT	JT	04/12/24	
Scale		Project Ref.	Drawing No.	Rev
Sheet	A1	01-100084	S00012	E

NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
	SITE RETENTION PLAN	DA No:		
		DRAWING No: S10001		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO





KEY PLAN

CAPPING BEAM SCHEDULE

MARK	WIDTH	DEPTH	TOP BARS	BTM BARS	TIES	CONCRETE GRADE (fc)
CB1	700	600	5N20	5N20	N12-300 (2 Legs)	40 MPa
CB2	1000	600	5N20	5N20	N12-200 (4 Legs)	40 MPa
CB3	(TBC)	2000	REFER PILE CAP SCHEDULE (TBC)			
CB4	1000	1250	5N32 (SIDE BAR 8N32)	5N32 (SIDE BAR 8N32)	N16-200 (4 Legs) REFER DWG.S10004 FOR ADDITIONAL HORZ. U/S	40 MPa

NOTE: CB1a, CB2a CAPPING BEAM WILL CONSIST OF RETAINING WALLS. CB1 AND CB1a WILL HAVE SIMILAR TOP AND BOTTOM REO. CB2 AND CB2a WILL HAVE SIMILAR TOP AND BOTTOM REO. THE TIES SHALL BE MIN N12-200 (4 LEGS) FOR CB1a AND CB2a (REFER TO DWG.S10004)
* DIMENSIONS OF SB (STEEL BEAMS) USED AS WALERS SHALL BE PROVIDED IN A SEPARATE DRAWING.

SHORING PILE SCHEDULE

MARK	DIAMETER	VER. REO	TIES	CONCRETE GRADE	COVER (mm)	SOCKET LENGTH (mm) (TERMINATION BELOW BEL) BULK EXCAVATION IS AT B-6 LEVEL
P1	600 DIA	8N32	N12-90 HELIX FROM CAPPING BEAM TO BASEMENT 4 N16-120 HELIX AFTER BASEMENT 4 TO 6	50 MPa	60	1200mm (FOR DIFFERED LENGTHS REFER SW4a-SW4f)
P2	900 DIA	8N32	N12-150 HELIX	50 MPa	60	1200mm
P3	900 DIA	8N32+4N24 FROM CAPPING BEAM TO BASEMENT 3 8N36+4N24 AFTER BASEMENT 3 TO 6	N12-125 HELIX FROM CAPPING BEAM TO BASEMENT 3 N16-120 HELIX AFTER BASEMENT 3 TO 6	50 MPa	60	1200mm
P4	900 DIA	8N32+4N24 FROM CAPPING BEAM TO BASEMENT 3 8N36+4N24 AFTER BASEMENT 3 TO 6	N12-125 HELIX FROM CAPPING BEAM TO BASEMENT 3 N16-120 HELIX AFTER BASEMENT 3 TO 6	50 MPa	60	6000mm
P5	600 DIA	8N24	N16-90 HELIX	50 MPa	60	900mm
P6	600 DIA	8N32	N12-90 HELIX	50 MPa	60	3000mm

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- ZONE OF INFLUENCE
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- EXISTING SEWER MAIN LINE
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- PROPOSED SEWER DEVIATION
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SITE RETENTION PLAN

SCALE @ 1 : 100

WORK IN PROGRESS
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Rev	Description	Date	By	App
H	ISSUED FOR INFORMATION ONLY	25.05.09	RT	NAA
G	ISSUED FOR INFORMATION ONLY	25.04.03	RT	NAA
F	ISSUED FOR INFORMATION ONLY	25.03.25	RT	NAA
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Project: **849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.**

Developer: Billbergia creating communities®

Contractor:

Architect : pbd architects

Design Consultant: CADIGAL GROUP
1002, 22-24 Market Street, Sydney , NSW 2000 Australia
T: +61 2 8630 8559
info@cadigalgroup.com.au
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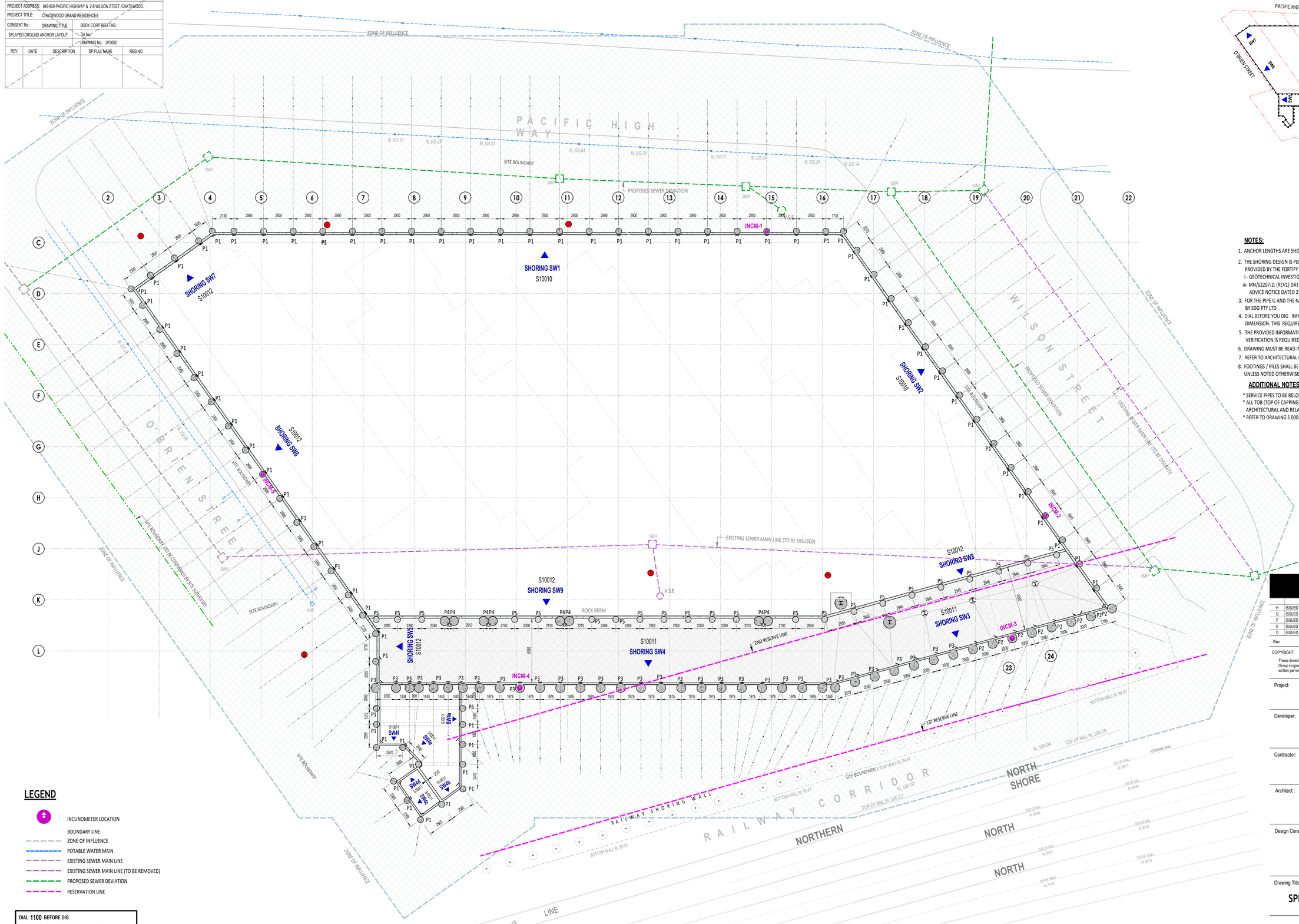
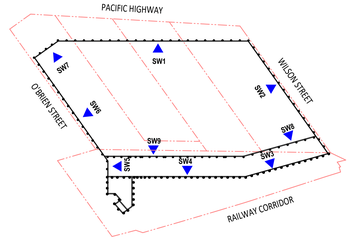
Drawing Title: **SITE RETENTION PLAN**

STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Modelled:	RT	JT	24.05.15	
Scale:	1:100	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10001	H

NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
SPLAYED GROUND ANCHOR LAYOUT		DA No:		
		DRAWING No: S10002		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO





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SPLAYED GROUND ANCHOR LAYOUT

SCALE @ 1 : 125

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H	ISSUED FOR INFORMATION ONLY	25.05.09	RT	NAA
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Design Consultant: CADIGAL GROUP
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Sydney , NSW 2000
Australia
T: +61 2 8630 8559
info@c-adigalgroup-.com.au
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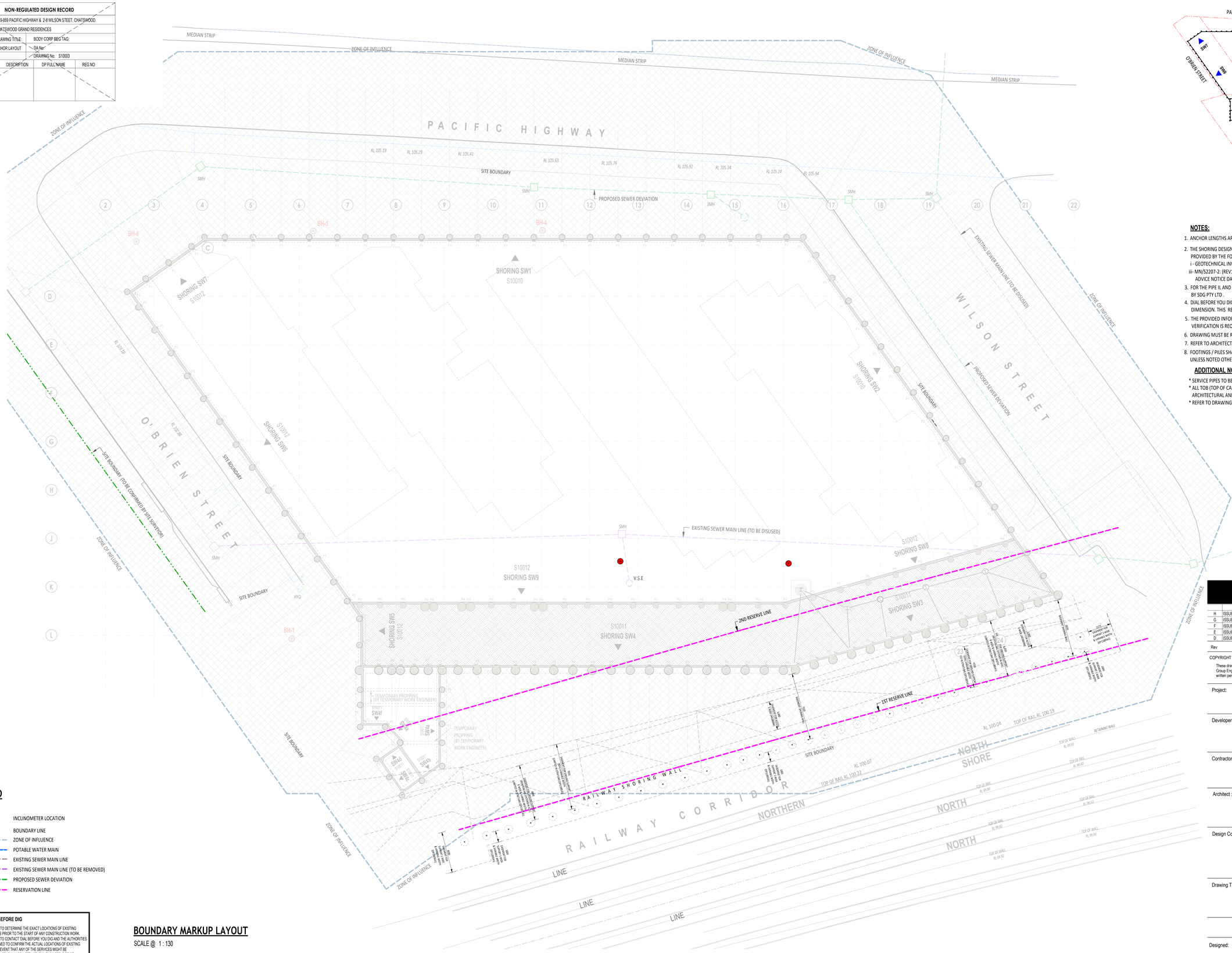
Drawing Title:

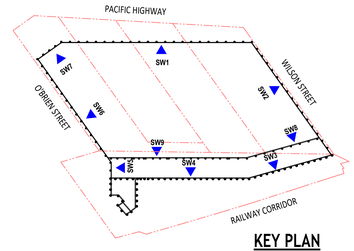
SPLAYED GROUND ANCHOR LAYOUT

STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Modelled:	RT	JT	24.05.15	
Scale:	1:125	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10002	H

NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
SPLAYED GROUND ANCHOR LAYOUT		DA No:		
		DRAWING No: S10003		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO





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BOUNDARY MARKUP LAYOUT

SCALE @ 1 : 130

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Drawing Title:
BOUNDARY MARKUP LAYOUT

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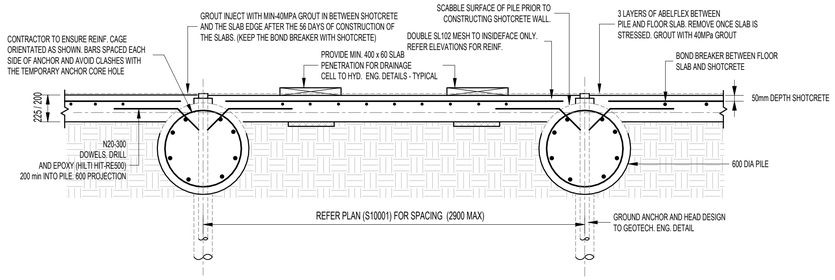
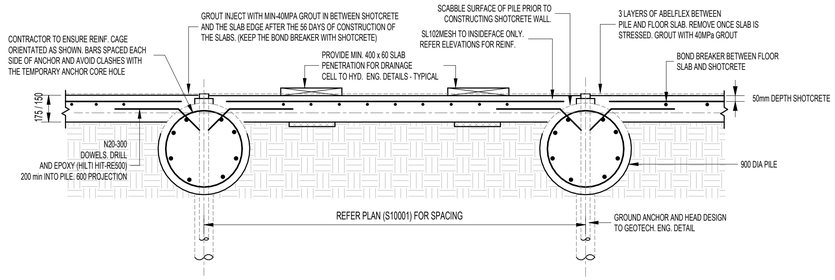
Sheet:	A0	01-100084	S10003	H

NON DECLARED DESIGN				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.				
PROJECT TITLE: CHADSWOOD				
CONSENT No.:			BODY CORP REG TAG:	
DRAWING TITLE: SPECIFICATION NOTES - SH3			DA-No: S00012	
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO



TYPICAL 600 DIA SHORING PILE FOR 200/225 THK SHOTCRETE WALL PLAN - 32MPa



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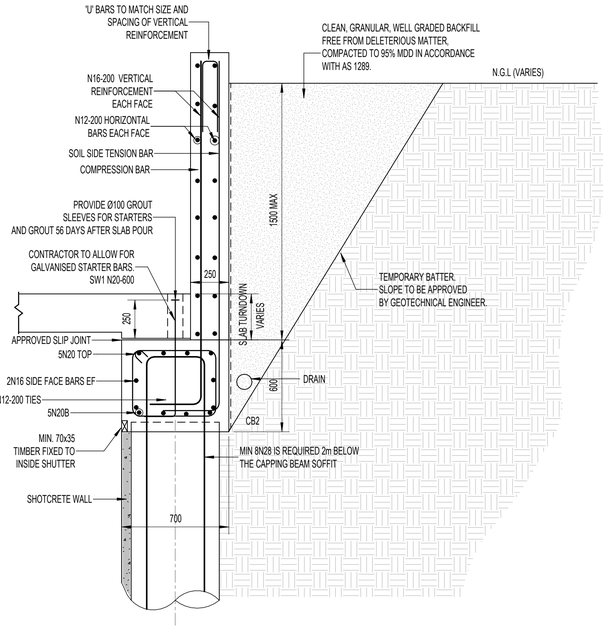
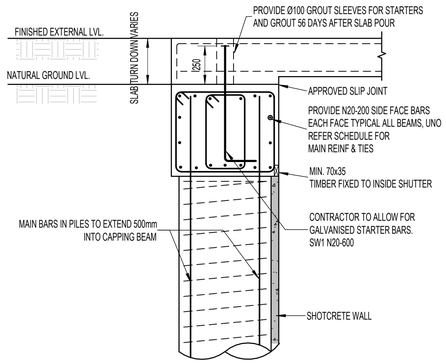
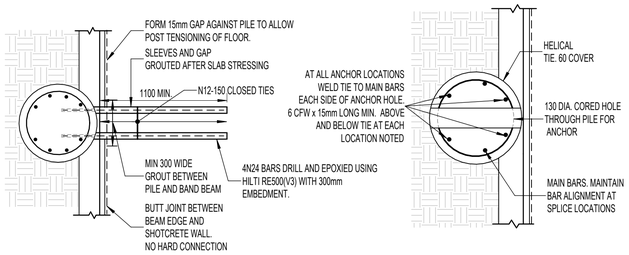


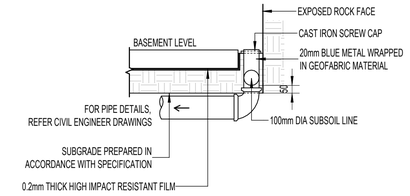
TYPICAL CB2 CAPPING BEAM DETAIL



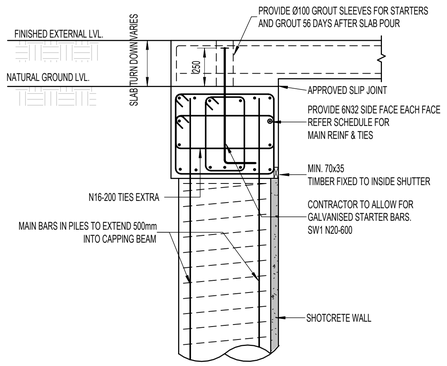
TYPICAL CAPPING BEAM SECTION



TYPICAL SHORING PILE TO BAND BEAM CONNECTION DETAIL

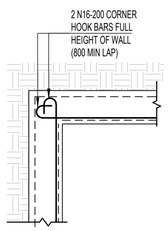


WALL DRAINAGE DETAIL - EXPOSED ROCKFACE (TYP)

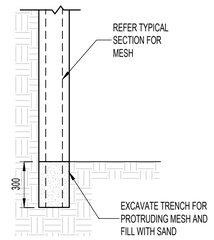


CAPPING BEAM SECTION SW3

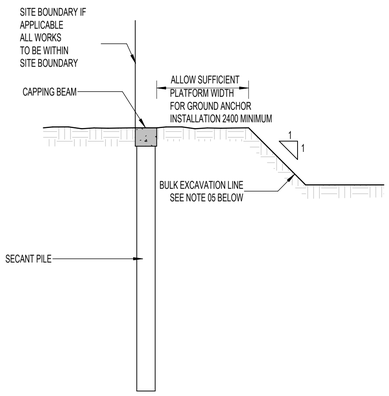
NOTE: SHOTCRETE WALL OMITTED FOR CLARITY



TYPICAL SHOTCRETE WALL CORNER

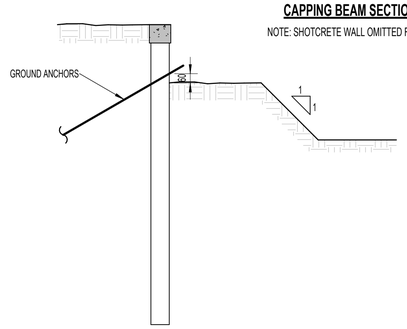


HORIZONTAL SHOTCRETE CONST. JOINT



STAGE 1

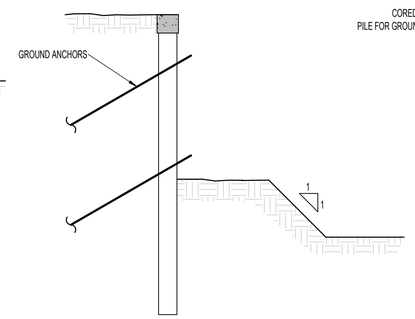
01. BORE PILE TO THE SET-OUT AND DEPTH AS SHOWN ON PLAN AND ELEVATIONS. SOCKETS SHALL BE DE-WATERED AND INSPECTED BY A GEOTECHNICAL ENGINEER TO VERIFY THAT THE FOUNDATION CONDITIONS COMPLY WITH THE DESIGN ASSUMPTIONS. SOCKETS SHALL BE CLEANED OF DEBRIS.
02. PLACE THE REINFORCEMENT CAGES INTO THE HOLES ENSURING THAT SPECIFIED COVER AND ORIENTATION IS ACHIEVED.
03. POUR CONCRETE FOR SOLDIERS.
04. CONSTRUCT THE CAPPING BEAM ALONG TOP OF SOLDIER WHERE INDICATED ON ELEVATIONS AND SECTIONS.
05. BULK EXCAVATION MAY PROCEED AS INDICATED ABOVE WHILST SOLDIERS ARE BEING CONSTRUCTED.



STAGE 2

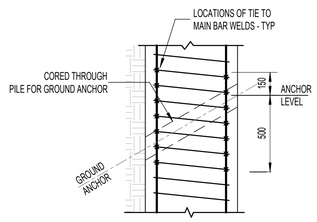
01. EXCAVATE LOCALLY ADJACENT TO SOLDIERS TO A LEVEL 300 BELOW THE FIRST ROW OF ANCHORS.
02. DRILL, INSTALL, PROOF TEST AND LOCK OFF GROUND ANCHORS.

CONSTRUCTION PROCEDURE FOR SECANT PILES RETENTION

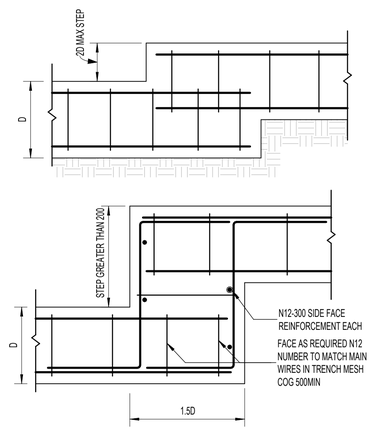


STAGE 3

01. REPEAT STAGE 2 300 BELOW NEXT ANCHOR.
02. COMPLETE EXCAVATION TO FINAL LEVEL IN SUITABLE DROPS.
03. INSTALL ANY SUBSEQUENT ROWS OF GROUND ANCHORS SHOWN ON WALL ELEVATIONS.



TYPICAL PILE REINFORCEMENT



TYPICAL STEP IN CAPPING BEAM DETAILS U.N.O

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
F	ISSUED FOR INFORMATION ONLY	25.03.25	RT	NAA
E	ISSUED FOR INFORMATION ONLY	25.03.11	RT	NAA
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	25.02.18	RM	JT
C	ISSUED FOR INFORMATION ONLY (DD 30%)	25.01.17	RM	JT
B	ISSUED FOR INFORMATION ONLY	24.08.05	RM	JT

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Project:
849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.

Developer:
Billbergia creating communities®

Contractor:

Architect :
pbd architects

Design Consultant:
CADIGAL GROUP

1002, 22-24 Market Street,
Sydney , NSW 2000
Australia
T: +61 2 8630 8559
info@cadigalgroup.com.au

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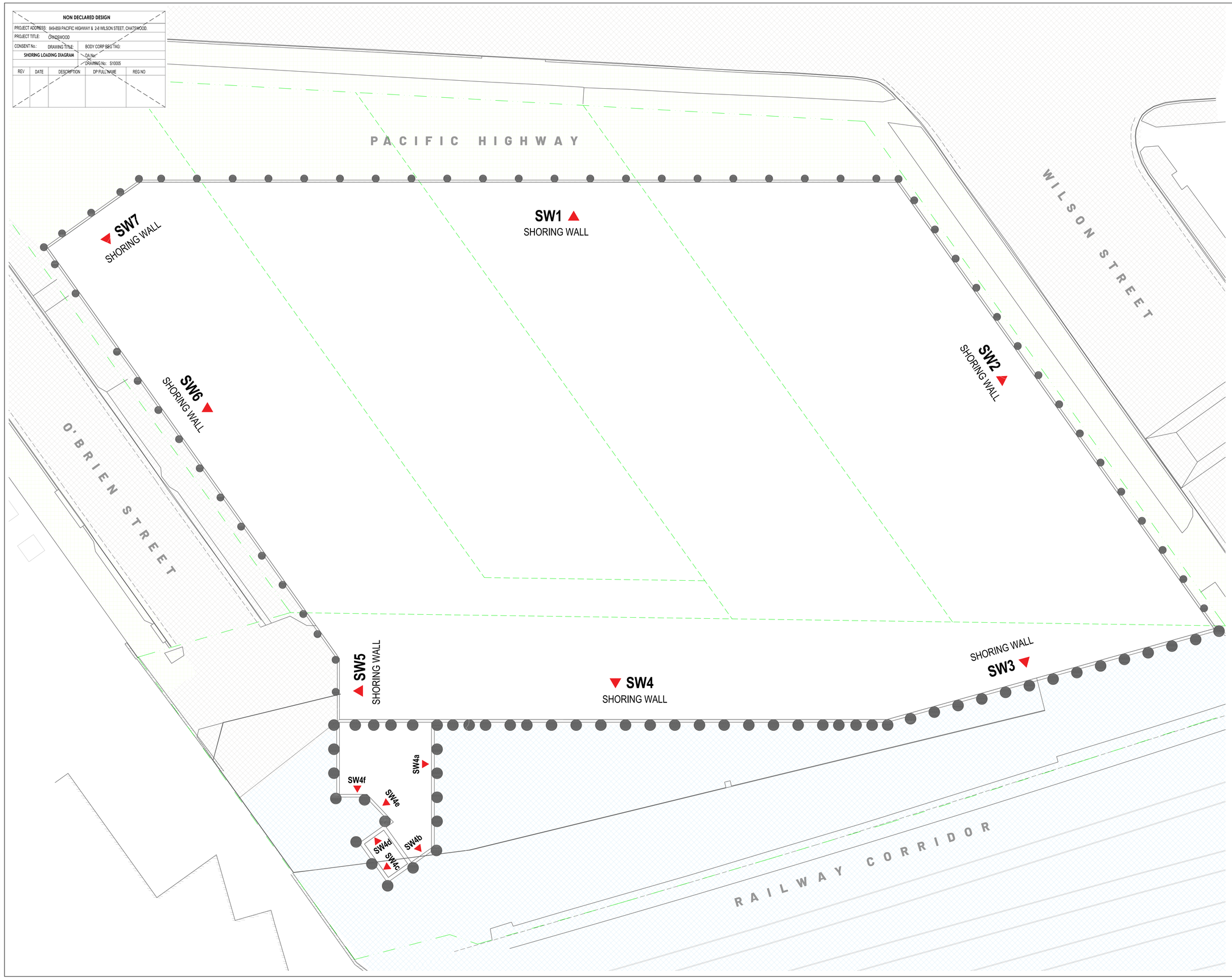
Drawing Title:
TYPICAL SHORING WALL DETAIL

STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Drawn:	RT	JT	03/25/25	
Scale		Project Ref.	Drawing No.	Rev
Sheet	A1	01-100084	S10004	F

NON DECLARED DESIGN				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD				
CONSENT No.:	DRAWING TITLE:	BODY CORP REG TAG:		
SHORING LOADING DIAGRAM		DA No:		
		DRAWING No: S10005		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO



LEGEND

- SU = TfNSW Considerations 300 LA
- SU = 20 kPa
- SU = 5 kPa

TYPICAL SURCHARGE VALUE

Road	20 kPa
On Ground Car Parking	20 kPa
Apartments (Per Floor)	20 kPa
Residential Housing	20 kPa

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	18.02.25	RM	JT
C	ISSUED FOR INFORMATION ONLY (DD 30%)	17.01.25	RM	JT
B	ISSUED FOR INFORMATION ONLY	05.08.24	RM	JT
A	ISSUED FOR INFORMATION ONLY	20.04.24	RM	JT

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T: +61 2 8630 8559
info@cadigalgroup.com.au
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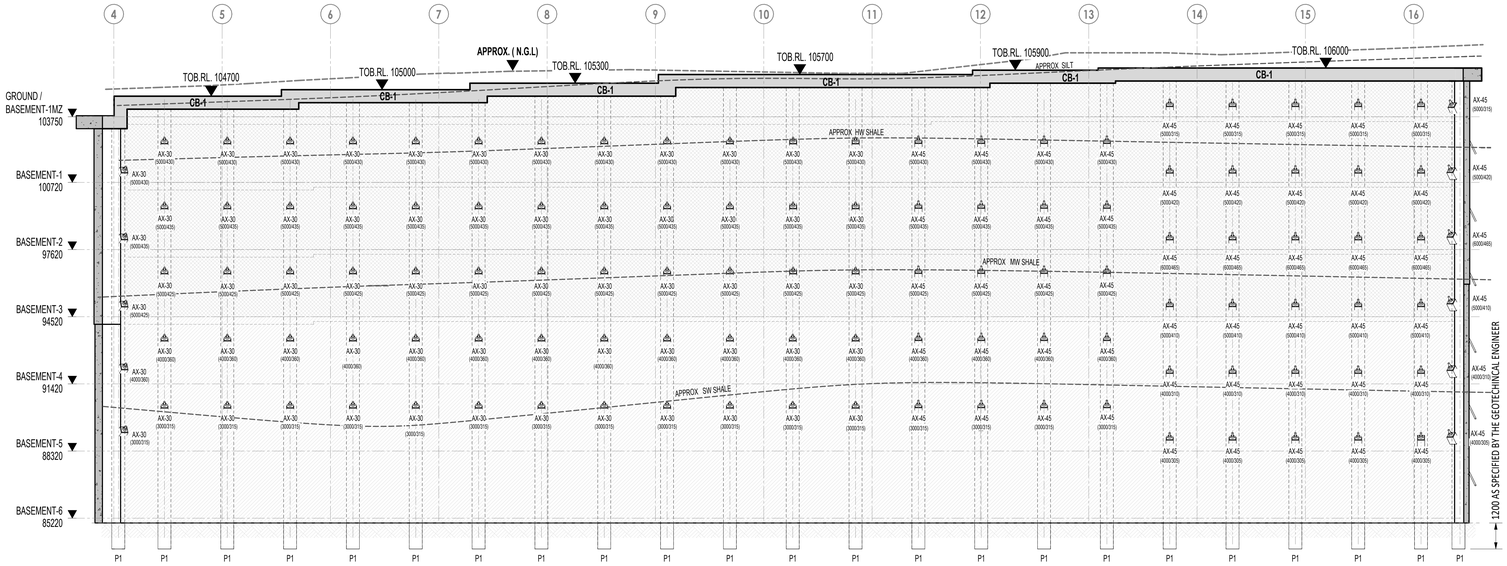
Drawing Title:
SHORING LOADING DIAGRAM

STRUCTURAL DRAWINGS

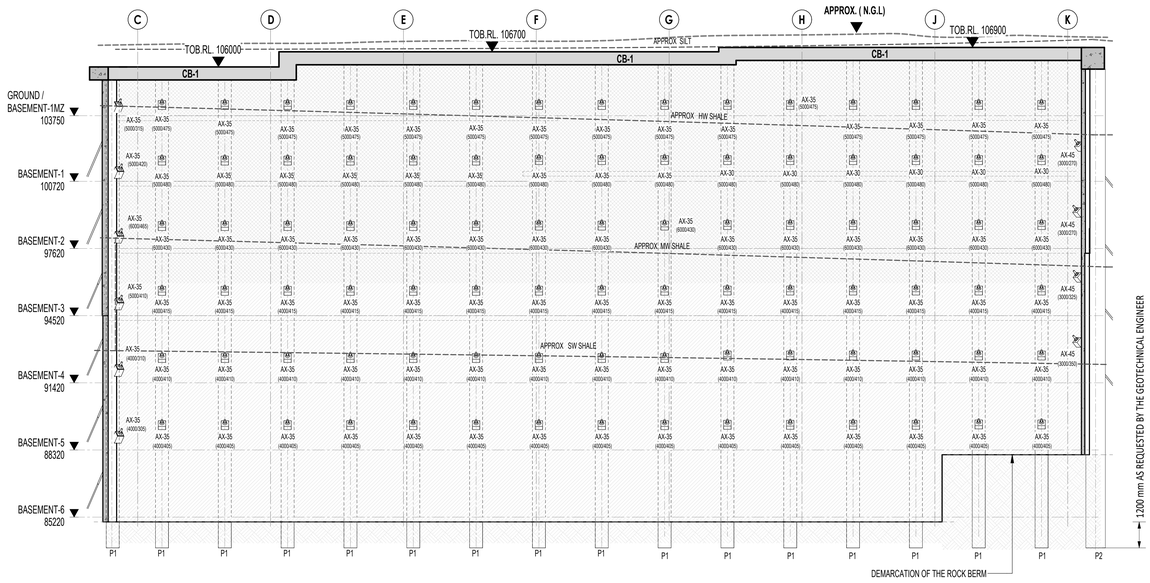
Designed:	SK	Project Director Approved	Date	North
Drawn:	RM	JT	20/04/24	N
Scale:	1:100	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10005	D

NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
SHORING ELEVATION SW1		DA No:		
		DRAWING No: S10010		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO



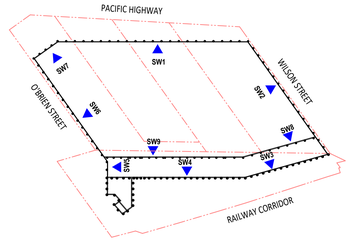
01 S10001 **SHORING WALL ELEVATION -SW1**

SCALE @ 1:100



02 S10001 **SHORING WALL ELEVATION -SW2**

SCALE @ 1:100



KEY PLAN

NOTES:

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRG S-0006 -SITE RETENTION PLAN

SHORING ELEVATION NOTES:

1. DRAWING MUST BE READ IN CONJUNCTION WITH ARCHITECTS DRAWINGS.
2. REFER TO ARCHITECTURAL DRAWINGS FOR ALL SETOUT U.N.O.
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4. FLOOR LEVELS (RL) SHOWN IN THIS DRAWING ARE FOR THE STRUCTURAL ENGINEERS USE ONLY. REFER TO ARCHITECTS DRAWINGS FOR LEVELS AND OTHER GEOMETRY RELATED DIMENSIONS.
5. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH SERVICES DRAWINGS. THE CONTRACTOR MUST CONTACT THE STRUCTURAL ENGINEER SHOULD ANY DISCREPANCIES OCCUR.
7. SOIL TYPES AND GROUND WATER LEVEL (IF ENCOUNTERED) SHOWN ARE INDICATIVE ONLY AND ARE AN EXTRAPOLATION BASED ON THE GEOTECHNICAL REPORT

GROUND ANCHOR TAGS

AX-45 (0000/000)

- DENOTES NUMBER OF STRANDS (DESIGN BY OTHERS)
- DENOTES DECLINATION ANGLE
- DENOTES ANCHOR LOAD IN kN (SERVICE LOAD)
- DENOTES ANCHOR BOND LENGTH IN (MM)

SHORING WALL SW1

- DENOTES EXPOSED ROCK / SHALE FACE TO BE RETAINED WITH SHOTCRETE AND ROCK BOLTS TO GEOTECHNICAL ENGINEERS' DETAILS
- DENOTES 175 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 150 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 200 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH
- DENOTES 225 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH

NOTE :
EXTENT OF SHOTCRETE WALLS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
H	ISSUED FOR INFORMATION ONLY	25.05.09	RT	NAA
G	ISSUED FOR INFORMATION ONLY	25.04.03	RT	NAA
F	ISSUED FOR INFORMATION ONLY	25.03.25	RT	NAA
E	ISSUED FOR INFORMATION ONLY	25.03.11	RT	NAA
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	25.02.18	RM	JT

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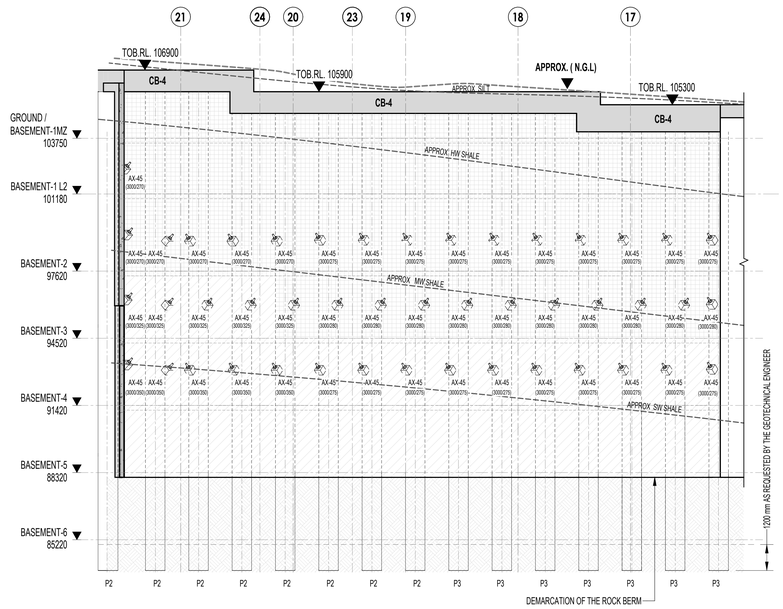
Drawing Title:
SHORING WALL ELEVATIONS - SHEET 1

STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Modelled:	RT	JT	24.05.15	
Scale:	1:100	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10010	H

NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
SHORING ELEVATION SW2		DA No:		
		DRAWING No: S10011		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO

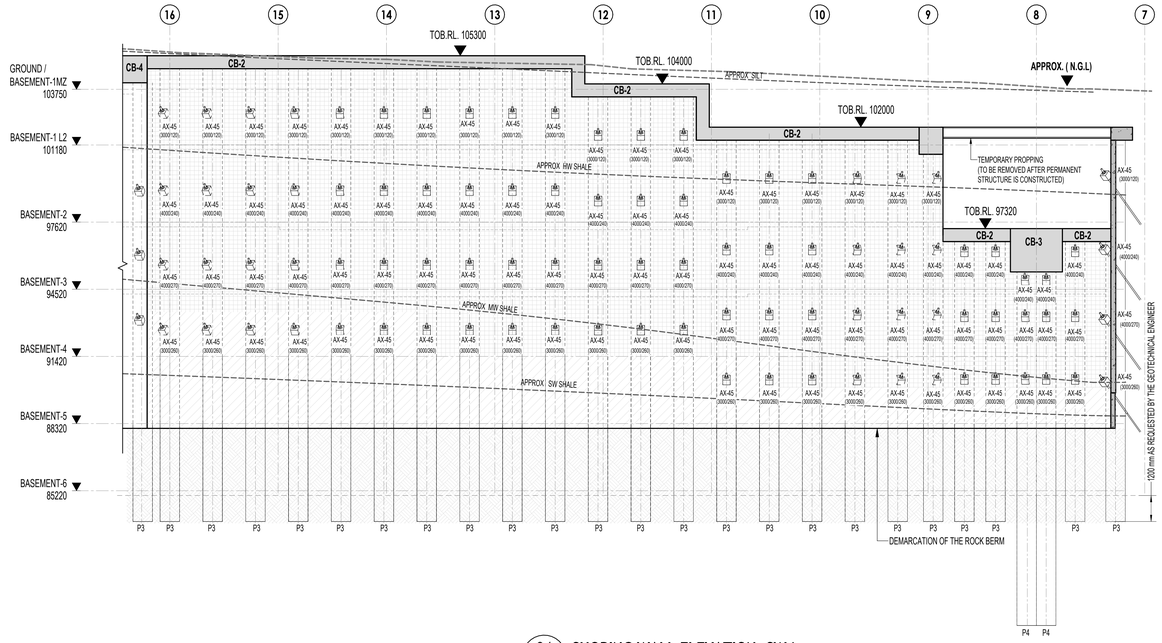


03 S10001 **SHORING WALL ELEVATION -SW3**

SCALE @ 1:100

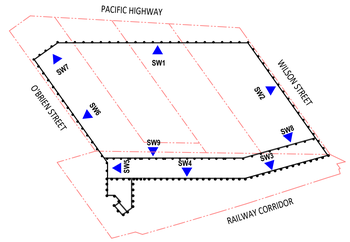
NOTES:

TEMPORARY BRACING TO BE PROVIDED IN LIEU OF THE 1ST LAYER OF ANCHORS REMOVED ALONG SW3



04 S10001 **SHORING WALL ELEVATION -SW4**

SCALE @ 1:100



KEY PLAN

NOTES:

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRG S-0006 -SITE RETENTION PLAN

SHORING ELEVATION NOTES:

1. DRAWING MUST BE READ IN CONJUNCTION WITH ARCHITECTS DRAWINGS.
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7. SOIL TYPES AND GROUND WATER LEVEL (IF ENCOUNTERED) SHOWN ARE INDICATIVE ONLY AND ARE AN EXTRAPOLATION BASED ON THE GEOTECHNICAL REPORT

GROUND ANCHOR TAGS

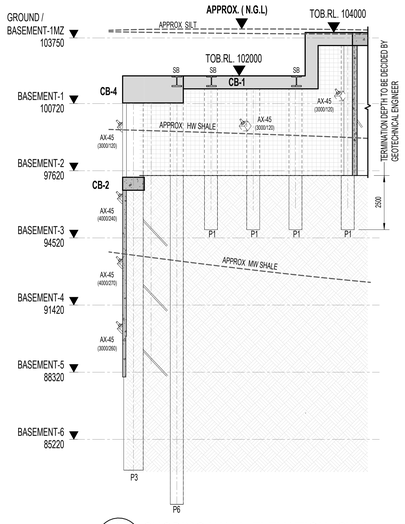
AX-45 (0000/000)

- DENOTES NUMBER OF STRANDS (DESIGN BY OTHERS)
- DENOTES DECLINATION ANGLE
- DENOTES ANCHOR LOAD IN kN (SERVICE LOAD)
- DENOTES ANCHOR BOND LENGTH IN (MM)

SHORING WALL SW1

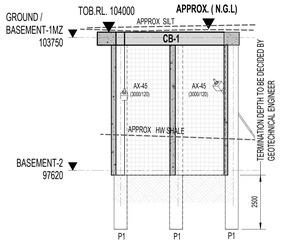
- DENOTES EXPOSED ROCK / SHALE FACE TO BE RETAINED WITH SHOTCRETE AND ROCK BOLTS TO GEOTECHNICAL ENGINEERS' DETAILS
- DENOTES 175 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 150 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 200 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH
- DENOTES 225 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH

NOTE :
EXTENT OF SHOTCRETE WALLS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER



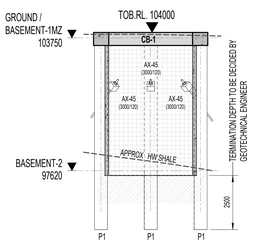
4a S10001 **SHORING WALL ELEVATION -SW4a**

SCALE @ 1:100



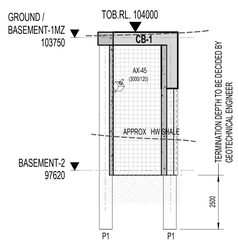
4b S10001 **SHORING WALL ELEVATION -SW4b**

SCALE @ 1:100



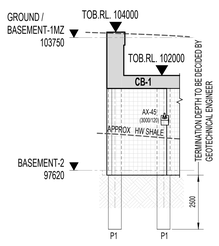
4c S10001 **SHORING WALL ELEVATION -SW4c**

SCALE @ 1:100



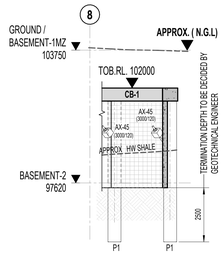
4d S10001 **SHORING WALL ELEVATION -SW4d**

SCALE @ 1:100



4e S10001 **SHORING WALL ELEVATION -SW4e**

SCALE @ 1:100



4f S10001 **SHORING WALL ELEVATION -SW4f**

SCALE @ 1:100

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
H	ISSUED FOR INFORMATION ONLY	25.05.09	RT	NAA
G	ISSUED FOR INFORMATION ONLY	25.04.03	RT	NAA
F	ISSUED FOR INFORMATION ONLY	25.03.25	RT	NAA
E	ISSUED FOR INFORMATION ONLY	25.03.11	RT	NAA
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	25.02.18	RM	JT

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Project: **849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.**

Developer: Billbergia creating communities®

Contractor:

Architect : pbd architects

Design Consultant:

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info@cadigalgroup.com.au
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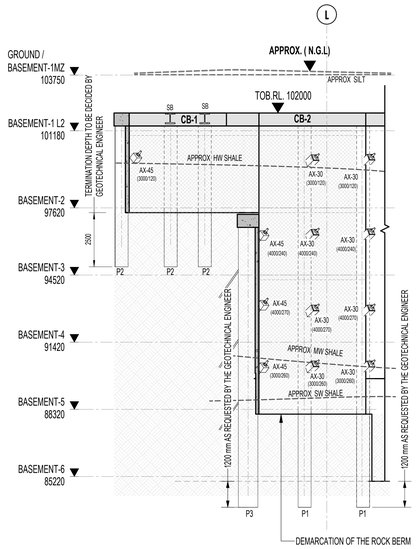
Drawing Title:

SHORING WALL ELEVATIONS - SHEET 2

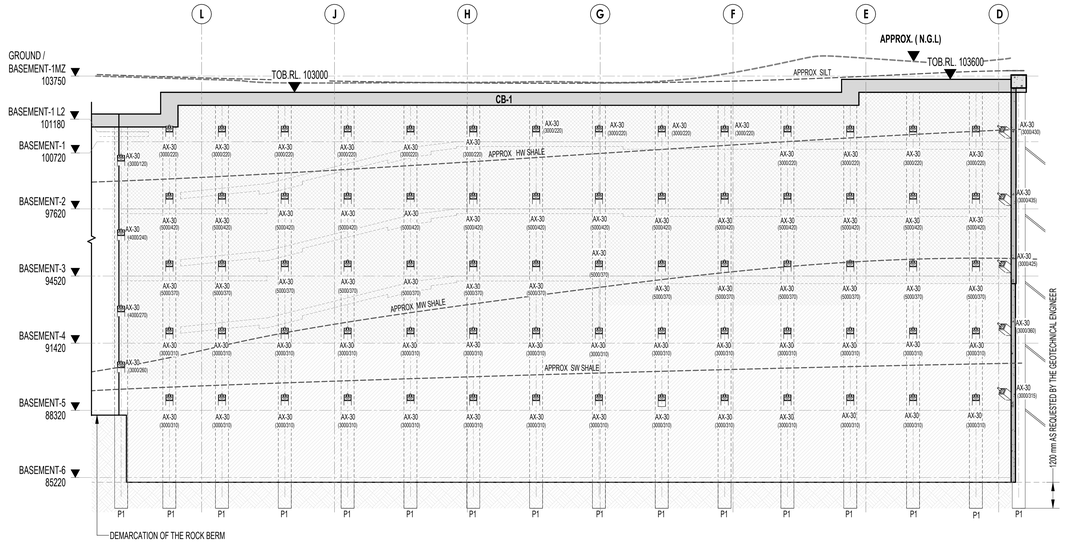
STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Modelled:	RT	JT	24.05.15	
Scale:	1:100	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10011	H

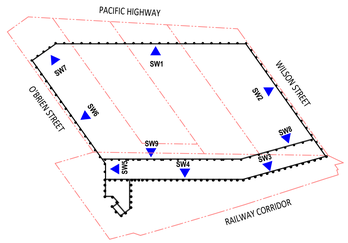
NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
SHORING ELEVATION SW3		DA No:		
		DRAWING No: S10012		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO



05 S10001 **SHORING WALL ELEVATION -SW5**
SCALE @ 1:100



06 S10001 **SHORING WALL ELEVATION -SW6**
SCALE @ 1:100



KEY PLAN

NOTES:

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SHORING ELEVATION NOTES:

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GROUND ANCHOR TAGS

AX-45 (0000/000)

- DENOTES NUMBER OF STRANDS (DESIGN BY OTHERS)
- DENOTES DECLINATION ANGLE
- DENOTES ANCHOR LOAD IN kN (SERVICE LOAD)
- DENOTES ANCHOR BOND LENGTH IN (MM)

SHORING WALL SW1

- DENOTES EXPOSED ROCK / SHALE FACE TO BE RETAINED WITH SHOTCRETE AND ROCK BOLTS TO GEOTECHNICAL ENGINEERS' DETAILS
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- DENOTES 150 THK. SHOTCRETE WALL WITH REO. SL102MESH
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NOTE :
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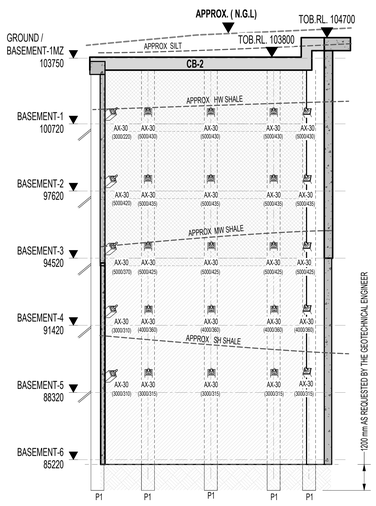
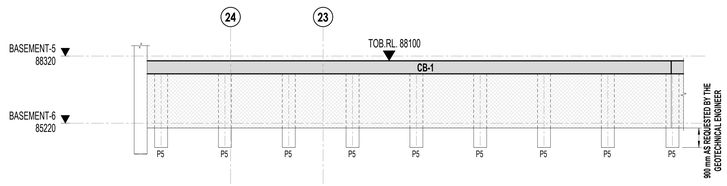
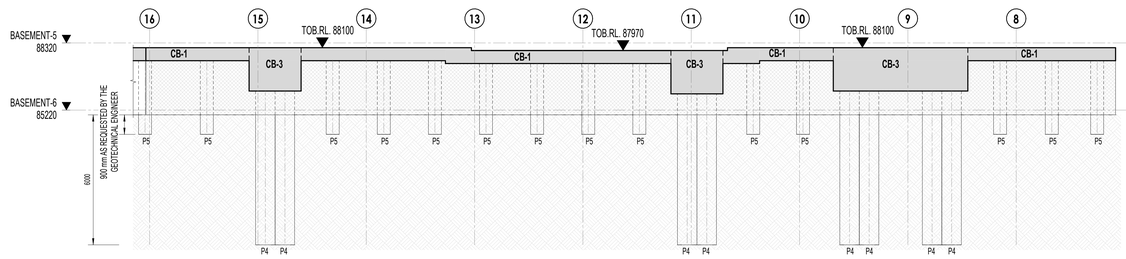


07 S10001 **SHORING WALL ELEVATION -SW7**
SCALE @ 1:100



08 S10001 **SHORING WALL ELEVATION -SW8**
SCALE @ 1:100



09 S10001 **SHORING WALL ELEVATION -SW9**
SCALE @ 1:100

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
H	ISSUED FOR INFORMATION ONLY	25.05.09	RT	NAA
G	ISSUED FOR INFORMATION ONLY	25.04.03	RT	NAA
F	ISSUED FOR INFORMATION ONLY	25.03.25	RT	NAA
E	ISSUED FOR INFORMATION ONLY	25.03.11	RT	NAA
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	25.02.18	RM	JT

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Contractor:

Architect :
pbd architects

Design Consultant:
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T: +61 2 9630 8559
info@cadigalgroup.com.au
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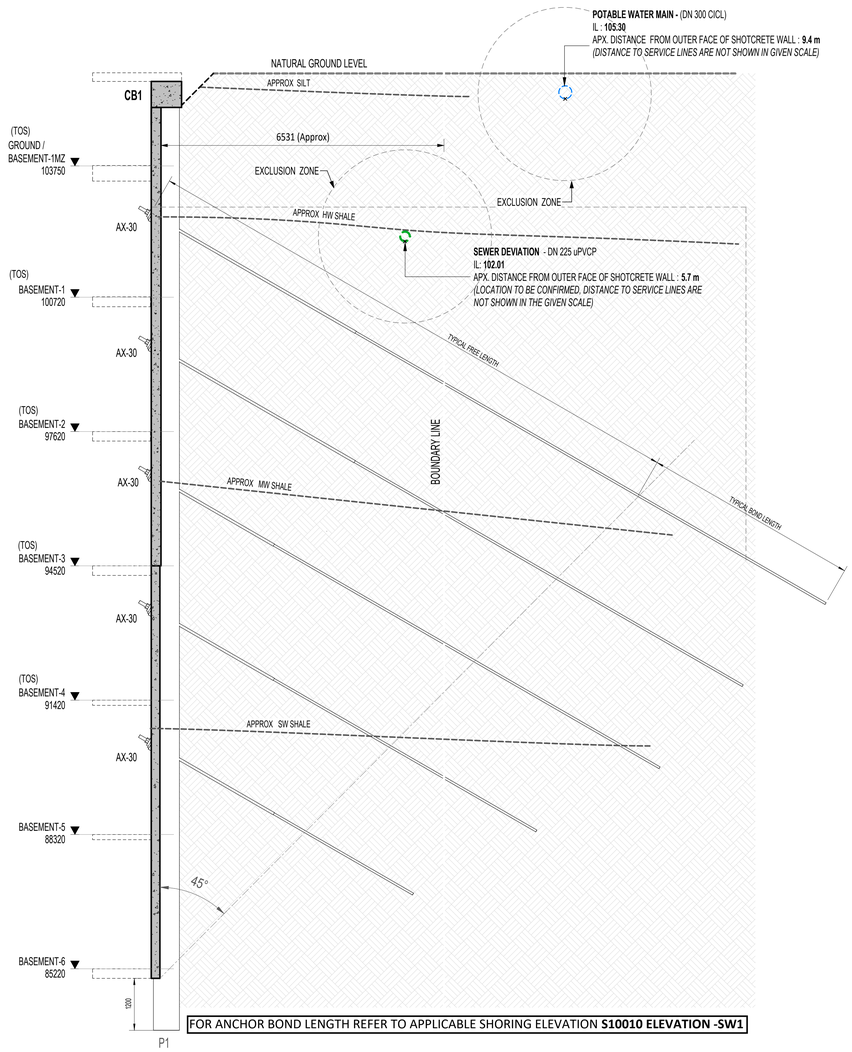
Drawing Title:
SHORING WALL ELEVATIONS - SHEET 3

STRUCTURAL DRAWINGS

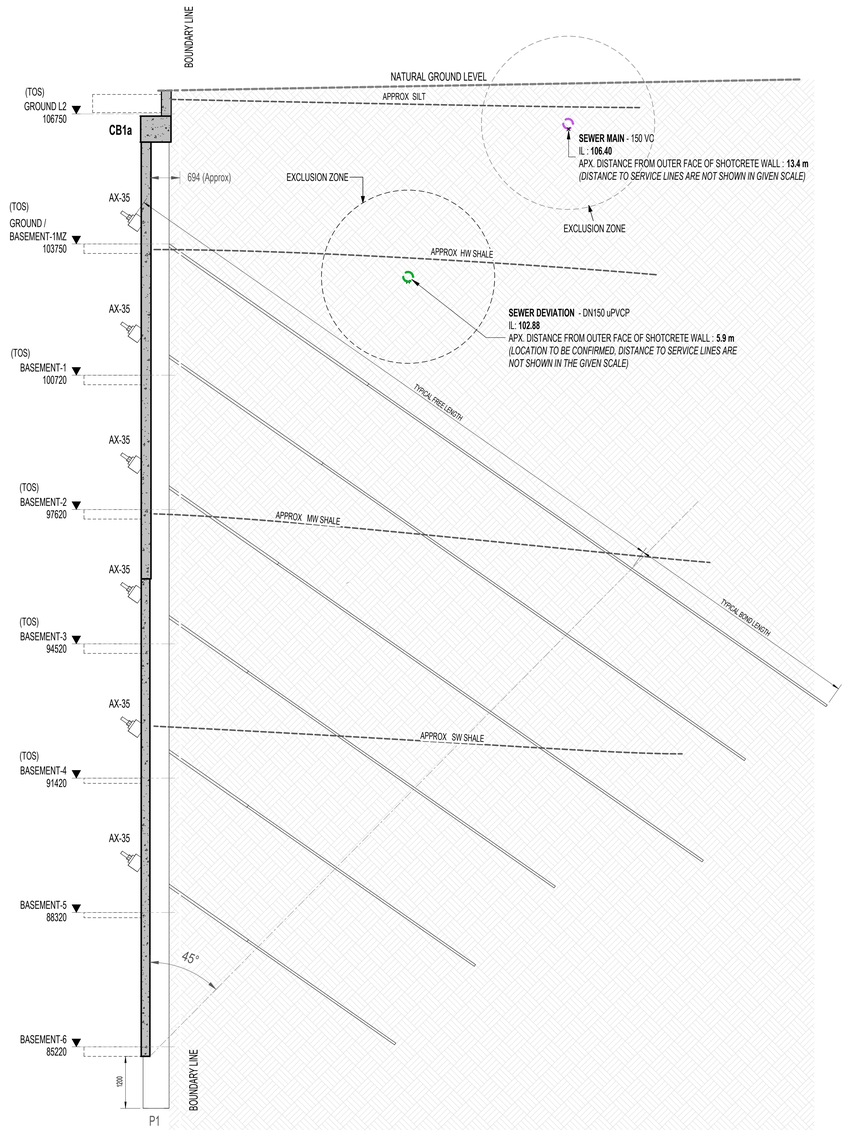
Designed:	NAA	Project Director Approved	Date	North
Modelled:	RT	JT	24.05.15	
Scale:	1:100	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10012	H

NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.: DRAWING TITLE:		BODY CORP BEG TAG:		
SHORING SECTIONS SH1		DA No:		
		DRAWING No: S10016		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO



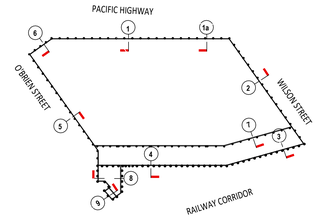
FOR ANCHOR BOND LENGTH REFER TO APPLICABLE SHORING ELEVATION **S10010 ELEVATION -SW1**

01 / S10001 **SECTION -1**
SCALE @ 1:50



FOR ANCHOR BOND LENGTH REFER TO APPLICABLE SHORING ELEVATION **S10010 ELEVATION -SW2**

02 / S10001 **SECTION -2**
SCALE @ 1:50



KEY PLAN

NOTES:

1. BOUNDARY DIMENSIONS ARE SHOWN INDICATIVELY ONLY. PLEASE FOLLOW ARCHITECT DRAWINGS FOR THE DETAILS.
2. THE POTABLE WATER PIPE DIAMETER IS TENTATIVELY ASSUMED TO BE 110mm
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRG S-0006 -SITE RETENTION PLAN

SHORING WALL SW1

- DENOTES EXPOSED ROCK / SHALE FACE TO BE RETAINED WITH SHOTCRETE AND ROCK BOLTS TO GEOTECHNICAL ENGINEERS' DETAILS
- DENOTES 175 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 150 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 200 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH
- DENOTES 225 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH

NOTE :
EXTENT OF SHOTCRETE WALLS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
H	ISSUED FOR INFORMATION ONLY	25.05.09	RT	NAA
G	ISSUED FOR INFORMATION ONLY	25.04.03	RT	NAA
F	ISSUED FOR INFORMATION ONLY	25.03.25	RT	NAA
E	ISSUED FOR INFORMATION ONLY	25.03.11	RT	NAA
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	25.02.18	RM	JT

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Project:
849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.

Developer:
Billbergia creating communities®

Contractor:

Architect :
pbd architects

Design Consultant:
CADIGAL GROUP
1002, 22-24 Market Street,
Sydney , NSW 2000
Australia
T: +61 2 8630 8559
info@cadigalgroup.com.au
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Drawing Title:
SHORING WALL SECTIONS - SHEET 1

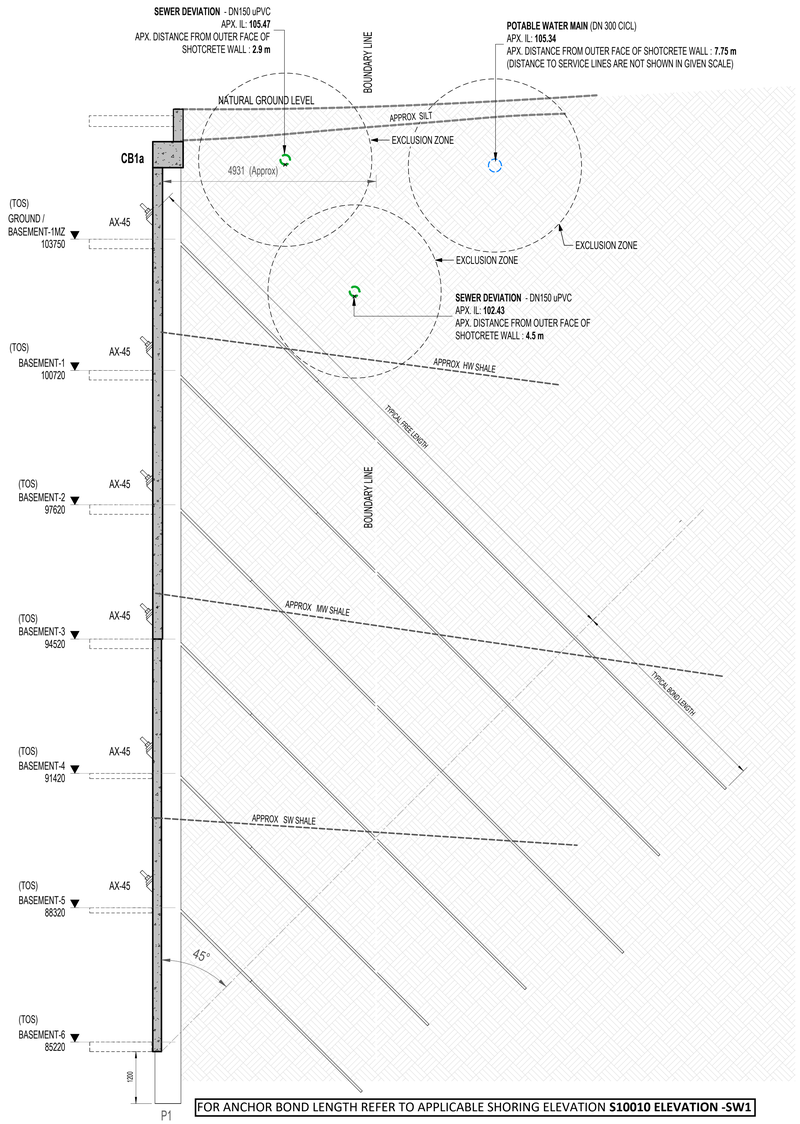
STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Modelled:	RT	JT	24.05.15	
Scale:	1:100	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10016	H

NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
SHORING SECTIONS SH2		DA No:		
		DRAWING No: S10017		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO

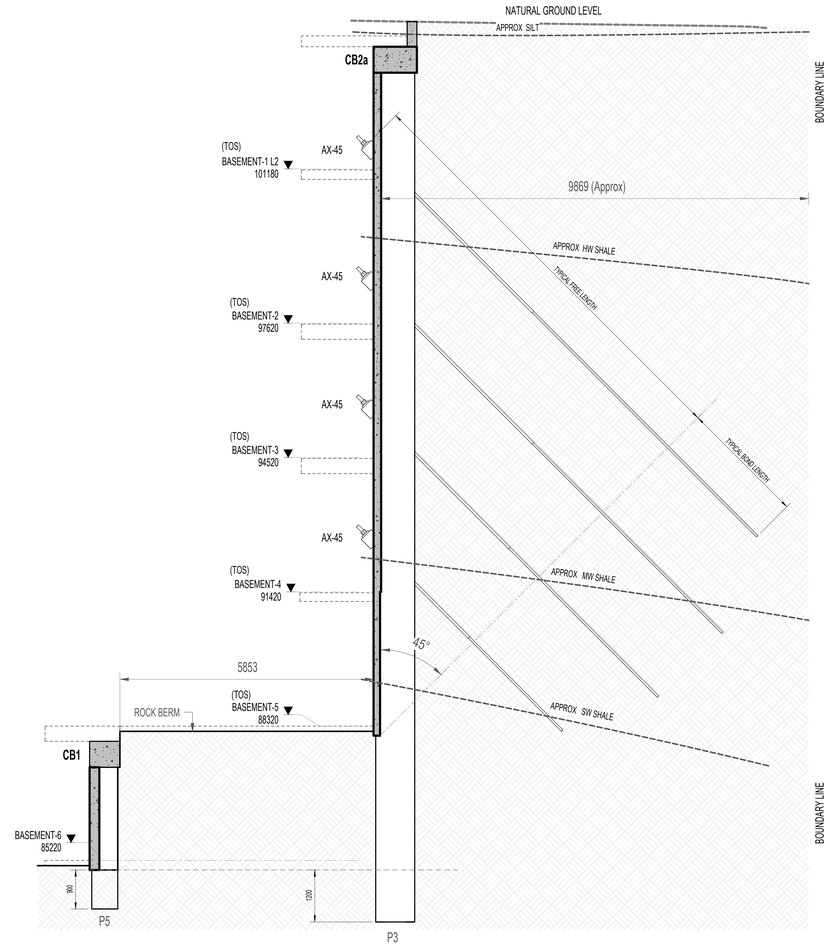
NOTES:

1. BOUNDARY DIMENSIONS ARE SHOWN INDICATIVELY ONLY. PLEASE FOLLOW ARCHITECT DRAWINGS FOR THE DETAILS.
2. THE POTABLE WATER PIPE DIAMETER IS TENTATIVELY ASSUMED TO BE 110mm



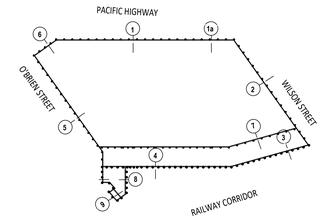
FOR ANCHOR BOND LENGTH REFER TO APPLICABLE SHORING ELEVATION **S10010 ELEVATION -SW1**

07 S10001 **SECTION -1a**
SCALE @ 1:50



FOR ANCHOR BOND LENGTH REFER TO APPLICABLE SHORING ELEVATION **S10011 ELEVATION-SW4**

04 S10001 **SECTION-4**
SCALE @ 1:50



KEY PLAN

NOTES:

1. BOUNDARY DIMENSIONS ARE SHOWN INDICATIVELY ONLY. PLEASE FOLLOW ARCHITECT DRAWINGS FOR THE DETAILS.
2. THE POTABLE WATER PIPE DIAMETER IS TENTATIVELY ASSUMED TO BE 110mm
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRG S-0006 -SITE RETENTION PLAN

SHORING WALL SW1

- DENOTES EXPOSED ROCK / SHALE FACE TO BE RETAINED WITH SHOTCRETE AND ROCK BOLTS TO GEOTECHNICAL ENGINEERS' DETAILS
- DENOTES 175 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 150 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 200 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH
- DENOTES 225 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH

NOTE :
EXTENT OF SHOTCRETE WALLS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
H	ISSUED FOR INFORMATION ONLY	25.05.09	RT	NAA
G	ISSUED FOR INFORMATION ONLY	25.04.03	RT	NAA
F	ISSUED FOR INFORMATION ONLY	25.03.25	RT	NAA
E	ISSUED FOR INFORMATION ONLY	25.03.11	RT	NAA
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	25.02.18	RM	JT

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Project: **849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.**

Developer: Billbergia creating communities®

Contractor:

Architect : pbd architects

Design Consultant: CADIGAL GROUP
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T: +61 2 8630 8559
info@cadigalgroup.com.au
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Drawing Title:

SHORING WALL SECTIONS - SHEET 2

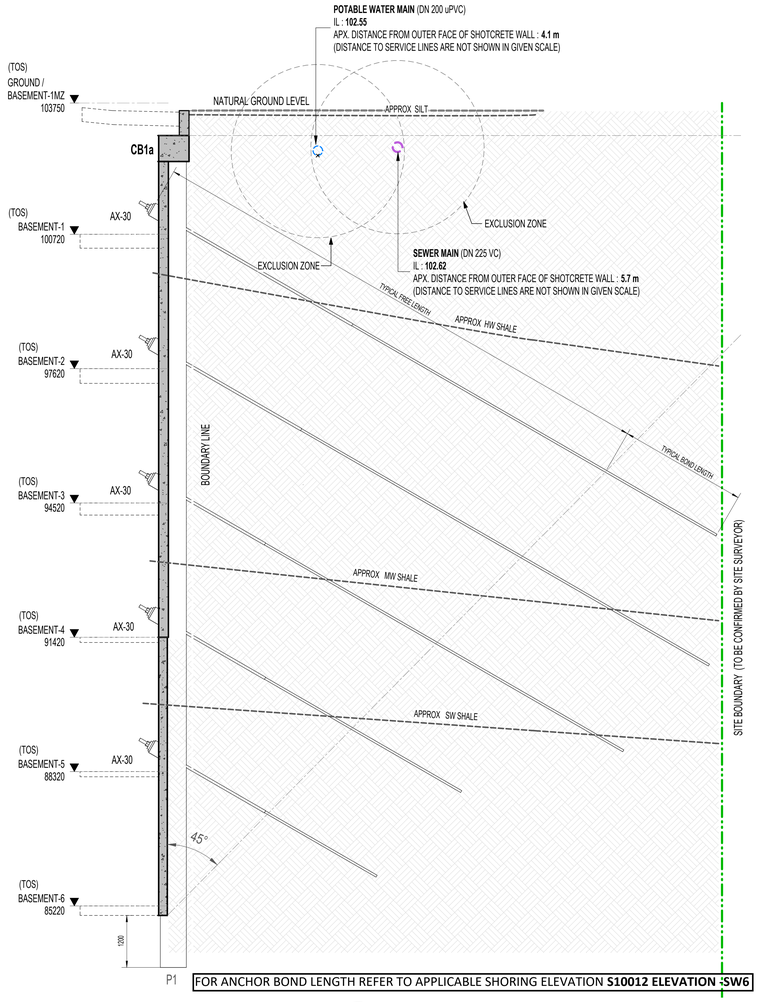
STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Modelled:	RT	JT	24.05.15	
Scale:	1:100	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10017	H

NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
SHORING SECTIONS SH2		DA No:		
		DRAWING No: S10018		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO

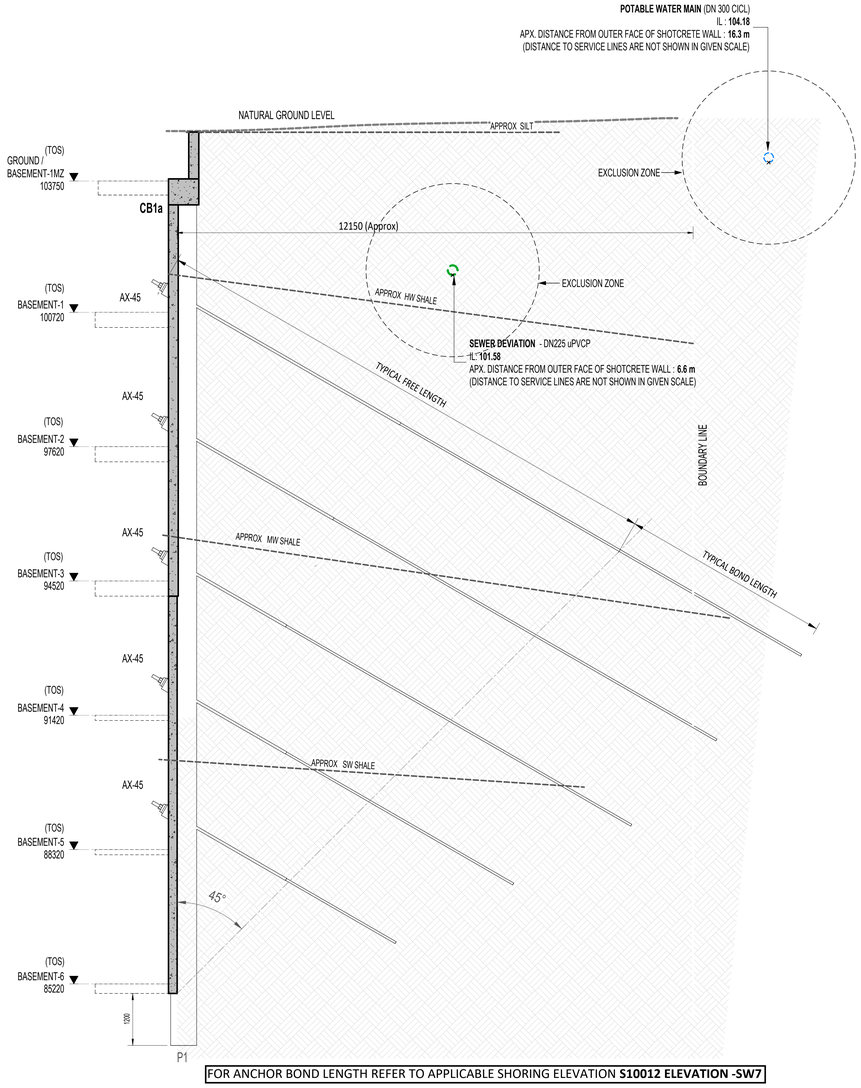
NOTES:

1. BOUNDARY DIMENSIONS ARE SHOWN INDICATIVELY ONLY. PLEASE FOLLOW ARCHITECT DRAWINGS FOR THE DETAILS.
2. THE POTABLE WATER PIPE DIAMETER IS TENTATIVELY ASSUMED TO BE 110mm



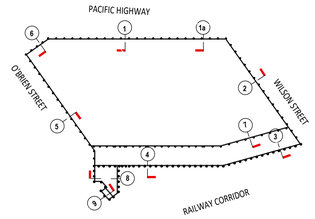
FOR ANCHOR BOND LENGTH REFER TO APPLICABLE SHORING ELEVATION **S10012 ELEVATION -SW6**

05 / S10001 **SECTION -5**
SCALE @ 1:50



FOR ANCHOR BOND LENGTH REFER TO APPLICABLE SHORING ELEVATION **S10012 ELEVATION -SW7**

06 / S10001 **SECTION -6**
SCALE @ 1:50



KEY PLAN

NOTES:

1. BOUNDARY DIMENSIONS ARE SHOWN INDICATIVELY ONLY. PLEASE FOLLOW ARCHITECT DRAWINGS FOR THE DETAILS.
2. THE POTABLE WATER PIPE DIAMETER IS TENTATIVELY ASSUMED TO BE 110mm
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRG S-0006 -SITE RETENTION PLAN

SHORING WALL SW1

- DENOTES EXPOSED ROCK / SHALE FACE TO BE RETAINED WITH SHOTCRETE AND ROCK BOLTS TO GEOTECHNICAL ENGINEERS' DETAILS
- DENOTES 175 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 150 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 200 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH
- DENOTES 225 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH

NOTE :
EXTENT OF SHOTCRETE WALLS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
H	ISSUED FOR INFORMATION ONLY	25.05.09	RT	NAA
G	ISSUED FOR INFORMATION ONLY	25.04.03	RT	NAA
F	ISSUED FOR INFORMATION ONLY	25.03.25	RT	NAA
E	ISSUED FOR INFORMATION ONLY	25.03.11	RT	NAA
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	25.02.18	RM	JT

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Project: **849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.**

Developer: Billbergia creating communities®

Contractor:

Architect : pbd architects

Design Consultant: CADIGAL GROUP

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info@cadigalgroup.com.au

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Drawing Title:

SHORING WALL SECTIONS - SHEET 3

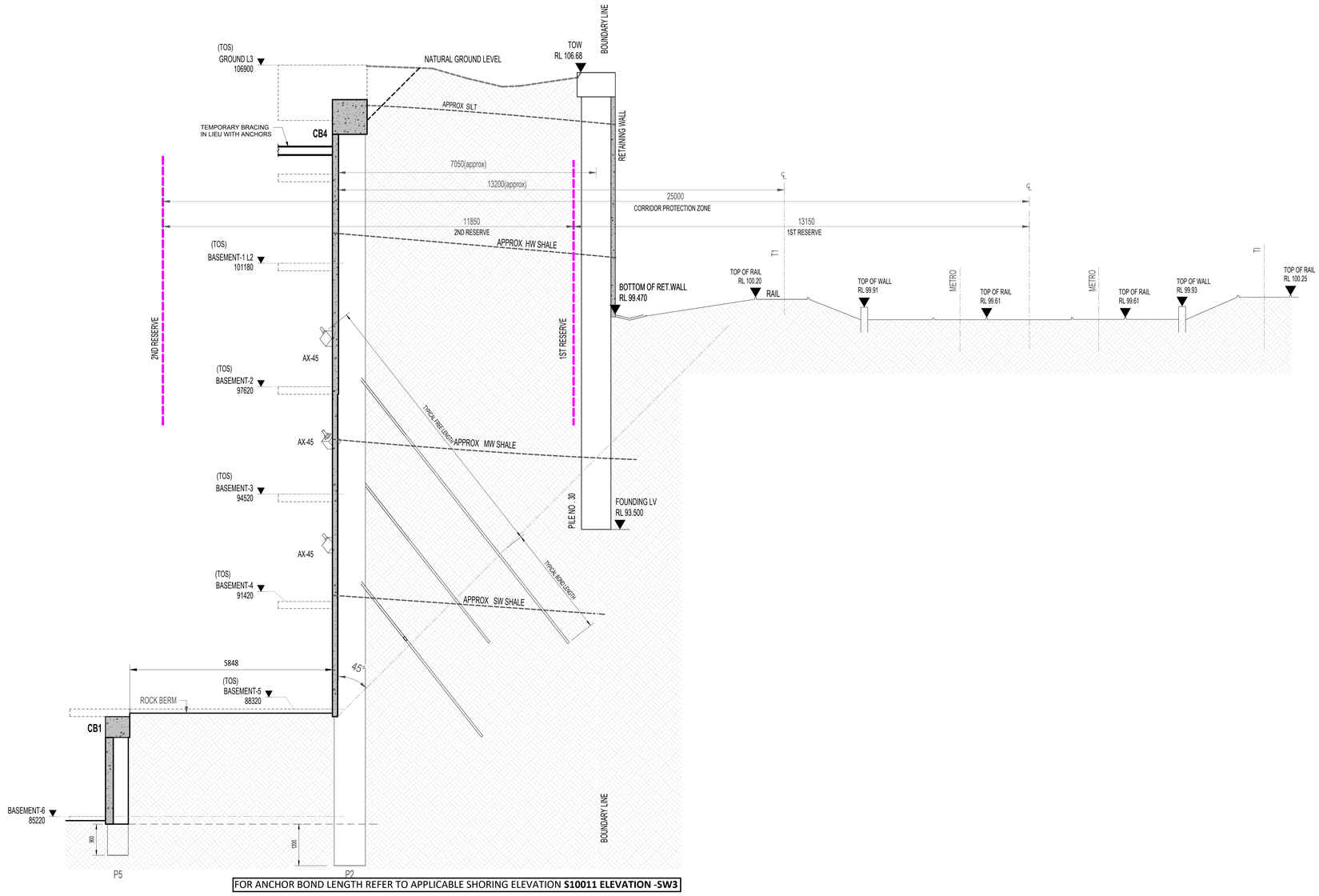
STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Modelled:	RT	JT	24.05.15	
Scale:	1:100	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10018	H

NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
SHORING SECTIONS SH4		DA No:		
		DRAWING No: S10019		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO

NOTES:

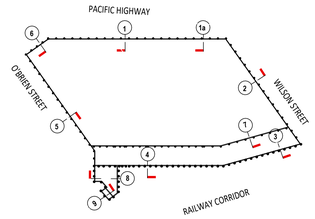
1. BOUNDARY DIMENSIONS ARE SHOWN INDICATIVELY ONLY. PLEASE FOLLOW ARCHITECT DRAWINGS FOR THE DETAILS.
2. THE POTABLE WATER PIPE DIAMETER IS TENTATIVELY ASSUMED TO BE 110mm



FOR ANCHOR BOND LENGTH REFER TO APPLICABLE SHORING ELEVATION **S10011 ELEVATION -SW3**

03 / S10001 **SECTION -3**

SCALE @ 1:50



KEY PLAN

NOTES:

1. BOUNDARY DIMENSIONS ARE SHOWN INDICATIVELY ONLY. PLEASE FOLLOW ARCHITECT DRAWINGS FOR THE DETAILS.
2. THE POTABLE WATER PIPE DIAMETER IS TENTATIVELY ASSUMED TO BE 110mm
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRG S-0006 -SITE RETENTION PLAN

SHORING WALL SW1

- DENOTES EXPOSED ROCK / SHALE FACE TO BE RETAINED WITH SHOTCRETE AND ROCK BOLTS TO GEOTECHNICAL ENGINEERS' DETAILS
- DENOTES 175 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 150 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 200 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH
- DENOTES 225 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH

NOTE :
EXTENT OF SHOTCRETE WALLS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
H	ISSUED FOR INFORMATION ONLY	25.05.09	RT	NAA
G	ISSUED FOR INFORMATION ONLY	25.04.03	RT	NAA
F	ISSUED FOR INFORMATION ONLY	25.03.25	RT	NAA
E	ISSUED FOR INFORMATION ONLY	25.03.11	RT	NAA
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	25.02.18	RM	JT

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849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.

Developer:
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Contractor:

Architect :
pbd architects

Design Consultant:
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Australia
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info@cadigalgroup.com.au
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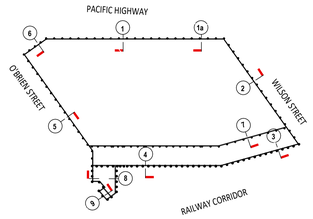
Drawing Title:
SHORING WALL SECTIONS - SHEET 4

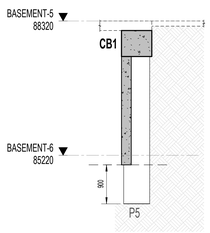
STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Modelled:	RT	JT	24.05.15	
Scale:	1:100	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10019	H

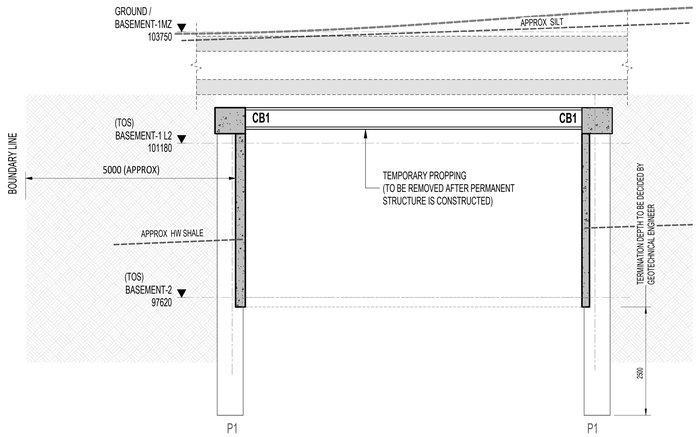
NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.: DRAWING TITLE:		BODY CORP BEG TAG:		
SHORING ELEVATION SW6		DA No:		
		DRAWING No: S10020		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO



KEY PLAN



07 S10001 **SECTION -7**
SCALE @ 1:50



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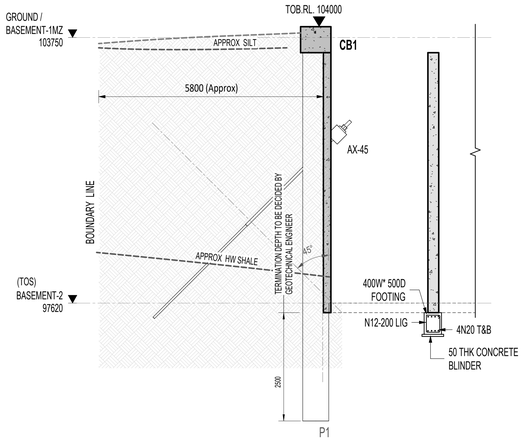

09 S10001 **SECTION-9**
SCALE @ 1:50

NOTES:

1. BOUNDARY DIMENSIONS ARE SHOWN INDICATIVELY ONLY. PLEASE FOLLOW ARCHITECT DRAWINGS FOR THE DETAILS.
2. THE POTABLE WATER PIPE DIAMETER IS TENTATIVELY ASSUMED TO BE 110mm
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRG S-0006 -SITE RETENTION PLAN

SHORING WALL SW1

- DENOTES EXPOSED ROCK / SHALE FACE TO BE RETAINED WITH SHOTCRETE AND ROCK BOLTS TO GEOTECHNICAL ENGINEERS' DETAILS
- DENOTES 175 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 150 THK. SHOTCRETE WALL WITH REO. SL102MESH
- DENOTES 200 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH
- DENOTES 225 THK. SHOTCRETE WALL WITH REO. DOUBLE SL102MESH

NOTE :
EXTENT OF SHOTCRETE WALLS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
H	ISSUED FOR INFORMATION ONLY	25.05.09	RT	NAA
G	ISSUED FOR INFORMATION ONLY	25.04.03	RT	NAA
F	ISSUED FOR INFORMATION ONLY	25.03.25	RT	NAA
E	ISSUED FOR INFORMATION ONLY	25.03.11	RT	NAA
D	ISSUED FOR INFORMATION ONLY (PRELIMINARY DD 70%)	25.02.18	RM	JT

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849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.

Developer:
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Contractor:

Architect :
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Design Consultant:
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info@cadigalgroup.com.au

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Drawing Title:
SHORING WALL SECTIONS - SHEET 5

STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Modelled:	RT	JT	24.05.15	
Scale:	1:100	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10020	H

NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
SW3 TEMPORARY BRACING -3D VIEW		DA No:		
		DRAWING No: S10100		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO

SW3 - TEMPORARY BRACING - 3D VIEW

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
A	ISSUED FOR INFORMATION ONLY	25.03.21	RT	NAA

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Project:
849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.

Developer:
Billbergia
creating communities®

Contractor:

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pbd architects

Design Consultant:
CADIGAL GROUP
1002, 22-24 Market Street,
Sydney , NSW 2000
Australia
T: +61 2 8630 8559
info@c-adigalgroup-.com.au
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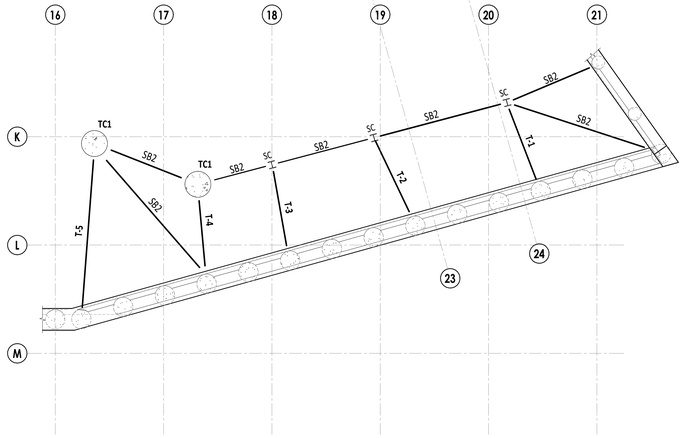
Drawing Title:
TEMPORARY BRACING-3D VIEW

STRUCTURAL DRAWINGS

Designed:	NAA	Project Director Approved	Date	North
Modelled:	RT	JT	03/21/25	
Scale:		Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10100	A

NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
TEMPORARY BRACING -PLANS		DA No:		
		DRAWING No: S10101		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO



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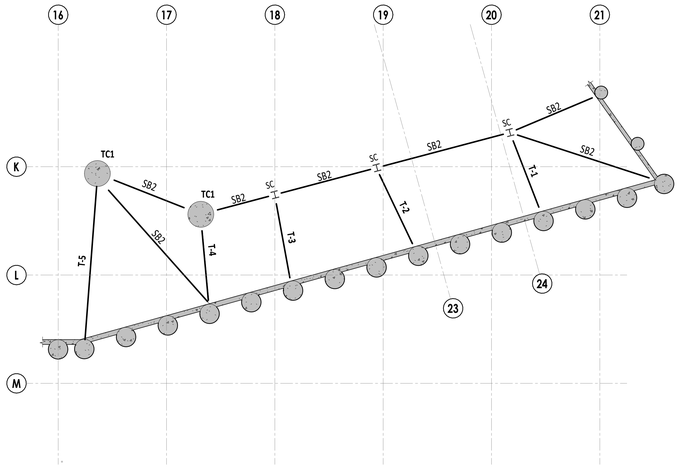
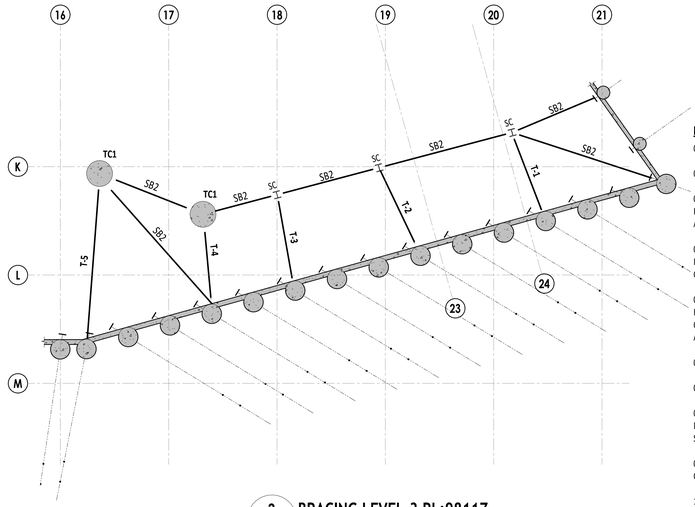
SCALE @ 1 : 100



2 BRACING LEVEL-2 RL:101217
SCALE @ 1 : 100



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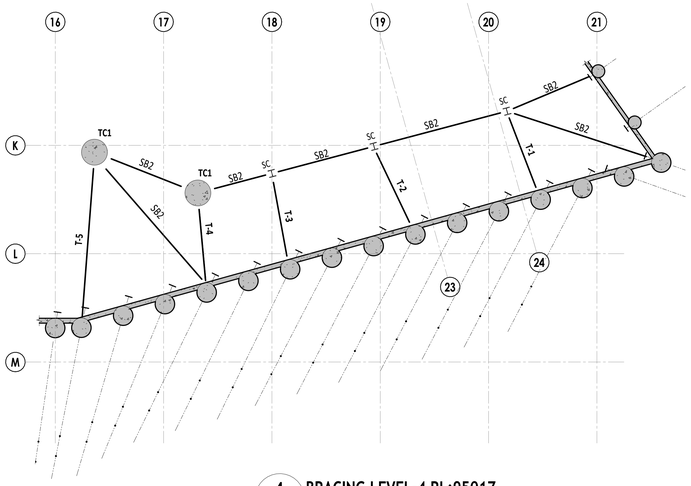
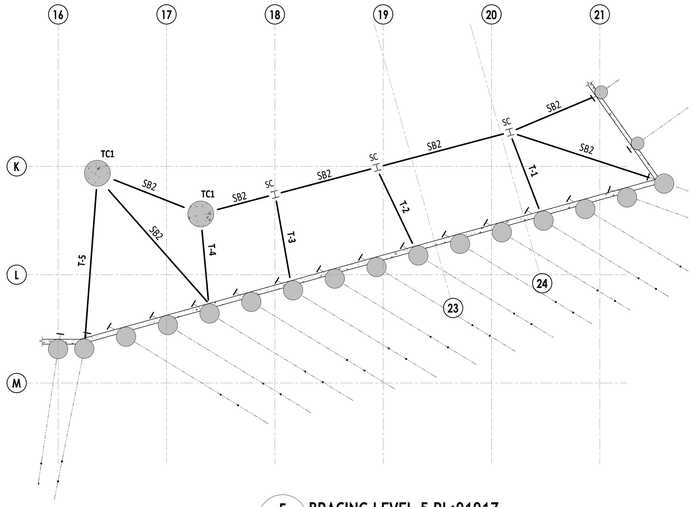
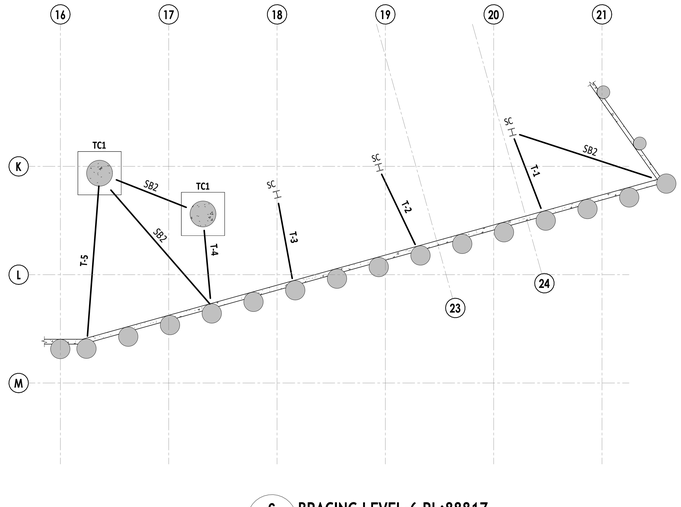


4 BRACING LEVEL-4 RL:95017
SCALE @ 1 : 100



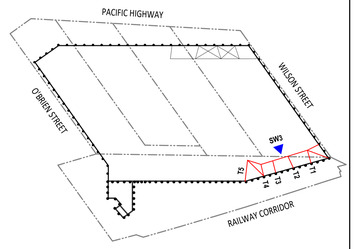
5 BRACING LEVEL-5 RL:91917
SCALE @ 1 : 100



6 BRACING LEVEL-6 RL:88817
SCALE @ 1 : 100

TEMPORARY BRACING -PLANS

SCALE @ 1:100



KEY PLAN

NOTES:

01.REFER DRAWINGS S10001-S10005,S10012 & S10019 FOR SHORING DETAILS.

02.REFER DRAWINGS S30002-S30008 FOR GENERAL ARRANGEMENTS

03.UNLESS NOTED OTHERWISE, ALL STEELWORK SHALL BE PREPARED, PRIMED AND PAINTED IN ACCORDANE WITH THE SPECIFICATION. ALL EXTERNAL EXPOSED STEELWORK TO BE HOT DIP GALVANISED.

04.UNLESS NOTED OTHERWISE, ALL EXTERNAL EXPOSED STEELWORK IN SOIL SHALL BE COATED WITH EPOXY PROTECTIVE COATINGS CONFORMING TO AS/NZS 2312.

05.UNLESS NOTED OTHERWISE, ALL WELDS TO BE 8mm CONTINUOUS FILLETS, LAID DOWN WITH APPROVED COVERED ELECTRODES. ALL WELDS SHALL BE CATEGORY SP. WELDS SHALL CONFORM TO AS/NZS 1554 AND ELECTRODES TO AS/NZS 1553.

06.REFER TO CORRESPONDING ARCHITECTURAL DRAWINGS FOR RL VALUES.

07.ALL DIMENSIONS ARE IN MILLIMETERS.

08.GEOTECHNICAL ENGINEER TO INSPECT EXPOSED SHALE FACE REGULARY DURING EXCAVATION AND NOMINATED APPROPRIATE SOIL ANCHORS AND SHOTCRETE AS REQUIRED TO ENSURE STABILITY AT ALL TIMES.

09.ANCHOR LENGTH ARE SHOWN INDICATIVELY ONLY, THIS IS DETERMINED BY OTHERS.

10.THE SHORING DESIGN IS PERFORMED BASED ON THE GEOTECHNICAL REPORT PROVIDED BY THE FORTIFY GEOTECH.

i - GEOTECHNICAL INVESTIGATION REPORT ISSUED ON 14/12/2023 (REF - JS/S1998 Rev 2)

iii - MN/S2207-2: (REV1) DATED 13.05.2024 RESPONSES TO CADIGAL GROUP'S CONSULTANT ADVICE NOTICE DATED 22/04/2024

STEEL FRAMING SCHEDULE	
MARK	SIZE
SB1	250UC89.5 (GR 300)
SB2	200UC52.2 (GR 300)
SB3	250UC72.9 (GR 300)
SB4	200UC46.2 (GR 300)
SC	310UC158 (GR 300)

COLUMN SCHEDULE		
MARK	SIZE	GRADE
TC1	1200 DIA	N80

WORK IN PROGRESS
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Rev	Description	Date	By	App
A	ISSUED FOR INFORMATION ONLY	25.03.21	RT	NAA

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Project: **849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.**

Developer: Billbergia creating communities®

Contractor:

Architect : pbd architects

Design Consultant: CADIGAL GROUP

1002, 22-24 Market Street,
Sydney , NSW 2000
Australia
T: +61 2 8630 8559
info@cadigalgroup.com.au

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Drawing Title:

TEMPORARY BRACING -PLANS

STRUCTURAL DRAWINGS

Designed: NAA	Project Director Approved	Date	North
Modelled: RT	JT	03/21/25	
Scale: 1:100	Project Ref.	Drawing No.	Rev
Sheet: A0	01-100084	S10101	A

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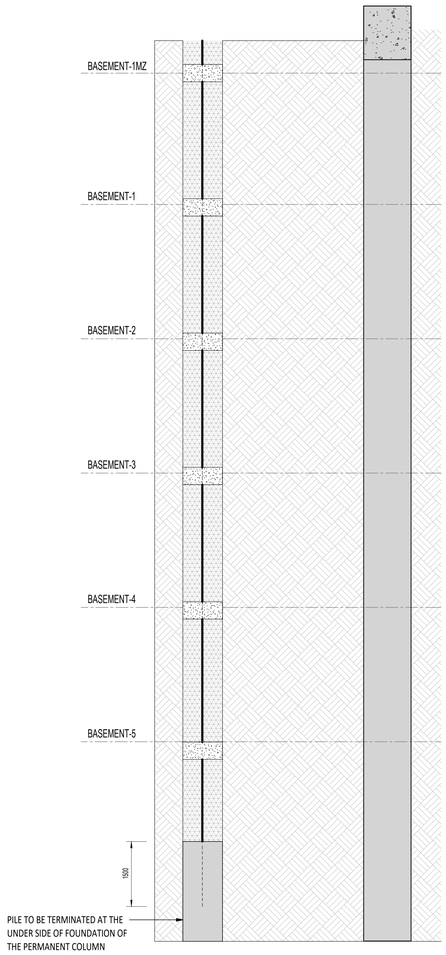
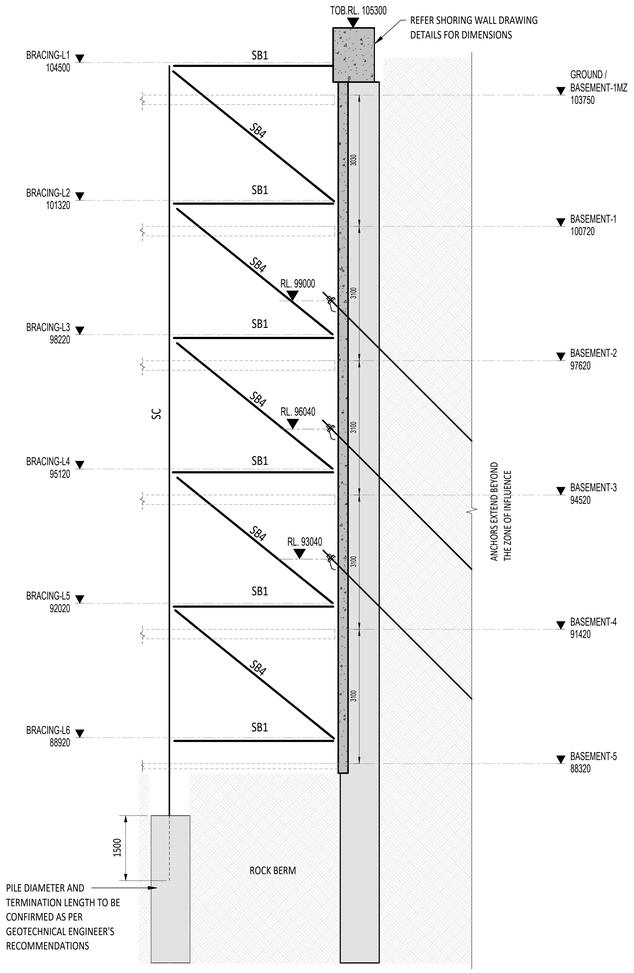
NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
CONNECTION DETAILS OF TRUSS T-4		DA No:		
		DRAWING No: S10105		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO

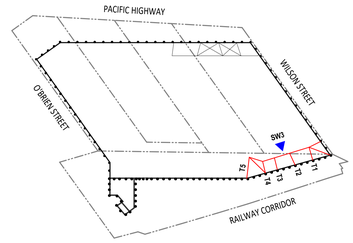


TYPICAL STEEL COLUMN INSTALLATION DETAIL



TRUSS T-1

SCALE @ 1 : 50



KEY PLAN

NOTE:

ALL STEEL COLUMNS SHALL BE INSTALLED IN ACCORDANCE WITH THE 'TYPICAL COLUMN INSTALLATION DETAIL.' THIS DETAIL MUST BE FOLLOWED FOR ALL LOCATIONS AS APPLICABLE.

STEEL FRAMING SCHEDULE	
MARK	SIZE
SB1	250UC89.5 (GR 300)
SB2	200UC52.2 (GR 300)
SB3	250UC72.9 (GR 300)
SB4	200UC46.2 (GR 300)
SC	310UC158 (GR 300)

SHORING WALL SW1

DENOTES SOIL FILL

DENOTES MASS CONCRETE FILL

DENOTES ROCK BERM

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
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Design Consultant: CADIGAL GROUP

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Drawing Title:

BRACING DETAIL-SH1

STRUCTURAL DRAWINGS

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Scale:	1:50	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10102	A

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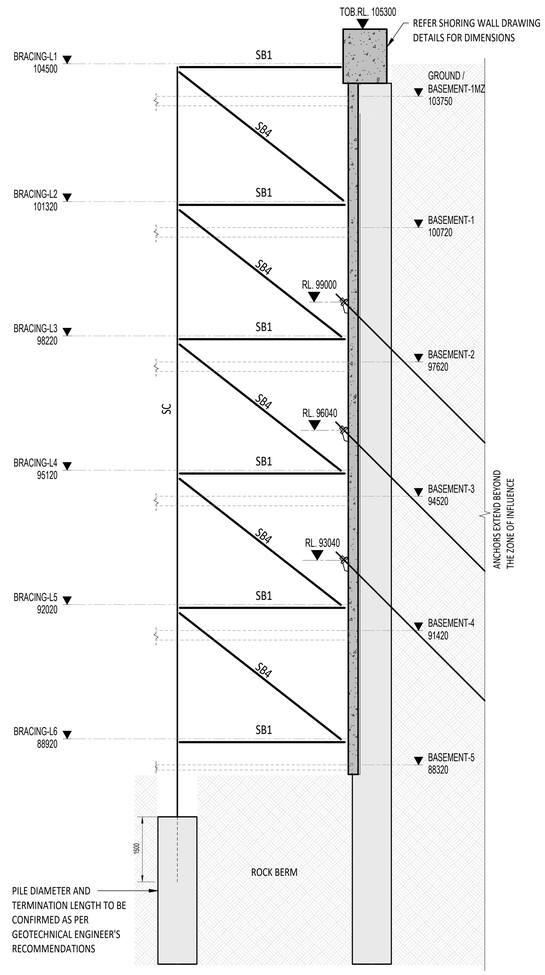
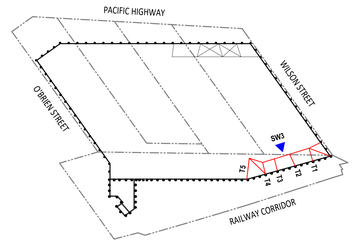
NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
		DA No:		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO



TRUSS T-2

SCALE @ 1 : 50



KEY PLAN

NOTE:

ALL STEEL COLUMNS SHALL BE INSTALLED IN ACCORDANCE WITH THE 'TYPICAL COLUMN INSTALLATION DETAIL.' THIS DETAIL MUST BE FOLLOWED FOR ALL LOCATIONS AS APPLICABLE.

STEEL FRAMING SCHEDULE	
MARK	SIZE
SB1	250UC89.5 (GR 300)
SB2	200UC52.2 (GR 300)
SB3	250UC72.9 (GR 300)
SB4	200UC46.2 (GR 300)
SC	310UC158 (GR 300)

SHORING WALL SW1

DENOTES SOIL FILL

DENOTES MASS CONCRETE FILL

DENOTES ROCK BERM

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
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Design Consultant: CADIGAL GROUP

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Drawing Title:

BRACING DETAIL-SH2

STRUCTURAL DRAWINGS

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Scale:	1:50	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10103	A

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NON-REGULATED DESIGN RECORD

PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.

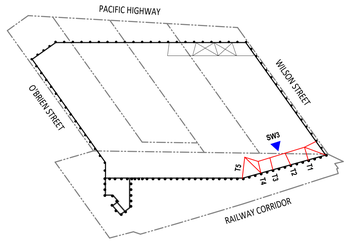
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES

CONSENT No.: DRAWING TITLE: BODY CORP BEG TAG:

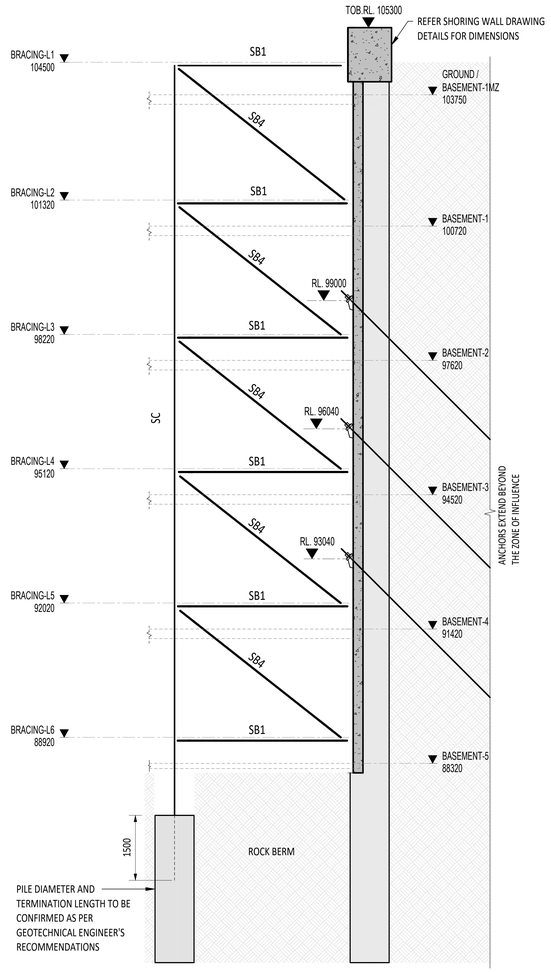
CONNECTION DETAILS OF TRUSS T-1 DA No:

DRAWING No: S10102

REV	DATE	DESCRIPTION	DP FULL NAME	REG NO



KEY PLAN



TRUSS T-3

SCALE @ 1 : 50

NOTE:

ALL STEEL COLUMNS SHALL BE INSTALLED IN ACCORDANCE WITH THE 'TYPICAL COLUMN INSTALLATION DETAIL.' THIS DETAIL MUST BE FOLLOWED FOR ALL LOCATIONS AS APPLICABLE.

STEEL FRAMING SCHEDULE	
MARK	SIZE
SB1	250UC89.5 (GR 300)
SB2	200UC52.2 (GR 300)
SB3	250UC72.9 (GR 300)
SB4	200UC46.2 (GR 300)
SC	310UC158 (GR 300)

SHORING WALL SW1

DENOTES SOIL FILL

DENOTES MASS CONCRETE FILL

DENOTES ROCK BERM

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

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Design Consultant:

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BRACING DETAIL-SH3

STRUCTURAL DRAWINGS

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Scale:	1:50	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10104	A

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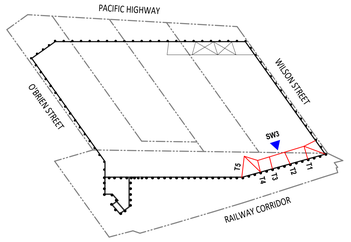
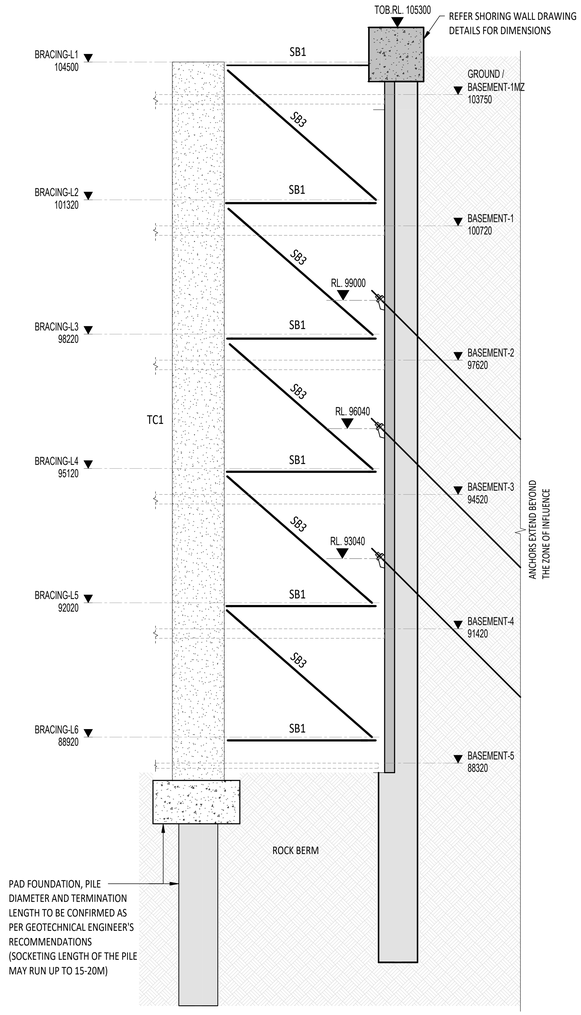
NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.: DRAWING TITLE:		BODY CORP BEG TAG:		
CONNECTION DETAILS OF TRUSS T-2		DA No:		
		DRAWING No: S10103		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO



KEY PLAN



TRUSS T-4

SCALE @ 1 : 50

COLUMN SCHEDULE		
MARK	SIZE	GRADE
TC1	1200 DIA	N80

STEEL FRAMING SCHEDULE	
MARK	SIZE
SB1	250UC89.5 (GR 300)
SB2	200UC52.2 (GR 300)
SB3	250UC72.9 (GR 300)
SB4	200UC46.2 (GR 300)
SC	310UC158 (GR 300)

SHORING WALL SW1

- DENOTES SOIL FILL
- DENOTES MASS CONCRETE FILL
- DENOTES ROCK BERM

WORK IN PROGRESS
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Rev	Description	Date	By	App
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Drawing Title:

BRACING DETAIL-SH4

STRUCTURAL DRAWINGS

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Modelled:	RT	JT	03/21/25	
Scale:	1:50	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10105	A

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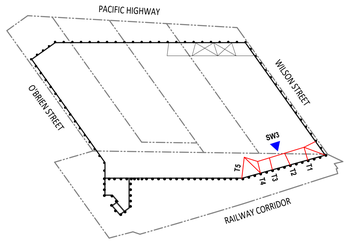
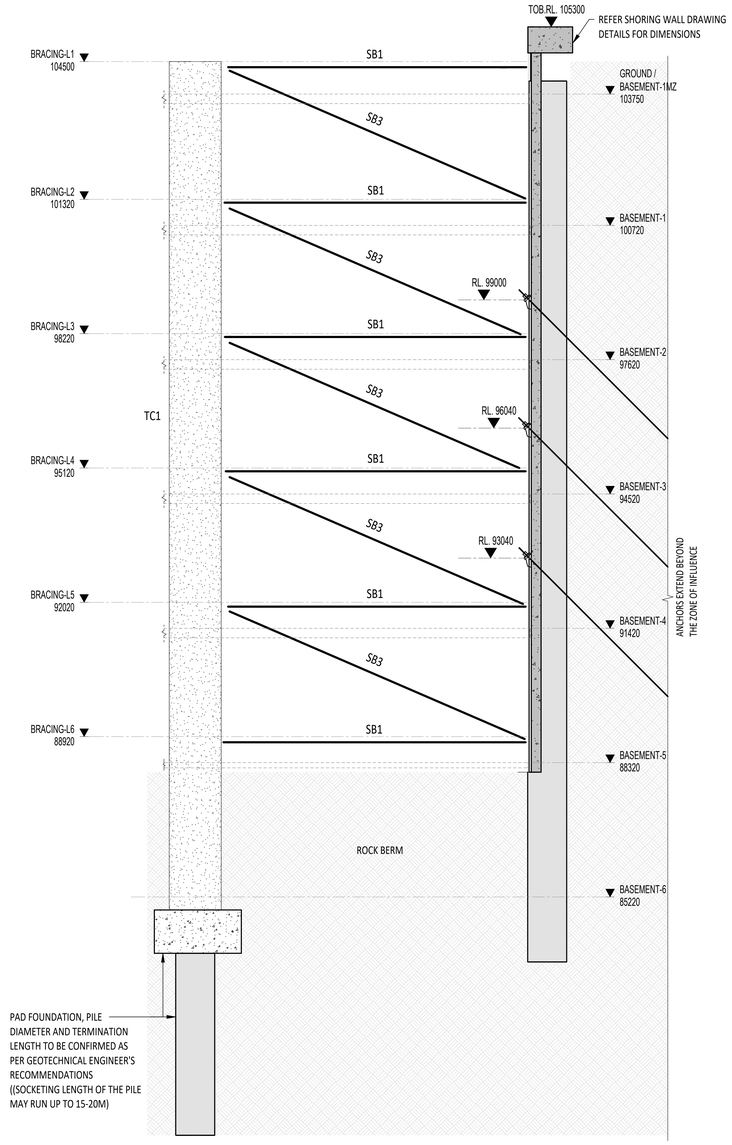
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
CONNECTION DETAILS OF TRUSS T-3		DA No:		
		DRAWING No: S10104		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO



KEY PLAN



TRUSS T-5

SCALE @ 1 : 50

COLUMN SCHEDULE		
MARK	SIZE	GRADE
TC1	1200 DIA	N80

STEEL FRAMING SCHEDULE	
MARK	SIZE
SB1	250UC89.5 (GR 300)
SB2	200UC52.2 (GR 300)
SB3	250UC72.9 (GR 300)
SB4	200UC46.2 (GR 300)
SC	310UC158 (GR 300)

SHORING WALL SW1

- DENOTES SOIL FILL
- DENOTES MASS CONCRETE FILL
- DENOTES ROCK BERM

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Drawing Title:

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STRUCTURAL DRAWINGS

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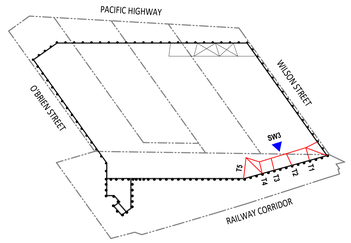
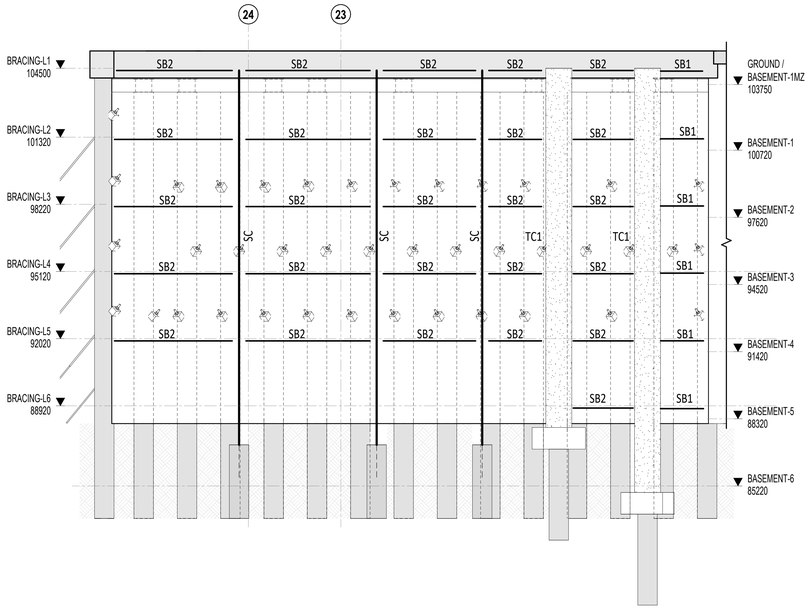
Modelled:	RT	JT	03/21/25	
Scale:	1:50	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10106	A

NON-REGULATED DESIGN RECORD

PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.: DRAWING TITLE:		BODY CORP BEG TAG:		
TEMP. BRACING FRONT ELEVATION		DA No:		
		DRAWING No: S10106		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO



KEY PLAN



TEMPORARY BRACING - FRONT ELEVATION

SCALE @ 1 : 100

COLUMN SCHEDULE		
MARK	SIZE	GRADE
TC1	1200 DIA	N80

STEEL FRAMING SCHEDULE	
MARK	SIZE
SB1	250UC89.5 (GR 300)
SB2	200UC52.2 (GR 300)
SB3	250UC72.9 (GR 300)
SB4	200UC46.2 (GR 300)
SC	310UC158 (GR 300)

SHORING WALL SW1

DENOTES SOIL FILL

DENOTES MASS CONCRETE FILL

DENOTES ROCK BERM

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Project: **849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.**

Developer: Billbergia creating communities®

Contractor:

Architect : pbd architects

Design Consultant:

CADIGAL GROUP
1002, 22-24 Market Street,
Sydney , NSW 2000
Australia
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info@cadigalgroup.com.au
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Drawing Title:

BRACING - FRONT ELEVATION

STRUCTURAL DRAWINGS

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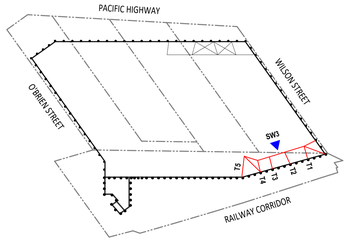
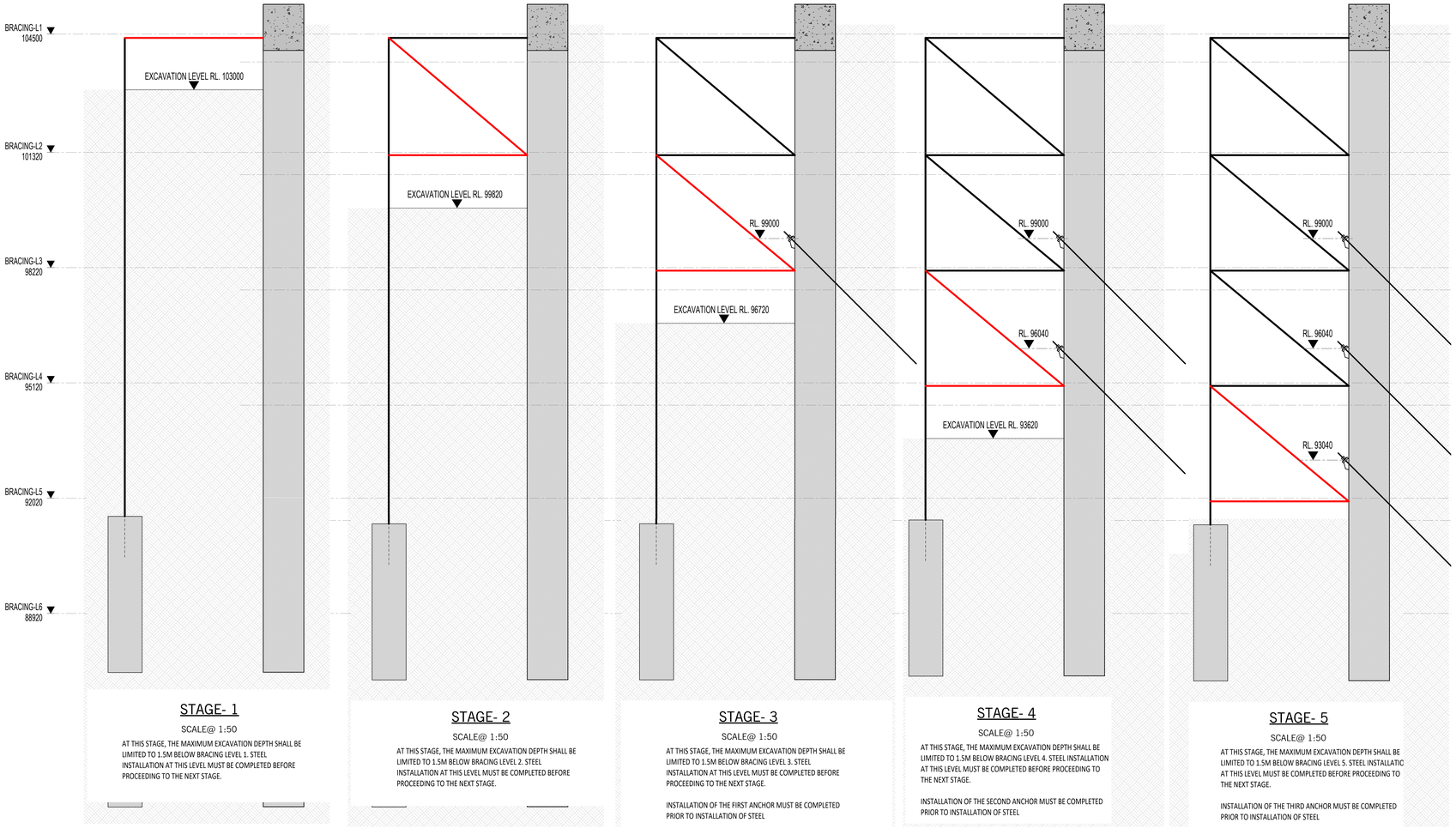
Scale:	1:100	Project Ref.	Drawing No.	Rev
Sheet:	A0	01-100084	S10107	A

NON-REGULATED DESIGN RECORD				
PROJECT ADDRESS: 849-859 PACIFIC HIGHWAY & 2-8 WILSON STEET, CHATSWOOD.				
PROJECT TITLE: CHATSWOOD GRAND RESIDENCES				
CONSENT No.:	DRAWING TITLE:	BODY CORP BEG TAG:		
		DA No:		
REV	DATE	DESCRIPTION	DP FULL NAME	REG NO



KEY PLAN



STAGE- 1

SCALE@ 1:50

AT THIS STAGE, THE MAXIMUM EXCAVATION DEPTH SHALL BE LIMITED TO 1.5M BELOW BRACING LEVEL 1. STEEL INSTALLATION AT THIS LEVEL MUST BE COMPLETED BEFORE PROCEEDING TO THE NEXT STAGE.

STAGE- 2

SCALE@ 1:50

AT THIS STAGE, THE MAXIMUM EXCAVATION DEPTH SHALL BE LIMITED TO 1.5M BELOW BRACING LEVEL 2. STEEL INSTALLATION AT THIS LEVEL MUST BE COMPLETED BEFORE PROCEEDING TO THE NEXT STAGE.

STAGE- 3

SCALE@ 1:50

AT THIS STAGE, THE MAXIMUM EXCAVATION DEPTH SHALL BE LIMITED TO 1.5M BELOW BRACING LEVEL 3. STEEL INSTALLATION AT THIS LEVEL MUST BE COMPLETED BEFORE PROCEEDING TO THE NEXT STAGE.

INSTALLATION OF THE FIRST ANCHOR MUST BE COMPLETED PRIOR TO INSTALLATION OF STEEL

STAGE- 4

SCALE@ 1:50

AT THIS STAGE, THE MAXIMUM EXCAVATION DEPTH SHALL BE LIMITED TO 1.5M BELOW BRACING LEVEL 4. STEEL INSTALLATION AT THIS LEVEL MUST BE COMPLETED BEFORE PROCEEDING TO THE NEXT STAGE.

INSTALLATION OF THE SECOND ANCHOR MUST BE COMPLETED PRIOR TO INSTALLATION OF STEEL

STAGE- 5

SCALE@ 1:50

AT THIS STAGE, THE MAXIMUM EXCAVATION DEPTH SHALL BE LIMITED TO 1.5M BELOW BRACING LEVEL 5. STEEL INSTALLATIC AT THIS LEVEL MUST BE COMPLETED BEFORE PROCEEDING TO THE NEXT STAGE.

INSTALLATION OF THE THIRD ANCHOR MUST BE COMPLETED PRIOR TO INSTALLATION OF STEEL

STEEL FRAMING SCHEDULE	
MARK	SIZE
SB1	250UC89.5 (GR 300)
SB2	200UC52.2 (GR 300)
SB3	250UC72.9 (GR 300)
SB4	200UC46.2 (GR 300)
SC	310UC158 (GR 300)

SHORING WALL SW1

DENOTES SOIL FILL

DENOTES MASS CONCRETE FILL

DENOTES ROCK BERM

WORK IN PROGRESS
NOT SUITABLE FOR CONSTRUCTION

Rev	Description	Date	By	App
A	ISSUED FOR INFORMATION ONLY	25.03.21	RT	NAA

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Project: **849-859 PACIFIC HIGHWAY & 2-8 WILSON STREET, CHATSWOOD.**

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Annexure C: Geotechnical Railway Impact Assessment by Fortify Geotech

FORTIFY GEOTECH

Geotechnical Railway Impact Assessment - 849, 853 & 859 Pacific Highway, Chatswood

CLIENT

BB Wilson Property Pty Ltd

ADDRESS

Locked Bag 1400,
Meadowbank,
NSW

DATE

June 2025

39 Sydenham Rd, Marrickville NSW 2204
PO Box 9225, Deakin ACT 2600

Consulting Engineers

(02) 9188 4033
FortifyGeotech.com.au

02 June 2025
Our ref: S2207_GIA_01_Rev1

BB Wilson Property Pty Ltd

Via email: oscar.brady@billbergia.com.au

Attention: Mr Oscar Brady

849, 853 & 859 Pacific Highway, Chatswood, NSW

Geotechnical Railway Impact Assessment

We are pleased to present this report summarising our geotechnical railway impact assessment, in accordance with T HR CI 12090 ST – Airspace and External Developments, for the Sydney Trains (TfNSW) assets, as well as the Sydney Metro At Grade and Elevated Sections Corridor Protection Guidelines, in proximity to the proposed development at 849, 853 & 859 Pacific Highway, Chatswood, NSW.

The report outlines the assumptions, methodology and outcomes of our assessment and it has been reviewed by a TfNSW AEO/TAO.

Should you require any further information regarding this report, please do not hesitate to contact our office.

Yours faithfully
Fortify Geotech

Written by;

Manuel Neves
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Registered PE of Queensland (RPEQ) # 32190
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Reviewed by;

Jeremy Murray
Director | Senior Geotechnical Engineer
FIEAust CPEng Eng Exec NER RPEQ APEC Engineer IntPE(Aust)
Registered PE of Queensland (RPEQ) #19719
NSW PE Registration #PRE0001487

About us

We work with our clients to provide practical advice and solutions tailored to each project. Our professional services are reliable, responsive and efficient.

Our highly capable Geotechnical Engineers and Geologists have a comprehensive understanding of the industry. We provide the best engineering solution for complicated geotechnical engineering issues. This has earned us a solid reputation with our Construction Industry, Municipal and Government clients.

INDUSTRIES WE WORK IN

- Residential
- Commercial
- Transport Infrastructure
- Industrial Developments of all sizes.

SERVICES

- Geotechnical Site Investigations and Reporting;
- Engineering Geology;
- Mining/Rock Geotechnics;
- Foundation Engineering;
- Dam Engineering; Embankment Design and Specification;
- Geotechnical Design Recommendations;
- Pavement Engineering and Design;
- Pavement Condition Surveys;
- Slope Stability and Risk Assessments;
- Geotechnical and Hydrological Instrumentation and Monitoring;
- Footing and Excavation Supervision and Certifications;
- Excavated soil/rock assessments and VENM assessments;
- Supervision and Certification of Earthworks and Controlled Fill, including Level 1 supervision;
- Geotechnical Construction Specifications;
- Deep Excavation Support; and
- Slope/Retaining Structure Analysis and Design

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Appendix C: Summary of soil-structure analysis for design sections 1 to 3

Appendix D: TAO/AEO review certificate

Appendix E: Limitations in the use and interpretation of this geotechnical report

FORTIFY GEOTECH

Geotechnical Railway Impact Assessment

849, 853 & 859 Pacific Highway, Chatswood, NSW

QUALITY INFORMATION

Revision history

Reference/ Revision	Description	Date	Author	Reviewer
S2207_GIA_01_Rev0	First issue	11/04/2025	MN	JM
S2207_GIA_01_Rev1	Revision following update of structural layout	02/06/2025	MN	JM

BB Wilson Property Pty Ltd

849, 853 & 859 Pacific Highway, Chatswood, NSW

Geotechnical Railway Impact Assessment

1 INTRODUCTION

BB Wilson Property Pty Ltd (the Client) has engaged Fortify Geotech Pty Ltd (Fortify) to carry out a geotechnical railway impact assessment for the proposed multi-storey development at 849, 853 & 859 Pacific Highway, Chatswood, NSW. The requirement for this assessment has been triggered by TfNSW Standard T HR CI 12090 ST – Airspace and External Developments (Reference 1) requirements, in particular Clause 14.2.

> *"Where ground penetration is greater than 2 m within 25 m of the rail corridor, unless otherwise directed by TfNSW, the developer shall carry out an engineering analysis and impact assessment to demonstrate that the effects of the proposed development on the existing rail infrastructure facilities will not cause any adverse effect. This assessment shall be presented in an engineering assessment report. (…)*
>
> *The numerical modelling shall be based on the realistic geological model derived from the subsurface information gathered through the geotechnical investigation. It shall include critical geological features such as bedding planes, weak layers, joints and other discontinuities.*

In addition to the above TfNSW guideline, this impact assessment has also considered the requirements of Sydney Metro At Grade and Elevated Sections Corridor Protection Guidelines, in particular the geotechnical component described in Clauses 5.2 and 6.

> *"The main aim of these assessments (…) is to demonstrate that there will be no adverse effects arising from the proposed development within the defined protection reserves. The acceptability of the effects predicted (as determined through investigation and assessment) must be viewed against the performance requirements described in Section 6 of this guideline document, as well as compliance with relevant standards and codes.*

The project involves the construction of a multi-storey building, comprising a two-storey podium with a mix of commercial uses, two split residential towers of up to 36 storeys, and a 6-level basement extending to circa 20 m depth (the proposed bulk excavation level is at circa RL 84.9 m AHD, whereas existing ground surface across the site varies between RL103.5 and RL107 m AHD (and between 103.5 and 105 m AHD in proximity to the railway assets in analysis).

The aims of this assessment were to:

1. Undertake a numerical modelling assessment of the proposed works and its impacts on the adjacent Sydney Trains / Sydney Metro assets:
    a. Rail retaining wall along railway corridor (eastern boundary of the site)
    b. Wilson Street vehicle overbridge (at north-eastern corner of the site)
    c. O'Brien St pedestrian bridge (at south-eastern corner of the site)

2. Estimate the induced ground displacements at the location of the above railway assets, as well as stress changes to the surrounding soil/rock mass.

3. Estimate displacements on rail corridor land adjacent to the development (less than 10mm vertical and +/- 10mm horizontal)

4. Estimate track distortion (vertical dip of under 5mm)

2 INPUT INFORMATION

To assist with this assessment the following information was provided by the Client/Client's Design Consultants:

- Level survey *"Detail and Level Survey of Lot 1 in DP1189541, SP1496, SP60178, SP10110 and part of SP52947 – 849-859 Pacific Highway, 2 Wilson Street & Lot 1 O'Brien Street"*, produced by SGD Pty Ltd, reference 9062, issue C, dated 20-03-24

- Proposed Ground Floor and Site Plans, produced PBD Architects, Project 2308, Drawings DA004 & DA105, Issue 2, dated 22-04-24

- Dewatering Management Plan for "*849, 853 & 859 Pacific Highway and 2 and 8 Wilson Street, Chatswood NSW 2067*", produced by Reditus, Project No. 23210, version 1, dated 01-05-24

- Sydney Trains / Sydney Metro as-built records:

    - *"Down Side Outer Pile Retaining Wall"*, GC-3 Works Contract, unknown author, unknown date

    - *"Pacific Place Railway Street Chatswood"*, unknown author, dated October 2001

    - *"Wilson Street Overbridge"*, GC-3 Works Contract, unknown author, unknown date

- Shoring (Soldier Pile System) for *"849-859 Pacific Highway & 2-8 Wilson Street, Chatswood*", produced by Cadigal Group, Project Ref. 01-100084, Revision H, dated 09-05-25

- Internal shoring system drawing set, produced by Cadigal Group, Project Ref. 01-1000084, Revision A, dated 18-03-25

Relevant extracts of the above documentation are provided in Appendix A of this report.

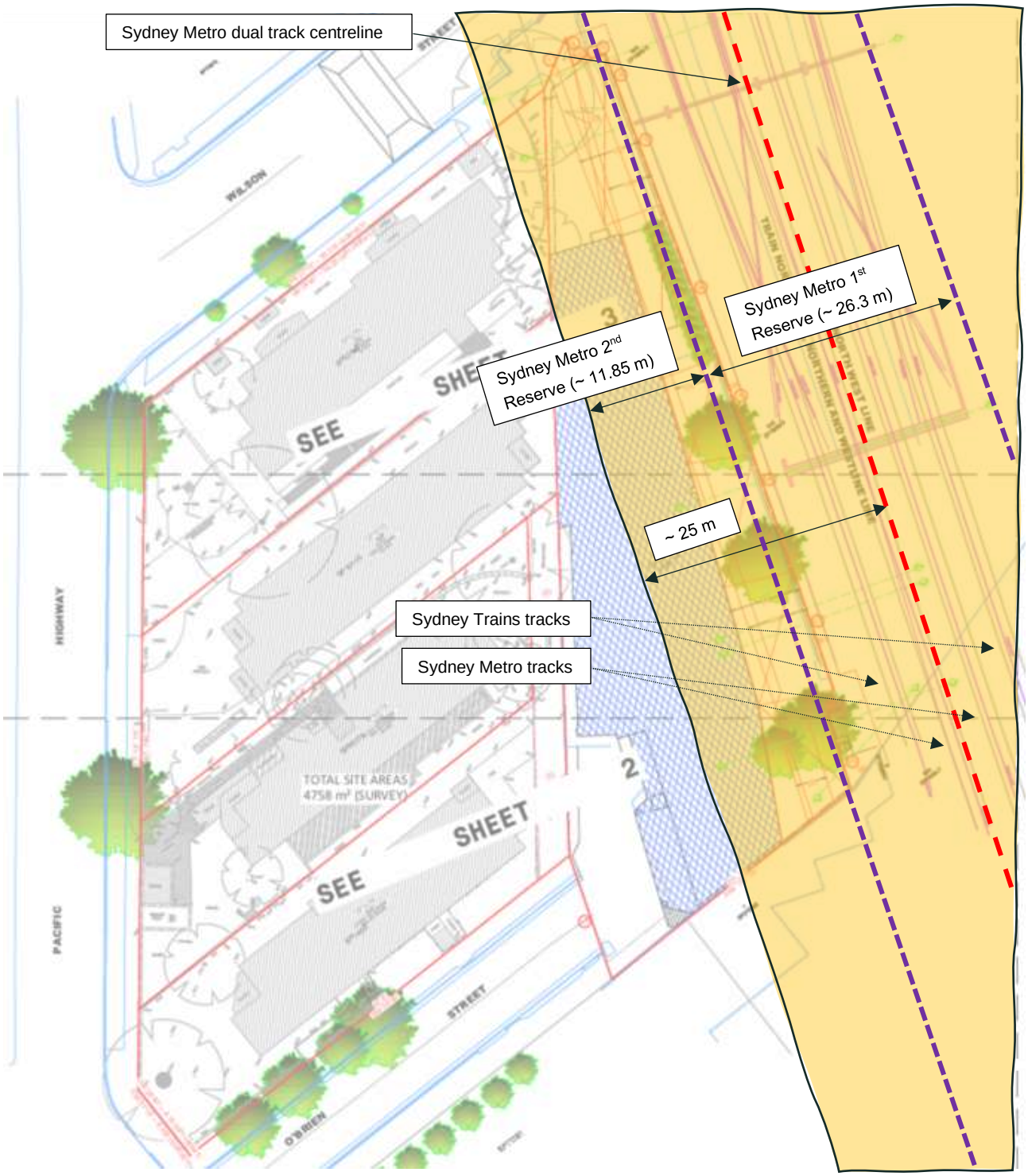
3 SITE CONDITIONS

3.1 SITE LOCATION AND DESCRIPTION

The site has a combined area of approximately ~4,660m2, and is irregular in shape. The site is bounded by Wilson Street to the north, Pacific Highway to the west, O'Brien Street to the south and a railway corridor to the east. The site is presently

occupied by existing residential unit buildings on the western portion of the site, and an existing warehouse structure on the eastern portion of the site. The ground surface is mostly concrete covered where not developed and is relatively flat, with a vertical cut at the eastern boundary of the site adjacent to the railway lines. Figure 1 shows the site locality and Plate 3-1 show the extent of the Sydney Metro protection zone in accordance with Clause 3.3 of Sydney Metro At Grade and Elevated Sections Corridor Protection Guidelines.

Plate 3-1: Site plan illustrating extent of Sydney Metro protection zone (highlighted in yellow)



3.2 REGIONAL GEOLOGY

The geological information provided by the Department of Regional NSW (Reference 2) indicates the area to be underlain by Middle Triassic age Ashfield Shale. Ashfield Shale consists of black to light grey marine shale and mudstone unit with minor siltstone and sandstone that outcrops in eastern Australia. Residual soils are expected above the shale bedrock.

Fortify has previously carried out a geotechnical investigation to investigate the subsurface conditions at the site, which comprised six (6) boreholes to a target depth of circa 20m with laboratory geotechnical testing of selected samples. Figure 2 shows the location of Fortify's 2023 boreholes, designed BH1 to BH6. The findings of the investigation are summarised in our report JS/S1998 Rev 2, dated 14 December 2023 (Reference 3) and the investigation's methods of description and classification of soils were based on the AS 1726-2017.

A supplementary investigation was conducted by Fortify and comprising of three (3) boreholes to a target depth of circa 27.5 m to inform the design of the additional basement levels and designated BH7 to BH9. The findings of the supplementary investigation are summarised in our report S2207_SGI_01_Rev2, dated 6 November 2024 (Reference 4). As part of the supplementary investigation three (3) dual groundwater monitoring wells were installed in boreholes BH7-BH9, with Reditus Consulting responsible for the installation and ongoing monitoring of data loggers. We understand that monitoring is still underway and that a revised Dewatering Management Plan will be prepared at a later date.

The findings of the site investigation broadly confirmed the information from the geological maps, with fill materials reported near surface, likely due to the existing residential/industrial developments at the site, overlying the natural soil.

3.3 SUBSURFACE CONDITIONS

For the purpose of this geotechnical assessment the ground conditions summarised in Table 3-1 have been adopted in our numerical analysis. These have been based on the initial and supplementary geotechnical investigation reports (References 3 and 4), which are included in Appendix B of this report. The inferred rock classification has been based on a new critical review of all available information with the team responsible for the Geotechnical Investigation team, which has considered rock weathering, point load test results, defect spacing and reported loss of material during coring. This has resulted in adjustments to the RLs (top and bottom) of some of the reported geological units, as well Unit 3c being re-classified as Class III / IV shale rock.

Table 3-1: Borehole Summary with Approximate RL's

Bore hole ID.	Approximate ground surface RL [1]	Top of Residual soils (Unit 2) (RL) [2]	Top of Shale Bedrock (RL) [2]					Top of Sandstone Bedrock (RL) [2]
			Class V Shale [Unit 3a]	Class IV Shale [Unit 3b]	Class III Shale [Unit 3c]	Class III/II Shale [Unit 3d]	Class II Shale [Unit 3e]	Class II Sandstone [Unit 4a]
BH1	103.6	103.3	98.8	95.8	94.1	88.6	86.6	N.E.
BH2	104.9	104.3	100.4	97.3	95.5	94.0	88.4	N.E.
BH3	105.8	105.3	101.3	98.3	97.7	96.7	90.7	N.E.
BH4	105.9	105.7	103.1	99.5	98.4	97.0	91.7	N.E.

Bore hole ID.	Approximate ground surface RL [1]	Top of Residual soils (Unit 2) (RL) [2]	Top of Shale Bedrock (RL) [2]					Top of Sandstone Bedrock (RL) [2]
			Class V Shale [Unit 3a]	Class IV Shale [Unit 3b]	Class III Shale [Unit 3c]	Class III/II Shale [Unit 3d]	Class II Shale [Unit 3e]	Class II Sandstone [Unit 4a]
BH5	105.7	105.1	102.5	99.7	97.3	96.2	89.7	N.E.
BH6	105.0	104.6	102.0	98.5	97.0	95.8	90.7	N.E.
BH7	104.8	103.8	99.3	99.0	91.8	N.C	87.8	N.E.
BH8	105.8	105.6	98.9	98.5	95.2	N.C	84.8	78.8
BH9	105.7	105.2	100.2	100.0	96.7	N.C	84.7	78.7

N.E. – Not encountered, N.C – Not considered

[1] RL's have been interpolated between survey points off the site survey.

[2] RL's have been calculated based on the interpolated RL at the top of each borehole.

3.4 GEOTECHNICAL DESIGN PARAMETERS

Table 3-2 summarises the key relevant geotechnical parameters of the soil/rock units used as part of this assessment. These have been discussed and agreed with the team responsible for the 2023 site investigation at the site and complement/supersede the original parameters derived in the geotechnical investigation report (Reference 3). These parameters have been based on the log description of the materials, previous experience in the area, as well as in-situ (SPT testing) and laboratory testing (e.g. Point Load Index – PLT testing). A summary of the PLT testing results is provided in Plate 3-1. The horizontal coefficient of earth pressures for Units 3b to 3e listed in Table 3-2 have been defined to replicate the range of likely horizontal stresses in the shale bedrock as defined in Bertuzzi (2014 – Reference 5) of $\sigma_H \approx 0.5 + 2.0 \times \sigma_V$.

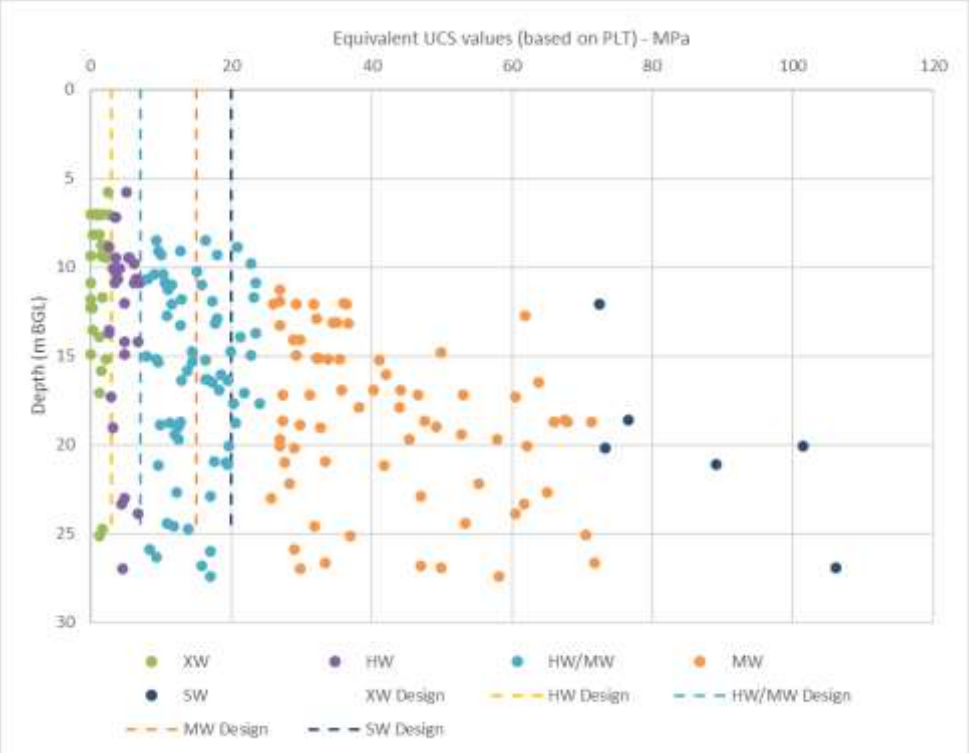
Table 3-2: Key Geotechnical Parameters

Unit	Typical description	Bulk Density γ_b (kN/m^3)	Effective Cohesion c' (kPa)	Friction Angle φ' (°)	Undrained Shear Strength s_u (kPa)	Design UCS (MPa)	Drained Young's Modulus E' (MPa)	Poisson Ratio ν	Horizontal K_0
Unit 1: Fill	Fine to coarse-grained Sandy GRAVEL and Gravelly SAND	18	0	30	N/A	N/A	10	0.3	0.53

Unit	Typical description	Bulk Density γ_b (kN/m^3)	Effective Cohesion c' (kPa)	Friction Angle φ' (°)	Undrained Shear Strength s_u (kPa)	Design UCS (MPa)	Drained Young's Modulus E' (MPa)	Poisson Ratio ν	Horizontal K_0
Unit 2: Residual Soil	Sandy Silty CLAY, stiff to hard	19	5	28	120	N/A	30	0.3	0.53
Unit 3a: XW Shale Bedrock		22	10	21	N/R	1	65	0.25	0.50
Unit 3b: HW Shale Bedrock **(Class IV)**		23	50	23	N/R	3	130	0.25	3.50
Unit 3c: HW/MW Shale Bedrock **(Class III / IV)**		23	100	28	N/R	7	300	0.2	3.50
Unit 3d: MW Shale Bedrock **(Class II / III)**		23	150	30	N/R	15	600	0.2	3.50
Unit 3e: SW Shale Bedrock **(Class II or better)**		24	400	32	N/R	20	700	0.2	3.50
Unit 4a: Class II Sandstone		24	500	40	N/R	25	900	0.2	3.50

N/A – Not applicable N/R – Not relevant

Plate 3-2: Equivalent UCS values for the different weathering profile of shale based on PLT testing



For the design of temporary ground anchors, the ultimate skin friction stresses provided in Table 3-3 have been adopted in this assessment. The have been based on the PLT results, as well as guidance from Pells et al. (2019 – Reference 6).

Table 3-3: Unit stresses adopted for ground anchors

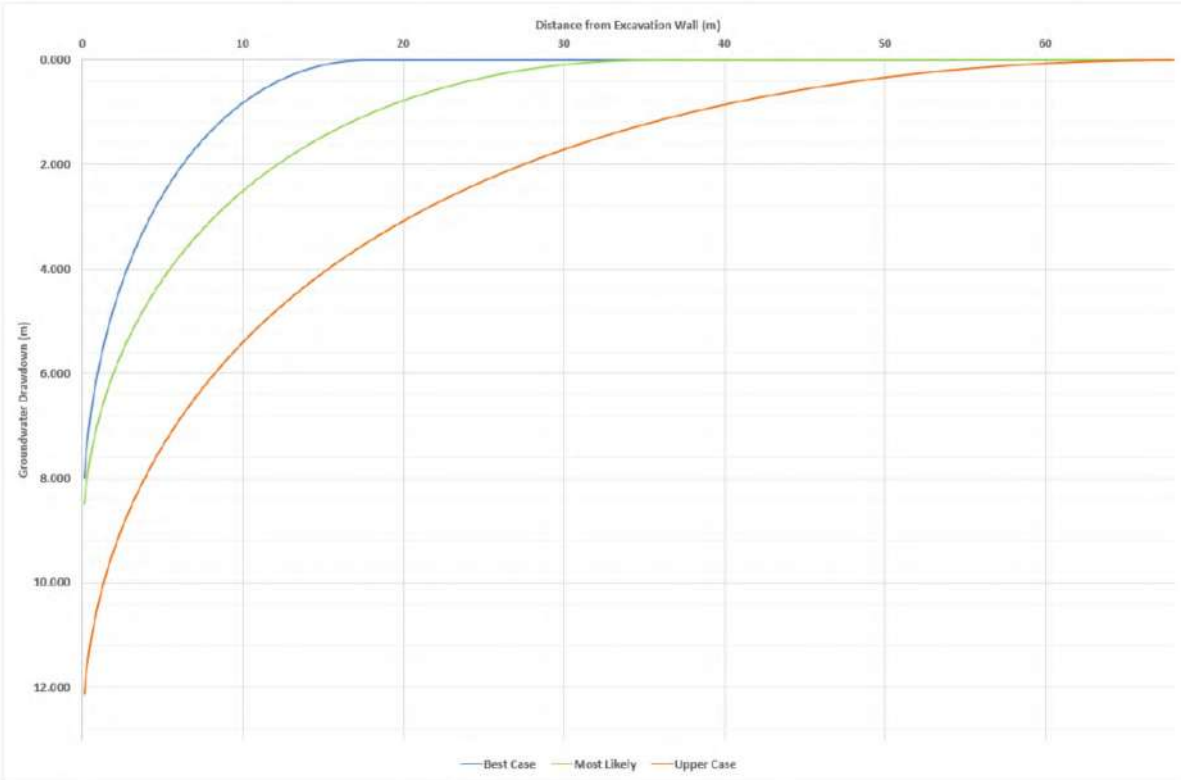
Unit	Allowable unit stresses for tension loads (kPa)
Unit 3a: XW Shale Bedrock	40
Unit 3b: HW Shale Bedrock **(Class IV)**	75
Unit 3c: HW/MW Shale Bedrock **(Class III / IV)**	100 - 225
Unit 3d: MW Shale Bedrock **(Class II / III)**	250 - 400
Unit 3e: SW Shale Bedrock **(Class II or better)**	> 400

3.5 DESIGN GROUNDWATER LEVELS

Groundwater levels (GWL) adopted in the analysis have been estimated based on the Dewatering Management Plan (DMP) for the site prepared by others. A 3-month monitoring campaign of GWL at the site, has reported GWL in proximity to the railway line to have a maximum standing water level of 97 m AHD, which has been adopted in this assessment.

As the proposed bulk excavation level for the development is RL 84.9 m AHD, it will intersect GWL. Given the proposals for a drained basement construction, long-term drawdown effects are expected in the area. The DMP has estimated the drawdown effect to extend to distances between 17.75 m to 67.50 m from the proposed excavation (Plate 3-1). However, note that this has been estimated for a 4-level basement excavation. An ongoing monitoring campaign is currently underway to inform the likely drawdown curves for a 6-level basement excavation.

Plate 3-3: Extent of drawdown from excavation [extract from Reditus' DWP]



A similar drawdown, albeit extending deeper into the ground profile and further away from the Site, has been adopted in this assessment. Note that these assumptions will have to be confirmed once a revised DMP for the Site is available and the analysis updated, if required.

4 METHODOLOGY AND KEY ASSUMPTIONS

The basement of the proposed development has been designed as a drained structure. As such, and as mentioned in Section 3.5, dewatering is assumed to occur progressively during construction, as the excavation intersects existing GWLs.

Based on the inputs provided by the Structural Engineer, the temporary lateral support for the excavation will be provided by multi-strand temporary ground anchors. These are expected to be sequentially de-activated as the permanent basement slabs are cast and connected to the retention piles.

As the design of the retention system is not part of the scope of this report, the following sub-sections provide details on the methodology and assumptions adopted for this assessment to infer the impact of the proposed works on the Sydney Trains / Sydney Metro assets listed in Section 1

The outcomes of the analyses are discussed in Section 7. Note that a sensitivity analysis has been carried out on all Design Sections considering a reduction in Young's Modulus values for all sol/rock layers of 25%, to capture the eventuality of more onerous ground conditions than anticipated.

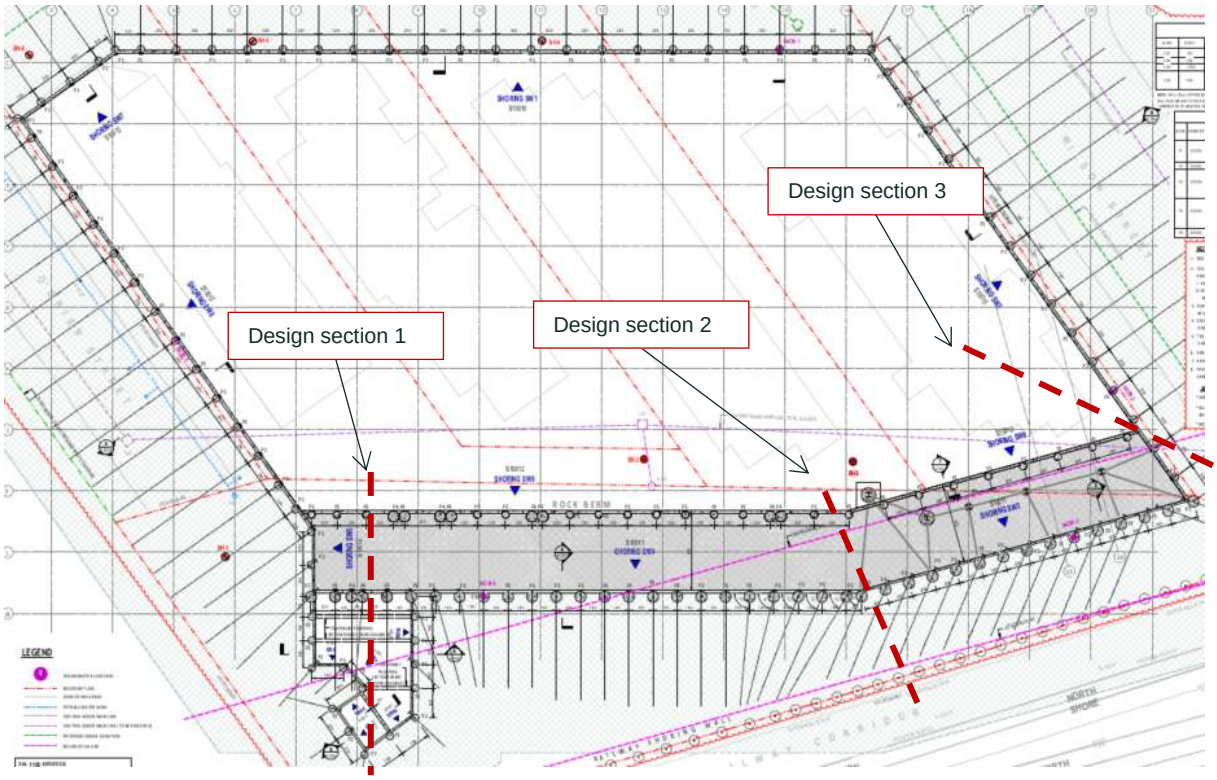
4.1 METHODOLOGY

The numerical analyses carried out as part of this assessment have made use of the commercially available finite element software PLAXIS-2D (V2024.1), which has accounted for the proposed construction sequence provided by the Structural Engineer.

The geometry and structural properties of the relevant railway assets have been based on the as-built records provided by the Client (refer to Section 4.4) and on past-experience.

The impact assessment was carried out by analysing three (3) design sections, designated as Sections 1 to 3 at the locations shown in Plate 4-1.

Plate 4-1: Location of design sections covered as part of this assessment



4.2 DESIGN LOADING

The following design loads have been adopted for the purpose of this assessment:

- Pedestrian traffic loading = 5 kPa
- Existing dwelling loading = 10 kPa / floor
- Communications hut loading = 10 kPa
- Train surcharge loading (300LA train) = 131 kPa, applied at the underside of the rail sleepers as per AS5100.2:2017 (Reference 7)
- 20 kPa surcharge at surface level between the basement walls and the railway corridor to allow for any future railway work (Clause 6.3 of Sydney Metro guideline – Reference 8), to be applied after construction is complete.

4.3 KEY ASSUMPTIONS

The following key assumptions have been considered in this geotechnical assessment:

- Geometry input provided by the Client and their Structural Engineer and largely based on the as-built records for the existing railway assets and the proposed Shoring System drawing set.
- Rock/soil relevant geotechnical design parameters used in the analyses based on Fortify's geotechnical investigation report for the site (report ref. S2207_SGI_01_Rev2, dated 6 November 2024) and summarised in Table 3-2.
- Clause 8.3.1 of AS5100.3 (Reference 8) requires that for a retaining wall stability assessment, the ground level in front of the wall to be lowered (i.e. passive resistance ignored) by 10% of the height of the wall beneath the lowest support, with a minimum value of 0.5 m. Based on the proposed levels for the lowest level of ground anchors (vary between approximately RL 93.1 m AHD and RL 90.3 m AHD), 10% of the remaining retained height corresponds to up to 0.8 m. However, as the excavation will be carried out in rock, we have assumed a 0.5 m over excavation sufficiently caters for this risk, as the likelihood of an over excavation extending past 0.5 m below BEL is very low.
- Except where stated otherwise, all results presented herein are based on unfactored loads and unfactored soil/rock parameters.
- Construction sequence and adopted RLs as advised by the Structural Engineer and summarised in Section 5. The assessment has only considered the impact of the proposed works until excavation to bulk excavation level (BEL) is reached, as well as the event of an accidental over-excavation, deemed as the most critical design scenario.
- Design GWLs considered as mentioned in Section 3.5 and presented in the outputs in Appendix C. Dewatering is assumed to occur progressively during construction, as the excavation intersects existing GWLs. The zone of influence of the GWL drawdown has been inferred based on the DMP for the site, yet considering the influence of a 6-level basement excavation, instead of 4-level.

- Given that only temporary conditions have been considered, the impacts of earthquake loading have not been included.

- Material proprieties for all structural elements have been agreed with the Structural Engineer and are listed in Section 6. In relation to the existing Sydney Trains / Sydney Metro assets, a reduction in their flexural rigidity (EI) to account for concrete cracking has been adopted throughout the entire analysis (EI = 0.6 x uncracked EI).

- The design of the temporary internal shoring system and its corresponding foundation piles is not part of the scope of this assessment and we assume that this will be designed by others at a subsequent stage of the design process. At this stage, we have assumed that the pile embedment below BEL will be sufficient to ensure adequate bearing capacity for any vertical and horizontal loads transferred through the internal bracing system. Overall, the geotechnical assessment has only considered a simplified approach to the modelling of this internal support structure, which should only be used for design validation. Results have been passed on to the Structural Engineer for verification against their structural model.

4.4 EXISTING SYDNEY TRAINS / SYDNEY METRO ASSETS

For the purpose of this assessment, three distinct existing Sydney Trains / Sydney Metro assets have been considered, which are described in the following subsections. A reinforced concrete Young's Modulus of 30 GPa has been assumed for all assets, albeit a reduction in EI to 60% of the uncracked value has been adopted in this assessment.

4.4.1 Rail retaining wall along railway corridor

An existing retaining wall runs along the railway corridor at the eastern boundary of the site. The wall comprises of a soldier pile wall with a continuous reinforced concrete capping beam at the top. The piles are 850 mm in diameter and have been installed at a 2.5 m spacing. Pile toe levels have been extracted from the as-built records (Plate 4-2).

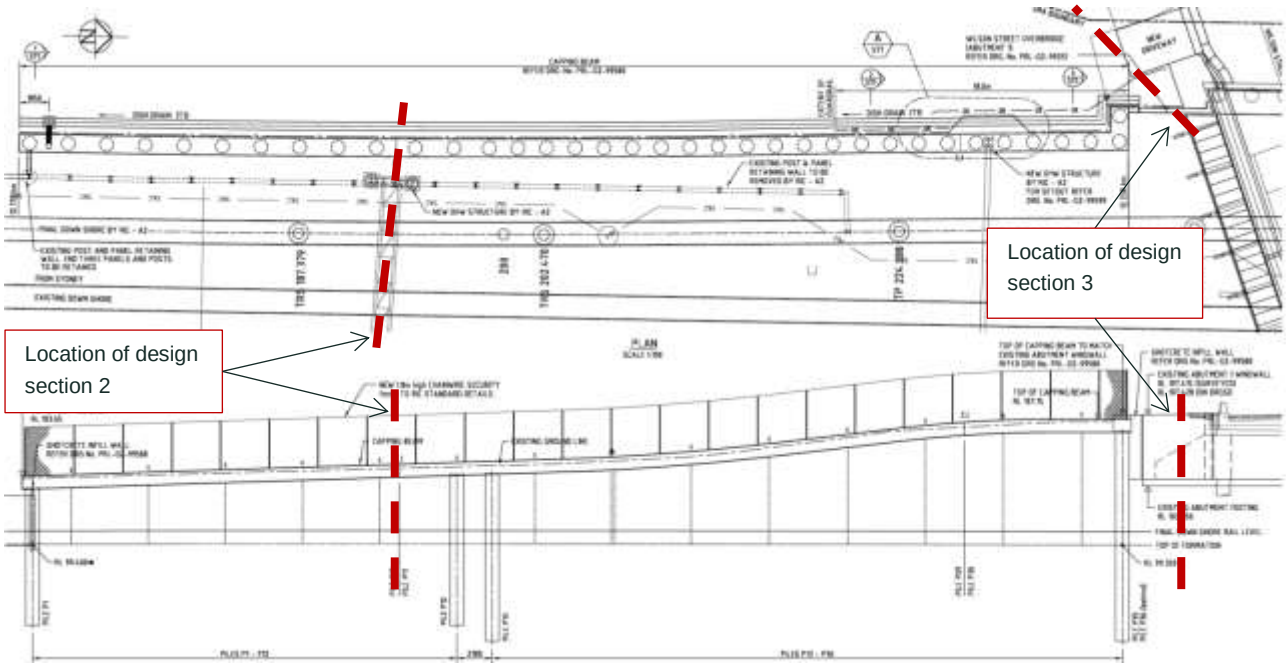
Plate 4-2: As-built extracts with pile toe levels

TABLE 1

PILE No	EASTING	NORTHING	DIAMETER	CUT OFF LEVEL	CONTRACT LEVEL	* ACTUAL FOUNDING LEVEL
P1	331 577.167	6 259 284.036	850	102.920	94.50	94.50
P2	331 577.085	6 259 286.405	850	102.995	94.50	94.50
P3	331 577.002	6 259 288.773	850	103.070	94.50	94.50
P4	331 576.917	6 259 291.142	850	103.145	94.50	94.50
P5	331 576.830	6 259 293.510	850	103.225	94.50	94.50
P6	331 576.739	6 259 295.879	850	103.300	94.50	94.50
P7	331 576.645	6 259 298.247	850	103.375	94.50	94.50
P8	331 576.548	6 259 300.615	850	103.450	94.50	94.50
P9	331 576.446	6 259 302.982	850	103.525	94.50	94.50
P10	331 576.339	6 259 305.350	850	103.600	94.50	94.50
P11	331 576.228	6 259 307.717	850	103.675	94.50	94.50
P12	331 576.112	6 259 310.085	850	103.750	94.50	94.50
P13	331 576.002	6 259 312.262	850	103.820	93.50	93.50
P14	331 575.910	6 259 314.020	850	103.875	93.50	93.50
P15	331 575.816	6 259 315.777	850	103.930	93.50	93.50
P16	331 575.719	6 259 317.535	850	103.990	93.50	93.50
P17	331 575.620	6 259 319.292	850	104.060	93.50	93.50
P18	331 575.519	6 259 321.049	850	104.185	93.50	93.50
P19	331 575.416	6 259 322.806	850	104.310	93.50	93.50

A design section aligned with the existing overhead wiring/signalling structure in the area has been selected, as show in Plate 4-3 against the as-built plan and elevation for the wall.

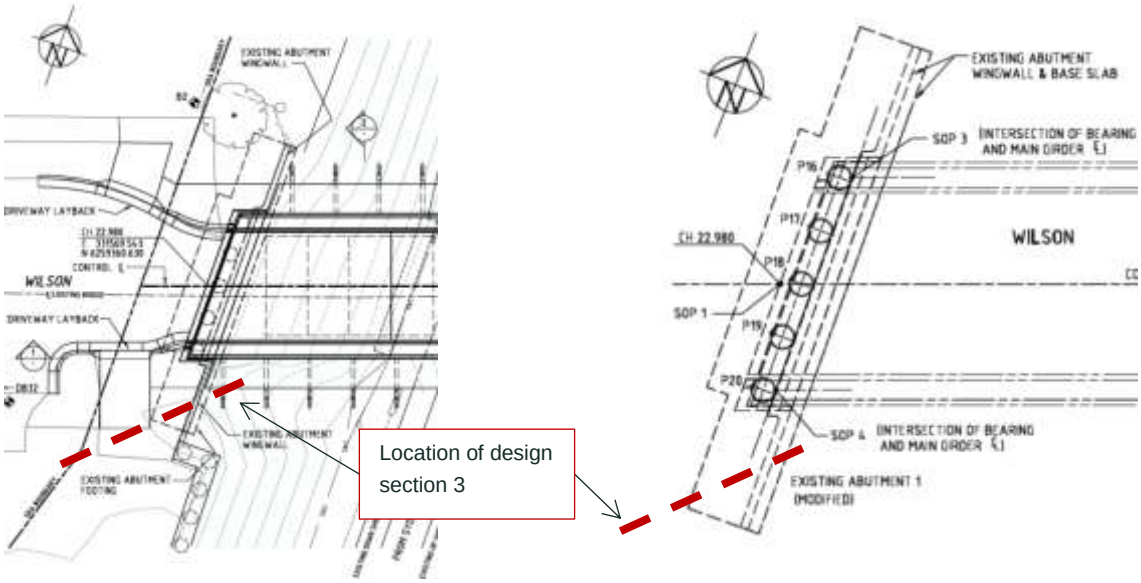
Plate 4-3: As-built extracts with indicative location of design section 2 (and design section 3)



4.4.2 Wilson Street overbridge

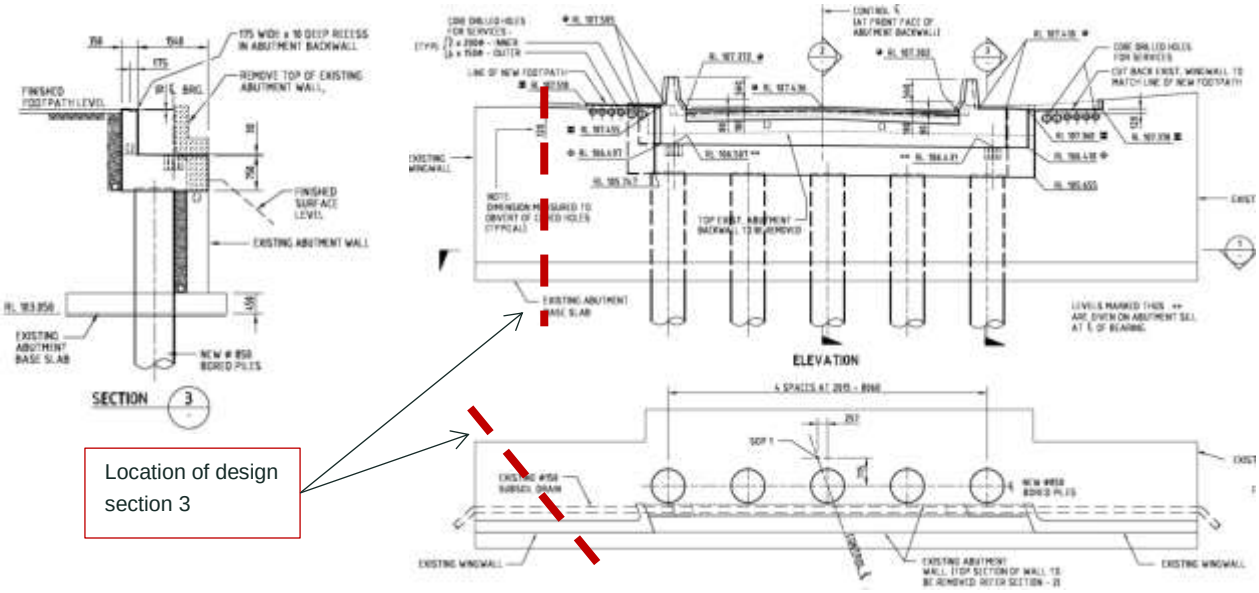
Wilson St overbridge is located to the northeast of the site. As-built records show the bridge to have the western abutment supported by piles that carry the bridge loads to a suitable foundation stratum, with L-shape retaining walls supporting the earth pressures acting on the abutment and wingwalls (Plate 4-4).

Plate 4-4: As-built extracts with indicative location of design section 3.



For the purpose of this assessment, the contribution of the foundation piles was ignored and the nearest wingwall to the excavation was considered as a standalone L-shape wall (Plate 4-5).

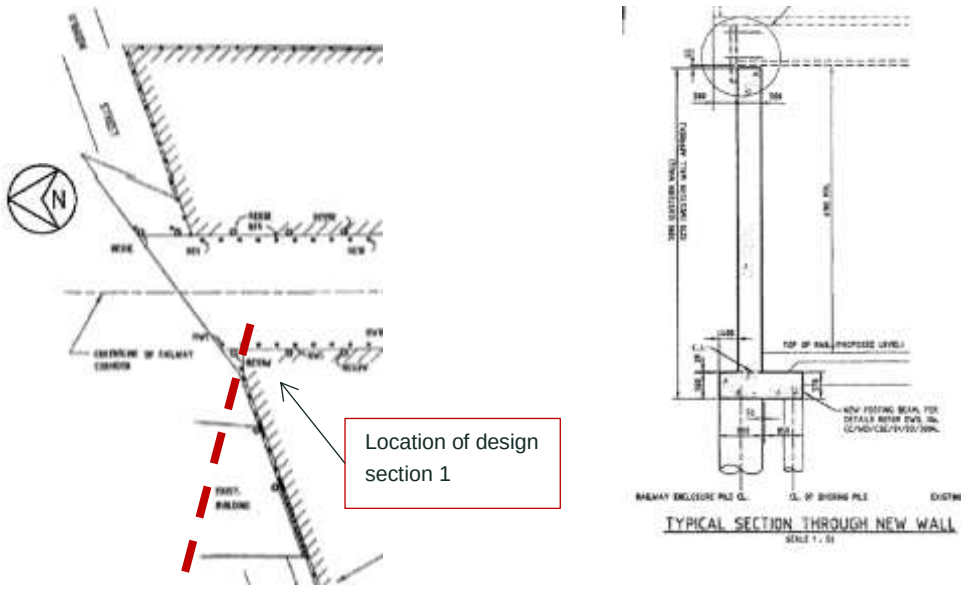
Plate 4-5: As-built extracts with indicative location of design section 3.



4.4.3 O'Brien St pedestrian bridge

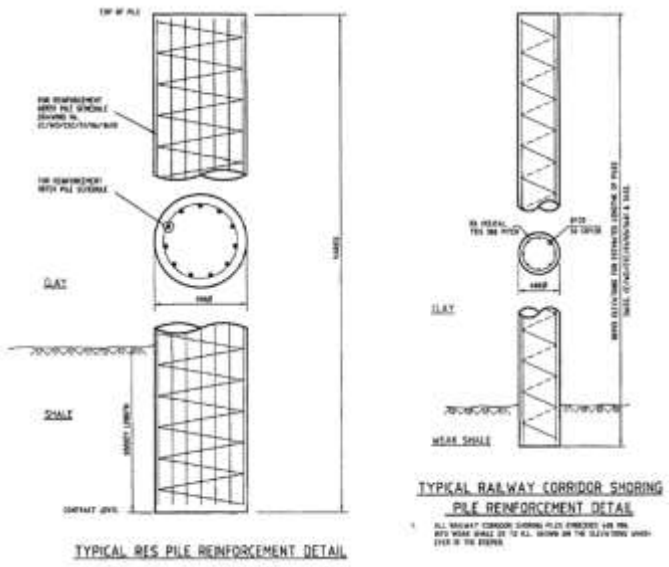
O'Brien St pedestrian bridge is located to the southeast of the site. As-built records show the bridge to have the western abutment supported by two sets of piles as shown in Plate 4-6.

Plate 4-6: As-built extracts with indicative location of design section 1.



The rear piles have 900 mm diameter and are spaced circa 7.5 m in plan. As-built toe levels have not been provided and an embedment of 2 diameters (1.8 m) into the underlying XW shale have been assumed based on the information shown in Plate 4-6. The front piles have 400 mm diameter and are spaced closer together at 2.5 m centres. Once again, no information about as-built pile toe levels has been provided, so for the purpose of this assessment an embedment of 1 diameter (0.4 m) into the underlying XW shale has been assumed based on the information shown in Plate 4-7.

Plate 4-7: As-built extracts about front and rear foundation piles of O'Brien St pedestrian bridge



As part of the numerical analysis a sensitivity assessment has been carried out by reducing the embedment of the rear piles from 2 diameters (1.8 m) to only 1 diameter (0.9 m). Given the distance between asset and the proposed excavation, this change has not impacted on the overall assessment results.

As the embedment of the existing piles is a function of the inferred ground model in the area, the updates and RL adjustments to inferred geological units following a review of all available information (refer to Section 3.3) have led to shorter foundation piles than previously assumed.

5 CONSTRUCTION SEQUENCE

The following construction sequences (staging) has been considered in this design geotechnical assessment:

<u>Section 1</u>

1) Establish initial site conditions;

2) Apply surcharge loading equivalent to current housing development;

3) Model railway trench excavation and associated retaining wall(s);

4) Apply train surcharge and reset deformation **(CURRENT CONDITION)**;

5) Demolition of current housing development;

6) Installation of outer soldier pile wall to the proposed toe level (RL 95.0 m AHD);

7) 1st level of excavation to RL 101.0 m AHD;

8) Installation of 1st level of ground anchors at RL 101.5 m AHD;

9) 2nd level of excavation to RL 97.6 m AHD;

10) Installation of inner soldier pile wall to the proposed toe level (RL 83.7 m AHD) and portion of basement slab connecting the outer and inner retaining walls;

11) 3rd level of excavation to RL 95.7 m AHD. **GWL lowered (dewatering)**;

12) Installation of 2nd level of ground anchors at RL 96.2 m AHD. **GWL lowered (dewatering)**;

13) 4th level of excavation to RL 92.7 m AHD. **GWL lowered (dewatering)**;

14) Installation of 3rd level of ground anchors at RL 93.2 m AHD. **GWL lowered (dewatering)**;

15) 5th level of excavation to RL 89.8 m AHD. **GWL lowered (dewatering)**;

16) Installation of 4th level of ground anchors at RL 90.3 m AHD. **GWL lowered (dewatering)**;

17) 6th level of excavation to RL 88.1 m AHD. **GWL lowered (dewatering)**;

18) Installation of rock berm shoring wall to the proposed toe level (RL 84.1 m AHD);

19) Excavation to BEL (RL 84.9 m AHD) with rock berm. **GWL lowered (dewatering)**;

- Undertake ‘phi-c’ strength reduction FoS check

19 a) Allow for an additional 0.5 m over-excavation;

- Undertake ‘phi-c’ strength reduction FoS check

20) Reduce bending stiffness of reinforced concrete elements to account for long-term effects. **GWL lowered (dewatering)**;

21) to 29) Sequentially install floor slabs and remove temporary ground anchors/struts. **Inferred Permanent GWL profile adopted.**

30) Apply 20 kPa surcharge between basement walls and railway corridor to allow for any future railway work (Clause 6.3 of Sydney Metro guideline – Reference 8). **Inferred permanent GWL profile adopted.**

Section 2

1) Establish initial site conditions;

2) Apply surcharge loading equivalent to current housing development;

3) Model railway trench excavation and associated retaining wall(s);

4) Apply train surcharge and reset deformation **(CURRENT CONDITION)**;

5) Demolition of current housing development;

6) Installation soldier pile wall to the proposed toe level (RL 83.7 m AHD);

7) 1st level of excavation to RL 103.8 m AHD;

8) Installation of 1st frame level support at RL 104.3 m AHD;

9) 2nd level of excavation to RL 101.7 m AHD;

10) 3rd level of excavation to RL 98.6 m AHD;

11) Installation of 2nd frame level at RL 99.6 m AHD and 1st level of ground anchors at RL 99.1 m AHD;

12) 4th level of excavation to RL 95.7 m AHD. **GWL lowered (dewatering)**;

13) Installation of 2nd level of ground anchors at RL 96.2 m AHD. **GWL lowered (dewatering)**;

14) 5th level of excavation to RL 92.2 m AHD. **GWL lowered (dewatering)**;

15) Installation of 3rd frame level at RL 93.6 m AHD and 3rd level of ground anchors at RL 92.7 m AHD;

16) 6th level of excavation to RL 88.1 m AHD. **GWL lowered (dewatering)**;

17) Installation of rock berm shoring wall to proposed toe level (RL 84.1 m AHD);

18) Excavation to BEL (RL 84.9 m AHD) with rock berm. **GWL lowered (dewatering)**;

    − Undertake ‘phi-c’ strength reduction FoS check

    18 a) Allow for an additional 0.5 m over-excavation;

    − Undertake ‘phi-c’ strength reduction FoS check

19) Reduce bending stiffness of reinforced concrete elements to account for long-term effects. **GWL lowered (dewatering)**;

20) to 28) Sequentially install floor slabs and remove temporary ground anchors/struts. **Inferred Permanent GWL profile adopted.**

29) Apply 20 kPa surcharge between basement walls and railway corridor to allow for any future railway work (Clause 6.3 of Sydney Metro guideline – Reference 8). **Inferred permanent GWL profile adopted.**

Section 3

1) Establish initial site conditions;

2) Apply surcharge loading equivalent to current housing development;

3) Model railway trench excavation and associated retaining wall(s);

4) Apply train surcharge and reset deformation **(CURRENT CONDITION)**;

5) Demolition of current housing development;

6) Installation soldier pile wall to the proposed toe level (RL 83.7 m AHD);

7) 1st level of excavation to RL 103.8 m AHD;

8) Installation of 1st frame level support at RL 104.3 m AHD;

9) 2nd level of excavation to RL 101.7 m AHD;

10) 3rd level of excavation to RL 98.6 m AHD;

11) Installation of 2nd frame level at RL 99.6 m AHD and 1st level of ground anchors at RL 99.1 m AHD;

12) 4th level of excavation to RL 95.7 m AHD. **GWL lowered (dewatering)**;

13) Installation of 2nd level of ground anchors at RL 96.2 m AHD. **GWL lowered (dewatering)**;

14) 5th level of excavation to RL 92.2 m AHD. **GWL lowered (dewatering)**;

15) Installation of 3rd frame level at RL 93.6 m AHD and 3rd level of ground anchors at RL 93.1 m AHD;

16) 6th level of excavation to RL 88.1 m AHD. **GWL lowered (dewatering)**;

17) Installation of rock berm shoring wall to proposed toe level (RL 84.1 m AHD);

18) Excavation to BEL (RL 84.9 m AHD) with rock berm. **GWL lowered (dewatering)**;

- Undertake ‘phi-c’ strength reduction FoS check

18 a) Allow for an additional 0.5 m over-excavation;

− Undertake 'phi-c' strength reduction FoS check

19) Reduce bending stiffness of reinforced concrete elements to account for long-term effects. **GWL lowered (dewatering)**;

20) to 29) Sequentially install floor slabs and remove temporary ground anchors/struts. **Inferred Permanent GWL profile adopted.**

30) Apply 20 kPa surcharge between basement walls and railway corridor to allow for any future railway work (Clause 6.3 of Sydney Metro guideline – Reference 8). **Inferred permanent GWL profile adopted.**

6 GEOMETRY AND STRUCTURAL INPUTS

Three cross sections have been selected as part of this geotechnical assessment, one for each asset in analysis and illustrated in Plates 6-1 to 6-3. Ground conditions at each design cross section have been interpolated based on the site investigation records and overall geometry has been based on the site survey provided by the Client.

Plate 6-1: Design cross section 1 (based on structural section 4 but considering two retaining walls – inner and outer, as depicted in the shoring set)

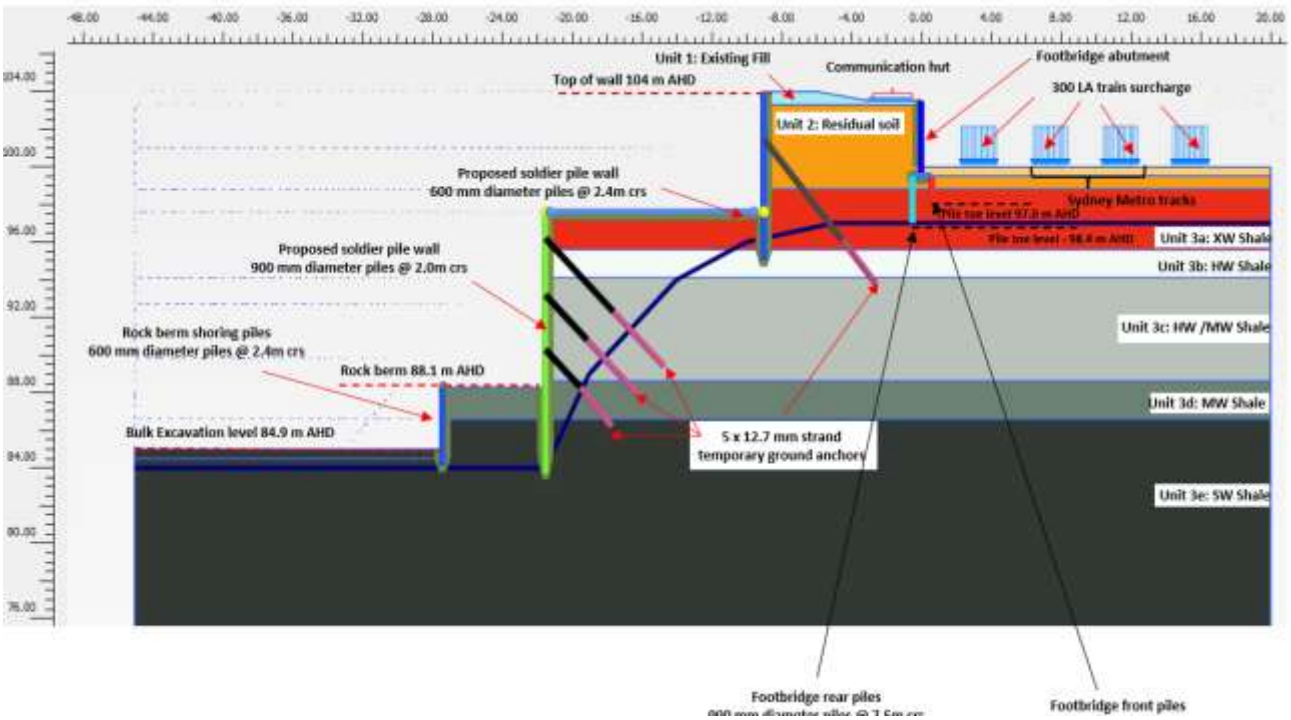


Plate 6-2: Design cross section 2 (based on structural section 3 but considering the top of wall and anchor levels shown on the elevation drawing, as well as the proposed internal shoring bracing system)

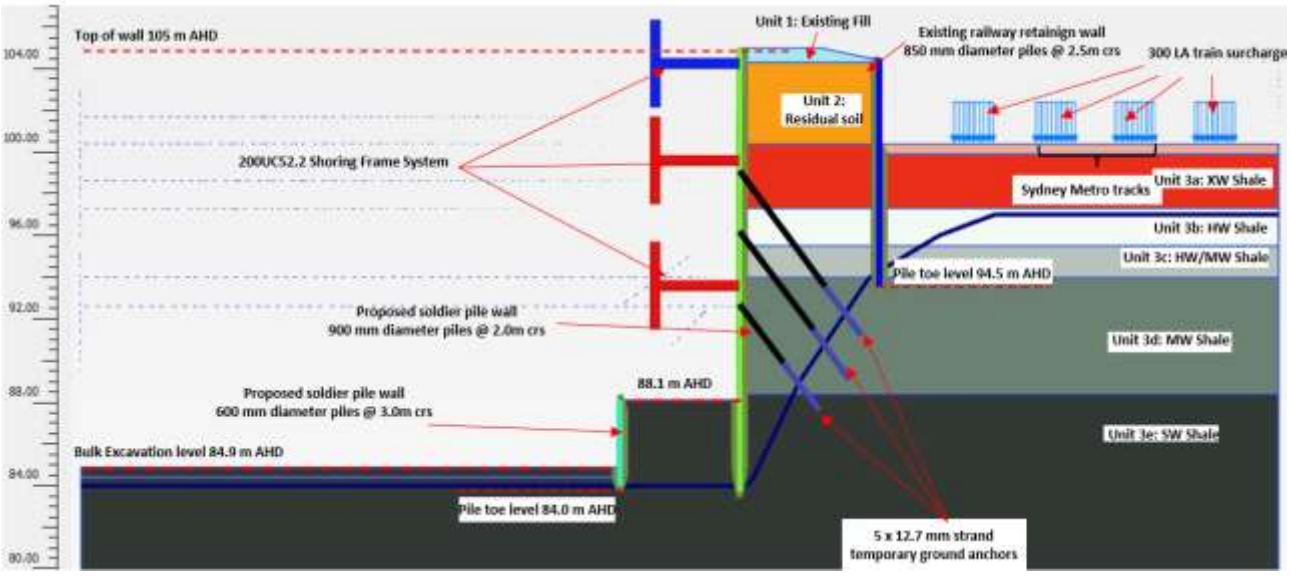
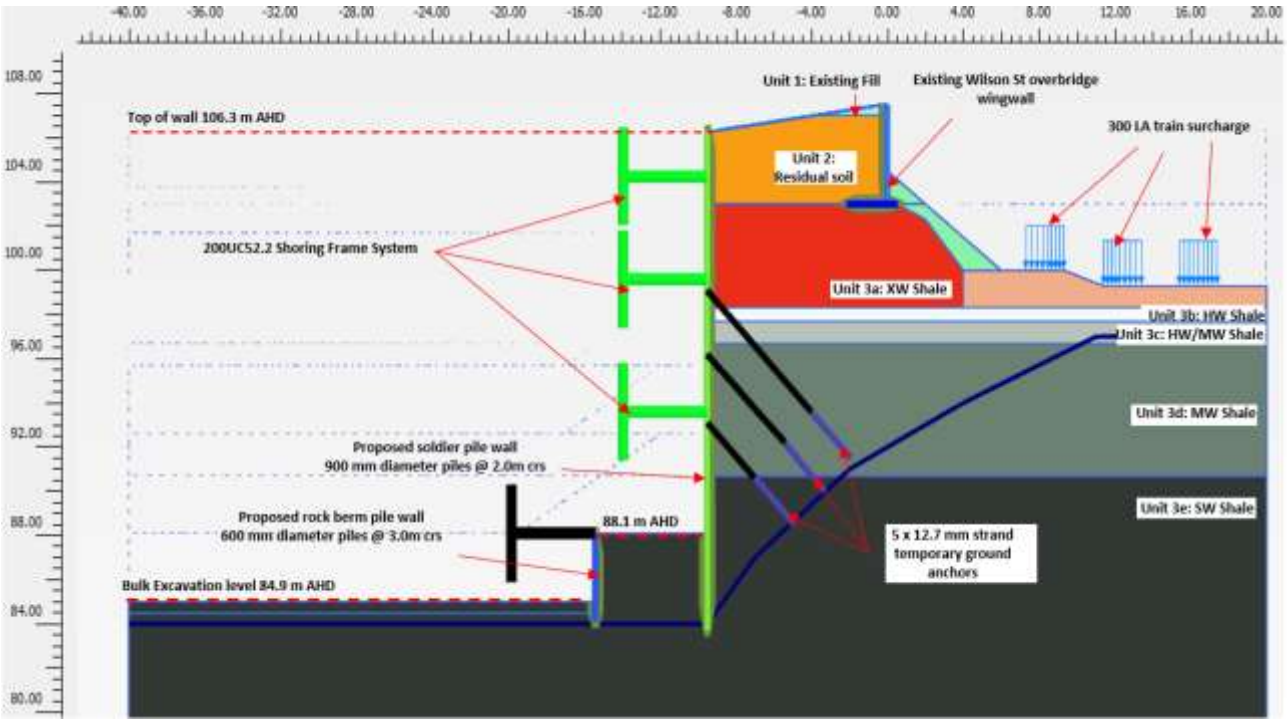


Plate 6-3: Design cross section 3 (based on structural section 3, as well as the proposed internal shoring bracing system)



The structural properties and dimensions adopted in this assessment are presented in Tables 6-1 and 6-2. Please note that the proposed shotcrete infill panels between soldier piles have been ignored for the purpose of the modelling.

Table 6-1: Basement soldier pile wall

Property	Section 1		Section 2	Section 3
Pile diameter and spacing	0.9 m @ 2.0 m crs (inner piles)	0.6 m @ 2.4 m crs (outer piles)	0.9 m @ 2.0 m crs	
E (GPa)	32.8			
EA (kN/m)	10.43E+06	3.86E+06	10.43E+06	
EI, short term / long term (kNm^2/m)[1]	475.0E+03 / 317.0E+03	78.2E+03 / 52.2E+03	475.0E+03 / 317.0E+03	
Existing surface level (m AHD)	104.0		105	107.5
Final surface level (m AHD)	104.0		105	106.3
Bulk excavation level (m AHD)	84.9			
Over-excavation level (m AHD)	84.4			
Pile toe level (m AHD)	83.7 (inner piles)	95.0 (outer piles)	83.7	83.7
Rock berm pile diameter and spacing	0.6 m @ 2.4 m crs		0.6 m @ 3.0 m crs	
Rock berm pile toe level (m AHD)	88.1			
Ground anchors embedment	HW Shale (inner piles)	HW Shale (outer piles)	MW Shale	MW to SW Shale
Ground anchors hole diameter (mm)	130	150		
Temporary strut [2] EA (kN)	N/A		30E3 (1st level) 120E3 (2nd & 3rd level)	240E3

[1] Short and long-term values of EI of 90% and 60%, respectively, of the uncracked stiffness values have been adopted in the assessment, following advice from the Structural Engineer.

[2] EA values for struts agreed with the Structural Engineer.

Table 6-2: – Ground anchors loading, ground anchor bond materials and strut loading

Design Section	Anchor / Strut Level	Anchors pre-stress load (kN)	Max anchor / strut load (kN)	Min bond length (m)	Bond material
1	GA 1	80	120	4	HW Shale
	GA 2	200	240	4	HW/MW Shale
	GA 3	200	270	4	HW/MW Shale
	GA 4	200	260	3	MW Shale
2	Strut 1	-	245	-	-
	Strut 2	-	715	-	-
	GA 1	250	275	3	MW Shale
	GA 2	250	280	3	MW Shale
	Strut 3	-	505	-	-
	GA 3	250	275	3	MW Shale
3	Strut 1	-	200	-	-
	Strut 2	-	400	-	-
	GA 1	230	270	3	MW Shale
	GA 2	275	325	3	MW Shale
	Strut 3	-	350	-	-
	GA 3	275	350	3	SW Shale

We recommend that the pre-stressing loads listed above are specified as part of the design, subject to confirmation/optimisation as part of the subsequent design stage (detailed design).

7 GEOTECHNICAL ASSESSMENT RESULTS

As described in Section 4, the numerical analysis carried out as part of this geotechnical assessment has been completed using the commercially available software PLAXIS-2D. The following subsections summarise the results of the geotechnical assessment. Further details on the soil-structure analysis can be found in Appendix C.

Although not part of the remit of this report, the 'phi-c' strength reduction analyses carried out in PLAXIS-2D have reported factors of safety higher than 1.5 against overall / global failure.

7.1.1 Induced ground displacements

Table 7-1 summarises the induced ground at the location of the relevant Sydney Trains /Sydney Metro assets.

Table 7-1: Sydney Trains / Sydney Metro assets lateral displacements due to the proposed works

Sydney Trains /Sydney Metro asset	Before 2nd Level of Strut / Excavation to Basement 3 Level (Stage 10/11)	End of excavation (Stage 18/19)	Removal of last level of ground anchors (Stage 28/29)	Largest differential to current conditions (Stage 4)
Rail retaining wall along railway corridor	< 5 mm	< 10 mm	< 10 mm	< 10 mm
Wilson Street vehicle overbridge	< 5 mm [1]	< 10 mm [1]	< 10 mm [1]	< 10 mm [1]
O'Brien St pedestrian bridge	< 5 mm	< 5 mm	< 5 mm	< 5 mm

[1] The estimates for the Wilson Street Overbridge wingwall are deemed as overestimate as they ignore the contribution of the bridge piles, as discussed in Section 4.4.2.

From an induced displacements point of view, the proposed works have minimum impacts on the existing Sydney Trains / Sydney Metro assets. No significant changes to the results shown above have been noted when a sensitivity analysis was carried out at each section with a reduction in Young Modulus values for all soils and rock layers of 25%.

On all design sections covered by this geotechnical assessment, the estimate of induced displacements on rail corridor land due to the proposed works are less than 10 mm.

7.1.2 Stress changes to surrounding soil/rock mass

Table 7-2 summarises the soil/rock stresses at the location of the relevant Sydney Trains /Sydney Metro assets prior to, during and post excavation works.

Table 7-2: Stresses in surrounding soil/rock mass of Sydney Trains / Sydney Metro assets

Sydney Trains / Sydney Metro asset		Current condition (Stage 4)	Before 2nd Level of Strut / Excavation to Basement-3 Level (Stage 10/11)	End of excavation (Stage 18/19)	Removal of last level of ground anchors (Stage 28/29)	Largest differential to Stage 4
XX (horizontal) direction [1]						
Rail retaining wall along railway corridor		0 to < 80 kPa (Units 1 to 3a) ~470 to < 730 kPa (Below Unit 3a)	0 to < 60 kPa (Units 1 to 3a) ~450 to < 710 kPa (Below Unit 3a)	0 to < 55 kPa (Units 1 to 3a) ~220 to < 370 kPa (Below Unit 3a)	0 to < 50 kPa (Units 1 to 3a) ~215 to < 365 kPa (Below Unit 3a)	< 30 kPa (Units 1 to 3a) < 390 kPa (Below Unit 3a)
Wilson Street vehicle	Stem	0 to < 60 kPa	0 to < 55 kPa	0 to < 65 kPa	0 to < 65kPa	< 10 kPa
Sydney Trains / Sydney Metro asset		**Current condition (Stage 4)**	**Before 2nd Level of Strut / Excavation to Basement-3 Level (Stage 10/11)**	**End of excavation (Stage 18/19)**	**Removal of last level of ground anchors (Stage 28/29)**	**Largest differential to Stage 4**
YY (vertical) direction [1]						
Rail retaining wall along railway corridor		0 to < 260 kPa	0 to < 200 kPa	0 to < 220 kPa	0 to < 200 kPa	< 70 kPa
Wilson Street vehicle overbridge	Stem	5 to < 90 kPa	5 to < 85 kPa	5 to < 90 kPa	to < 95 kPa	< 15 kPa
	Base	~50 to < 210 kPa	~55 to < 205 kPa	~40 to < 240 kPa	~40 to < 235 kPa	< 25 kPa
O'Brien St pedestrian bridge		0 to < 75 kPa	0 to < 70 kPa	0 to < 70 kPa	0 to < 70 kPa	< 5 kPa

[1] Total stresses measured behind the retaining walls and beneath the base of the wingwall at Wilson St overbridge

With regards to changes to surrounding soil/rock mass, the proposed works have minimum impacts on the existing Sydney Trains /Syndey Metro assets. Furthermore, the foundations for the proposed building will all be constructed below the founding level of all Sydney Trains / Sydney Metro assets and away from their influence zone. The Structural Engineer has also confirmed that the basement piles, or any foundation pile in proximity to the railway corridor, will not be subject to tension loading on any load cases.

No significant changes to the results shown above have been noted when a sensitivity analysis was carried out at each section with a reduction in Young Modulus values for all soils and rock layers of 25%.

7.1.3 Induced track movement

On all design sections covered by this geotechnical assessment, the estimate of induced displacements at the location of the existing Sydney Trains/Sydney Metro railway tracks is not greater than 5 mm, as summarised in Table 7-3.

Table 7-3: Induced track movement on Sydney Trains / Sydney Metro lines

Sydney Trains / Sydney Metro lines / Design Section	Sydney Trains (West Line)	Sydney Metro (West Line)	Sydney Metro (East Line)	Sydney Trains (East Line)
Horizontal Displacement (mm)				
Rail retaining wall along railway corridor	< 5 mm	< 4 mm	< 3 mm	< 1 mm
Wilson Street vehicle overbridge	< 4 mm	< 3 mm	< 2 mm	Not covered in analysis
O'Brien St pedestrian bridge	< 3 mm	< 2 mm	< 1 mm	< 1 mm
Vertical Displacement (mm)				
Rail retaining wall along railway corridor	< 2 mm	< 2 mm	< 1 mm	1 mm
Wilson Street vehicle overbridge	< 1 mm	< 1 mm	< 1 mm	Not covered in analysis
O'Brien St pedestrian bridge	< 1 mm	< 1 mm	< 1 mm	< 1 mm

In light of the above, and considering the requirements of TfNSW Technical Note – TN 004:2015 and TfNSW Engineering Specification SPC 207, as the risk of track displacement is rack displacement equal to, or greater than 4 mm, track monitoring will be required during the works.

8 INSTRUMENTATION AND MONITORING

At this point of the design development the instrumentation and monitoring plan is yet to be developed and may be developed by others. Nonetheless, we recommend that active monitoring of the proposed basement wall is carried out through the works, as its behaviour will be critical to the performance of the existing Sydney Trains / Sydney Metro assets as construction progresses.

We envisage that the instrumentation and monitoring plan will comprise of survey monitoring prisms/points are installed along the caping beam and on selected vertical arrays. In conjunction with the survey monitoring prisms/points, we

consider it would be prudent to install borehole inclinometers at selected locations behind the proposed basement wall, so that the ground displacement profile with depth can also be assessed.

Monitoring points should also be installed at the location of the existing Sydney Trains / Sydney Metro assets and it will be important to have that carried ahead of the works to establish baseline readings. The proposed monitoring should also adhere to the requirements set out by TfNSW Technical Note – TN 004:2015 and TfNSW Engineering Specification SPC 207 regarding track monitoring.

9 KEY RISKS AND CONSIDERATIONS

Some of the key risks and considerations associated with the assessment presented in this report include:

- Impacts on and underground services in the vicinity, if any, have not been considered within this technical memorandum. Any temporary works stability associated with these works are also outside of the scope of this report.
- The inferred ground conditions are based on the existing geotechnical investigation, which was carried put in excess of 20 m away from the Sydney Trains / Sydney Metro assets in analysis. Actual ground conditions may vary for those presented in this report.
- Any soil consolidation settlement has not been considered as part of this assessment and may be dependent on the extent of groundwater drawdown in the area. However, given that the existing railway lines/assets are founded on XW shale rock or better, no long-term settlement (primary consolidation or creep) are anticipated.
- As no site-specific information is available about the locked-in stresses within the shale rock mass in the area, published literature (References 5 & 6) has been used to calibrate the numerical modelling.
- The global stability check carried out using the c-phi reduction method in PLAXIS 2D has limitations and may be influenced by the stiffness of the structural elements in the model and assumed groundwater profiles.
- This impact assessment has been carried out based on the preliminary design for the shoring system for the site. Should the design proposal be updated, this assessment may need to be revisited.
- Based on the overall ground conditions, distance to the proposed works and their construction sequence, the overall impact of the works on the existing railway assets is considered minor to negligeable.

Fortify Geotech Pty Ltd

REFERENCES

Transport for NSW – Asset Standards Authority, “T HR CI 12090 ST – Airspace and External Developments”, version 1.0, issue date 01 June 2021

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Fortify Geotech, “Geotechnical Investigation Report”, report reference S2207_SGI_01_Rev2, dated 6 November 2024

Bertuzzi, Robert, “Sydney Sandstone and Shale Parameters for Tunnel Design”, Australian Geomechanics Vol 49 No 1, March 2014.

Pells, P.J.N., Mostyn, G., Bertuzzi, R. and Wong, P. K., “Classification of Sandstones and Shales in the Sydney Region: A Forty Year Review”, Australian Geomechanics, Vol 54 No 2, June 2019.

Standards Australia, “AS5100.2-2017 - Bridge design Part 2: Design loads”

Standards Australia, “AS5100.3-2017 - Bridge design Part 3: Foundations and soil-supporting structures”

Transport for NSW – Sydney Metro Authority, “Sydney Metro At Grade and Elevated Sections Corridor Protection Guidelines”, Project No 657578, Revision 0, September 2018

Transport for NSW – Technical Note - TN 004: 2015 - “Buried services at turnouts and special trackwork”, issued 03 September 2015

Transport for NSW – Engineering Specification – SPC 207 “Track Monitoring Requirements for Undertrack Excavation”, version 1.5, issued April 2013

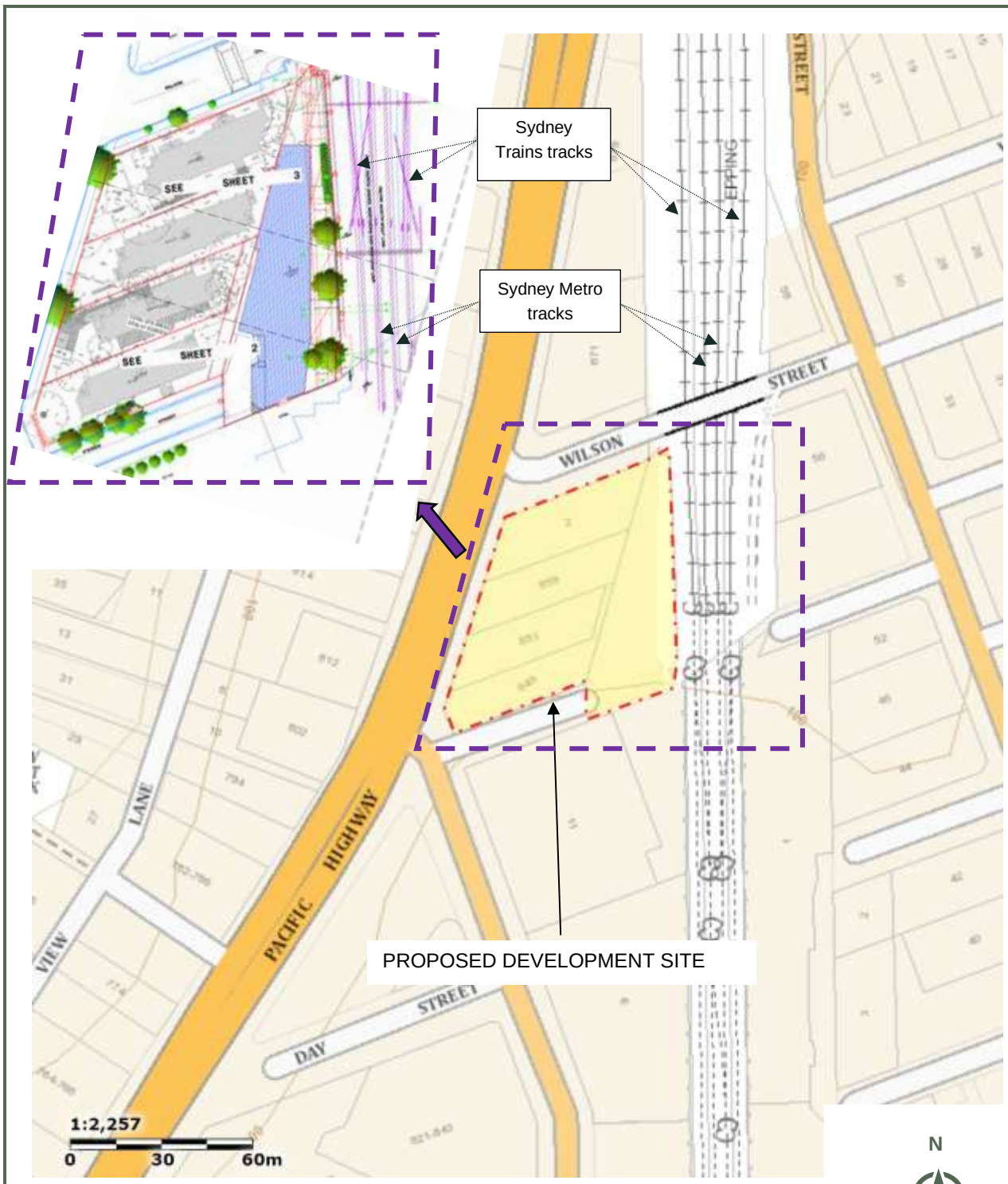


FIGURE 1: SITE LOCALITY	S2207

FIGURE 2: AERIAL PHOTOGRAPH AND 2023 FORTIFY BOREHOLE LOCATIONS

S2207

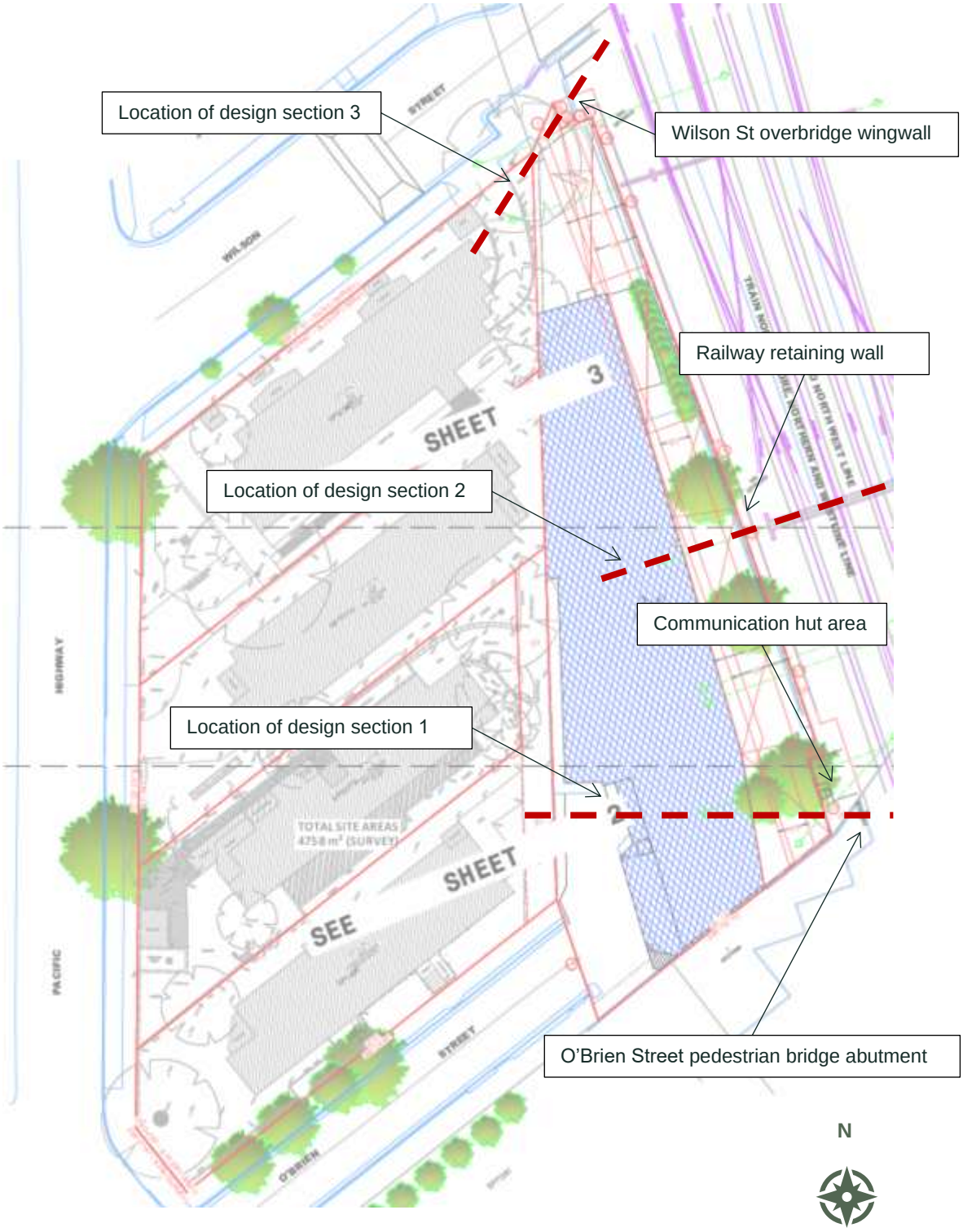


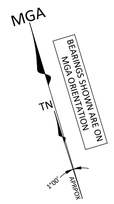
FIGURE 3: LOCATION OF DESIGN SECTIONS	S2207

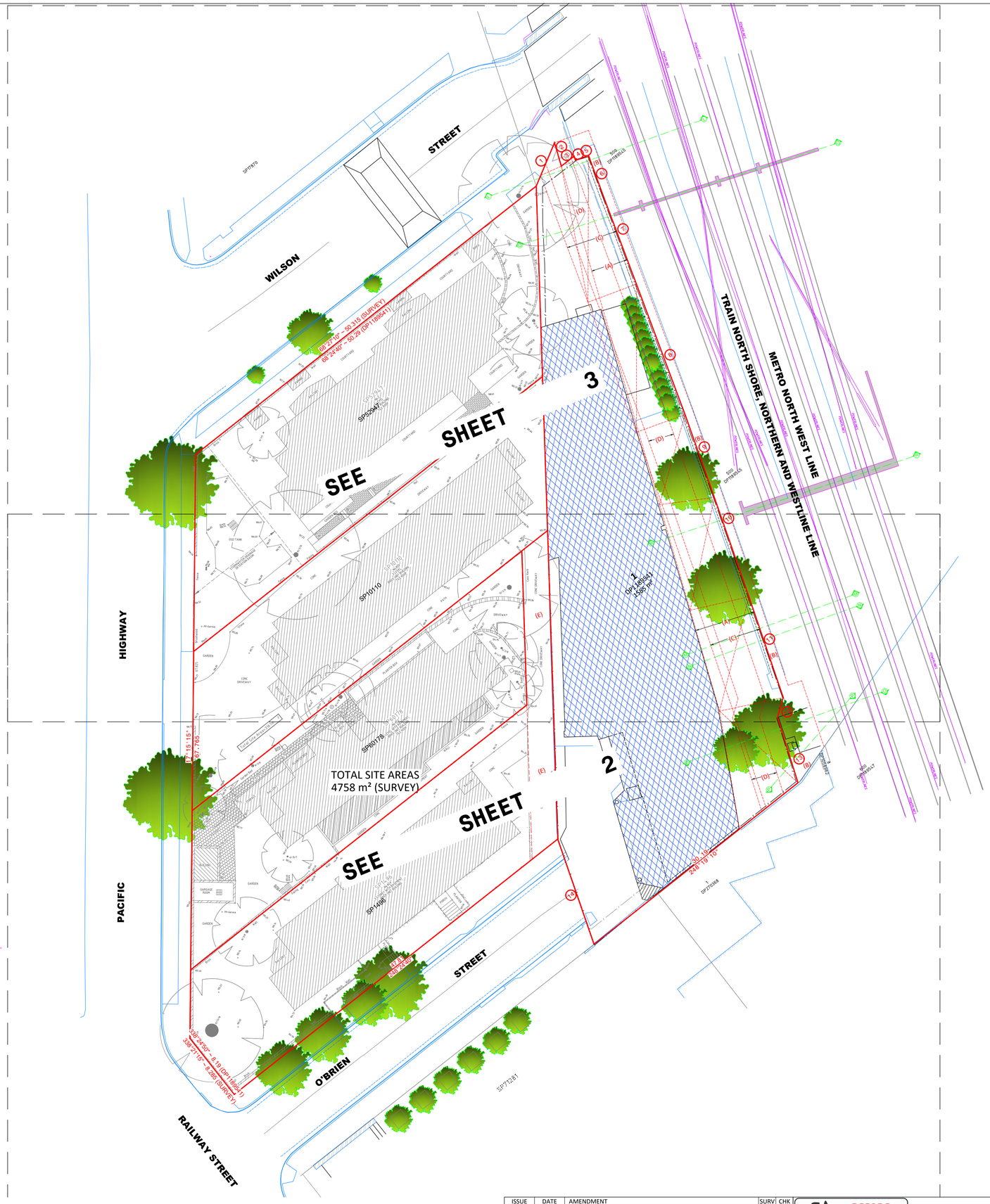
FORTIFY
GEOTECH

Appendix A

Relevant extracts of reference documents and input information

A1





Schedule of Easements & Restrictions	
No	Description
(A)	EASEMENT FOR GROUND SUPPORT (SOIL) VARIABLE WIDTH (LIMITED IN STRATUM) (DP1189541)
(B)	EASEMENT FOR SUPPORT 1 WIDE & VARIABLE WIDTH (DP1189541)
(C)	EASEMENT FOR GROUND SUPPORT (REINFORCING SYSTEMS IN SOIL) 6 WIDE & VARIABLE WIDTH (LIMITED IN STRATUM) (DP1189541)
(D)	EASEMENT FOR ACCESS 3 WIDE (AR288094)
(E)	RIGHT OF WAY 3.05 WIDE (550481)

NOTE:

UL 107.3 DENOTES UPPER LIMIT RL FOR STRATUM OF EASEMENTS SHOWN (4) AND (C)

WARNING

THE SURVEY INFORMATION RELATING TO SP52947, SP10110, SP60178 & SP1496 (SHOWN GREY) WAS TAKEN FROM THE DETAIL AND LEVEL PLAN PREPARED BY BURTON & FIELD DRAWING REF. E5380-78240 DATED 08/10/2020. THIS SURVEY HAS NOT BEEN VERIFIED SDG TAKES NO RESPONSIBILITY FOR THE ACCURACY OF THE INFORMATION TAKEN FROM THIS PLAN.

SEE SHEETS 2 & 3 FOR UNDERGROUND SERVICE LINES, TREE INFORMATION & EASEMENT DETAILS

SEE SHEET 4 FOR UNDERGROUND SERVICE TABLES

SEE SHEETS 5-9 FOR RAIL SECTIONS AND PROPOSED DESIGN LOCATION

SCHEDULE OF SHORT LINES

No.	BEARING	DISTANCE
1	39°37'10"	5.455
2	180°30'50"	2.835
3	68°25'10"	1.88
4	178°31'50"	0.485
5	87°13'30"	1.62
6	176°43'10"	4.93
7	176°06'	11
8	176°15'10"	16.155
9	177°13'40"	10.205
10	177°31'40"	12.19
11	177°55'	12.365
12	212°50'20"	2.39
13	179°18'50"	7.955
14	357°41'50"	12.91

2 4 6 8 10 20 25
1:250

ISSUE	DATE	AMENDMENT	SURV	CHK
A	01/11/23	ORIGINAL ISSUE	PQ	MT
B	29/01/24	RIDGES AND GUTTERS OF ADJOINING LOTS ADDED	SY	MT
C	20/03/24	RAILWAY SECTION VIEWS ADDED	AZ	MT

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MICHAEL TRIFIRO ID: SU008624
REGISTERED LAND SURVEYOR

GENERAL NOTES

ONLY TREES GREATER THAN 2 METRES IN HEIGHT ARE SHOWN ON THIS PLAN AND THEIR POSITIONS ARE DIAGRAMMATIC ONLY AND MAY REQUIRE ADDITIONAL SURVEY WHERE CRITICAL TO DESIGN.

CONTOURS ARE INDICATIVE AT GROUND FORM ONLY. SPOT LEVELS ONLY SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION.

LEVELS ARE ON AUSTRALIAN HEIGHT DATUM (AHD).

ALL SETOUT LEVELS MUST BE REFERRED TO THE BENCH MARK SHOWN ON THIS PLAN.

BOUNDARY NOTES

A BASIC BOUNDARY SURVEY HAS BEEN DONE SUITABLE FOR DA LODGEMENT PURPOSES.

BOUNDARIES HAVE NOT BEEN MARKED.

SURVEY INFORMATION NOTES

THE ORIGIN OF COORDINATES COMES FROM PM290 E331528.198 N6259353.120 CLASS B POSITIONAL UNCERTAINTY (PU) 0.02 (MGA2020) ADOPTED FROM SCIMS DATED 02/11/2023.

THE ORIGIN OF LEVELS COMES FROM PM290 RL107.323 CLASS LA POSITIONAL UNCERTAINTY (PU) 0.02 ADOPTED FROM SCIMS DATED 02/11/2023.

THE ORIENTATION OF THIS PLAN IS MGA NORTH WHICH HAS BEEN DETERMINED BY DP1189451.

CERTIFICATE OF TITLE NOTES

THE FOLLOWING INFORMATION RELATES TO THE RESPECTIVE CERTIFICATE OF TITLE OF EACH LOTS:

- LOT 1 IN DP1189541
  (CT EDITION 7 DATED 16/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - EASEMENT FOR GROUND SUPPORT (SOIL) VARIABLE WIDTH (LIMITED IN STRATUM) SHOWN AS (A) (DP1189541)
    - EASEMENT FOR GROUND SUPPORT (REINFORCING SYSTEMS IN SOIL) 6 METRES WIDE AND VARIABLE WIDTH (LIMITED IN STRATUM) SHOWN AS (C) (DP1189541)
    - EASEMENT FOR ACCESS 3 WIDE SHOWN AS (D) (AR288094)
  - BENEFITED BY:
    - EASEMENT FOR SUPPORT 1 METRE WIDE AND VARIABLE WIDTH SHOWN AS (B) (DP1189541)
- CP/SP1496
  (CT EDITION 4 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP60178
  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - RESTRICTION(S) ON THE USE OF LAND (SP60178)
    - POSITIVE COVENANT (SP60178)
  - BENEFITED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP10110
  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - BENEFITED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP52947
  (CT EDITION 10 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - POSITIVE COVENANT (SP52947)
    - RESTRICTION(S) ON THE USE OF LAND (SP52947)

COVENANTS AND RESTRICTIONS NOTED ON THE TITLE HAVE NOT BEEN INVESTIGATED. THESE SHOULD BE INVESTIGATED PRIOR TO DESIGN TO ENSURE ANY FUTURE DEVELOPMENT COMPLIES.

BY LAWS RELATING TO EACH OF THE SCHEMES HAVE NOT BEEN INVESTIGATED.

SERVICES NOTES

ONLY THOSE SERVICES VISIBLE AT THE TIME OF SURVEY HAVE BEEN LOCATED AND ARE QUALITY LEVEL A AS DEFINED BY AS 5488.1:2019.

UNDERGROUND SERVICES HAVE BEEN LOCATED FOR BY 'ON POINT LOCATING' ON 31/10/2023 AND 01/11/2023 USING EQUIPMENT AS NOTED ON REPORT PROVIDED DATED 31/10/2023 AND 01/11/2023. THE SERVICE POSITION IS SHOWN ON THE PLAN AND THEIR RESPECTIVE DEPTH AND QUALITY ARE AS STATED IN THE TABLE.

UNDERGROUND SERVICES HAVE BEEN PLOTTED FROM 'DIAL-BEFORE'YOU-DIG' PLANS, ARE QUALITY LEVEL D AS DEFINED BY AS 5488.1:2019 AND ARE ONLY CURRENT AT THE DATE OF SEARCH.

ALL RELEVANT AUTHORITIES MUST BE CONTACTED TO DETERMINE THE FULL EXTENT OF SERVICES PRIOR TO ANY PLANNING OR WORKS NEAR THE SITE.

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PROJECT:
DETAIL AND LEVEL SURVEY OF
LOT 1 IN DP1189541, SP1496,
SP60178, SP10110 AND PART OF SP52947

849-859 PACIFIC HIGHWAY, 2 WILSON STREET
& LOT 1 O'BRIEN STREET
CHATSWOOD

CLIENT: BB WILSON PROPERTY PTY LTD

FILE: 9062 - Detail & Level - Rev C - 849-859 Pacific Highway, 2 Wilson Street & Lot 1 O'Brien Street Chatswood

LGA: WILLOUGHBY

REF: 9062	CONTOURS: 0.5m
ISSUE: C	DATUM: AHD
SURVEY DATE: 20/03/2024	AZIMUTH: MGA2020
SCALE: 1:250	SHEET 1 OF 9 SHEETS

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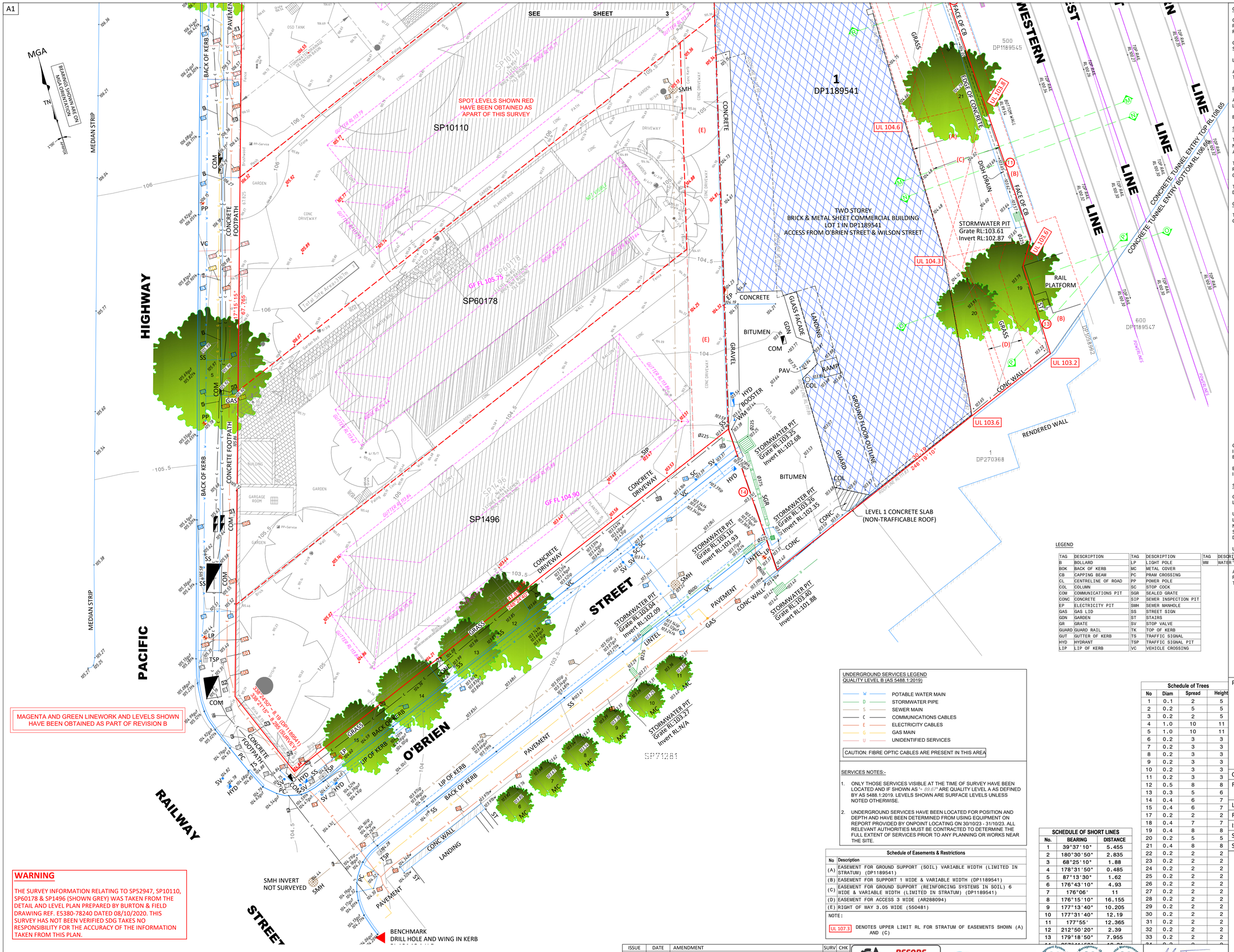
A1



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    - EASEMENT FOR GROUND SUPPORT (REINFORCING SYSTEMS IN SOIL) 6 METRES WIDE AND VARIABLE WIDTH (LIMITED IN STRATUM) SHOWN AS (C) (DP1189541)
    - EASEMENT FOR ACCESS 3 WIDE SHOWN AS (D) (AR288094)
  - BENEFITED BY:
    - EASEMENT FOR SUPPORT 1 METRE WIDE AND VARIABLE WIDTH SHOWN AS (B) (DP1189541)
- CP/SP1496
  (CT EDITION 4 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP60178
  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - RESTRICTION(S) ON THE USE OF LAND (SP60178)
    - POSITIVE COVENANT (SP60178)
  - BENEFITED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP10110
  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - BENEFITED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP52947
  (CT EDITION 10 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - POSITIVE COVENANT (SP52947)
    - RESTRICTION(S) ON THE USE OF LAND (SP52947)

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LEGEND

TAG	DESCRIPTION	TAG	DESCRIPTION	TAG	DESCRIPTION
B	BOLLARD	LP	LIGHT POLE	WM	WATER METER
BOK	BACK OF KERB	MC	METAL COVER		
CB	CAPPING BEAM	PC	PRAM CROSSING		
CL	CENTRELINE OF ROAD	PP	POWER POLE		
COL	COLUMN	SC	STOP COCK		
COM	COMMUNICATIONS PIT	SGR	SEALED GRATE		
CONC	CONCRETE	SIP	SEWER INSPECTION PIT		
EP	ELECTRICITY PIT	SMH	SEWER MANHOLE		
GAS	GAS LID	SS	STREET SIGN		
GDN	GARDEN	ST	STAIRS		
GR	GRATE	SV	STOP VALVE		
GUARD	GUARD RAIL	TK	TOP OF KERB		
GUT	GUTTER OF KERB	TS	TRAFFIC SIGNAL		
HYD	HYDRANT	TSP	TRAFFIC SIGNAL PIT		
LIP	LIP OF KERB	VC	VEHICLE CROSSING		

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UNDERGROUND SERVICES LEGEND
QUALITY LEVEL B (AS 5488.1:2019)

W	POTABLE WATER MAIN
D	STORMWATER PIPE
S	SEWER MAIN
C	COMMUNICATIONS CABLES
E	ELECTRICITY CABLES
G	GAS MAIN
U	UNIDENTIFIED SERVICES

CAUTION: FIBRE OPTIC CABLES ARE PRESENT IN THIS AREA

SERVICES NOTES:-

1. ONLY THOSE SERVICES VISIBLE AT THE TIME OF SURVEY HAVE BEEN LOCATED AND IF SHOWN AS '+ 89.67' ARE QUALITY LEVEL A AS DEFINED BY AS 5488.1:2019. LEVELS SHOWN ARE SURFACE LEVELS UNLESS NOTED OTHERWISE.
2. UNDERGROUND SERVICES HAVE BEEN LOCATED FOR POSITION AND DEPTH AND HAVE BEEN DETERMINED FROM USING EQUIPMENT ON REPORT PROVIDED BY ONPOINT LOCATING ON 30/10/23 - 31/10/23. ALL RELEVANT AUTHORITIES MUST BE CONTRACTED TO DETERMINE THE FULL EXTENT OF SERVICES PRIOR TO ANY PLANNING OR WORKS NEAR THE SITE.

Schedule of Easements & Restrictions

No	Description
(A)	EASEMENT FOR GROUND SUPPORT (SOIL) VARIABLE WIDTH (LIMITED IN STRATUM) (DP1189541)
(B)	EASEMENT FOR SUPPORT 1 WIDE & VARIABLE WIDTH (DP1189541)
(C)	EASEMENT FOR GROUND SUPPORT (REINFORCING SYSTEMS IN SOIL) 6 WIDE & VARIABLE WIDTH (LIMITED IN STRATUM) (DP1189541)
(D)	EASEMENT FOR ACCESS 3 WIDE (AR288094)
(E)	RIGHT OF WAY 3.05 WIDE (550481)

NOTE:

UL 107.3 DENOTES UPPER LIMIT RL FOR STRATUM OF EASEMENTS SHOWN (A) AND (C)

Schedule of Trees

No	Diam	Spread	Height
1	0.1	2	5
2	0.2	5	5
3	0.2	2	5
4	1.0	10	11
5	1.0	10	11
6	0.2	3	3
7	0.2	3	3
8	0.2	3	3
9	0.2	3	3
10	0.2	3	3
11	0.2	3	3
12	0.5	8	8
13	0.3	5	6
14	0.4	6	7
15	0.4	6	7
17	0.2	2	2
18	0.4	7	7
19	0.4	8	8
20	0.2	5	5
21	0.4	8	8
22	0.2	2	2
23	0.2	2	2
24	0.2	2	2
25	0.2	2	2
26	0.2	2	2
27	0.2	2	2
28	0.2	2	2
29	0.2	2	2
30	0.2	2	2
31	0.2	2	2
32	0.2	2	2
33	0.2	2	2

SCHEDULE OF SHORT LINES

No.	BEARING	DISTANCE
1	39°37'10"	5.455
2	180°30'50"	2.835
3	68°25'10"	1.88
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ISSUE	DATE	AMENDMENT	SURV	CHK
A	01/11/23	ORIGINAL ISSUE	PQ	MT
B	29/01/24	RIDGES AND GUTTERS OF ADJOINING LOTS ADDED	SY	MT
C	20/03/24	RAILWAY SECTION VIEWS ADDED	AZ	MT

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MICHAEL TRIFIRO ID: SU008624
REGISTERED LAND SURVEYOR

PROJECT:
DETAIL AND LEVEL SURVEY OF
LOT 1 IN DP1189541, SP1496,
SP60178, SP10110 AND PART OF SP52947

849-859 PACIFIC HIGHWAY, 2 WILSON STREET
& LOT 1 O'BRIEN STREET
CHATSWOOD

CLIENT: BB WILSON PROPERTY PTY LTD
FILE: 9062 - Detail & Level - Rev C - 849-859 Pacific Highway, 2 Wilson Street & Lot 1 O'Brien Street Chatswood
LGA: WILLOUGHBY

REF: 9062	CONTOURS: 0.5m
ISSUE: C	DATUM: AHD
SURVEY DATE: 20/03/2024	AZIMUTH: MGA2020
SCALE: 1:150	SHEET 2 OF 9 SHEETS

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A1

UNDERGROUND SERVICES LEGEND
QUALITY LEVEL B (AS 5488.1:2019)

- W — POTABLE WATER MAIN
- D — STORMWATER PIPE
- S — SEWER MAIN
- C — COMMUNICATIONS CABLES
- E — ELECTRICITY CABLES
- G — GAS MAIN
- U — UNIDENTIFIED SERVICES

CAUTION: FIBRE OPTIC CABLES ARE PRESENT IN THIS AREA

SERVICES NOTES:-

1. ONLY THOSE SERVICES VISIBLE AT THE TIME OF SURVEY HAVE BEEN LOCATED AND IF SHOWN AS '+ .99 @.7' ARE QUALITY LEVEL A AS DEFINED BY AS 5488.1:2019. LEVELS SHOWN ARE SURFACE LEVELS UNLESS NOTED OTHERWISE.
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MAGENTA AND GREEN LINEWORK AND LEVELS SHOWN HAVE BEEN OBTAINED AS PART OF REVISION B

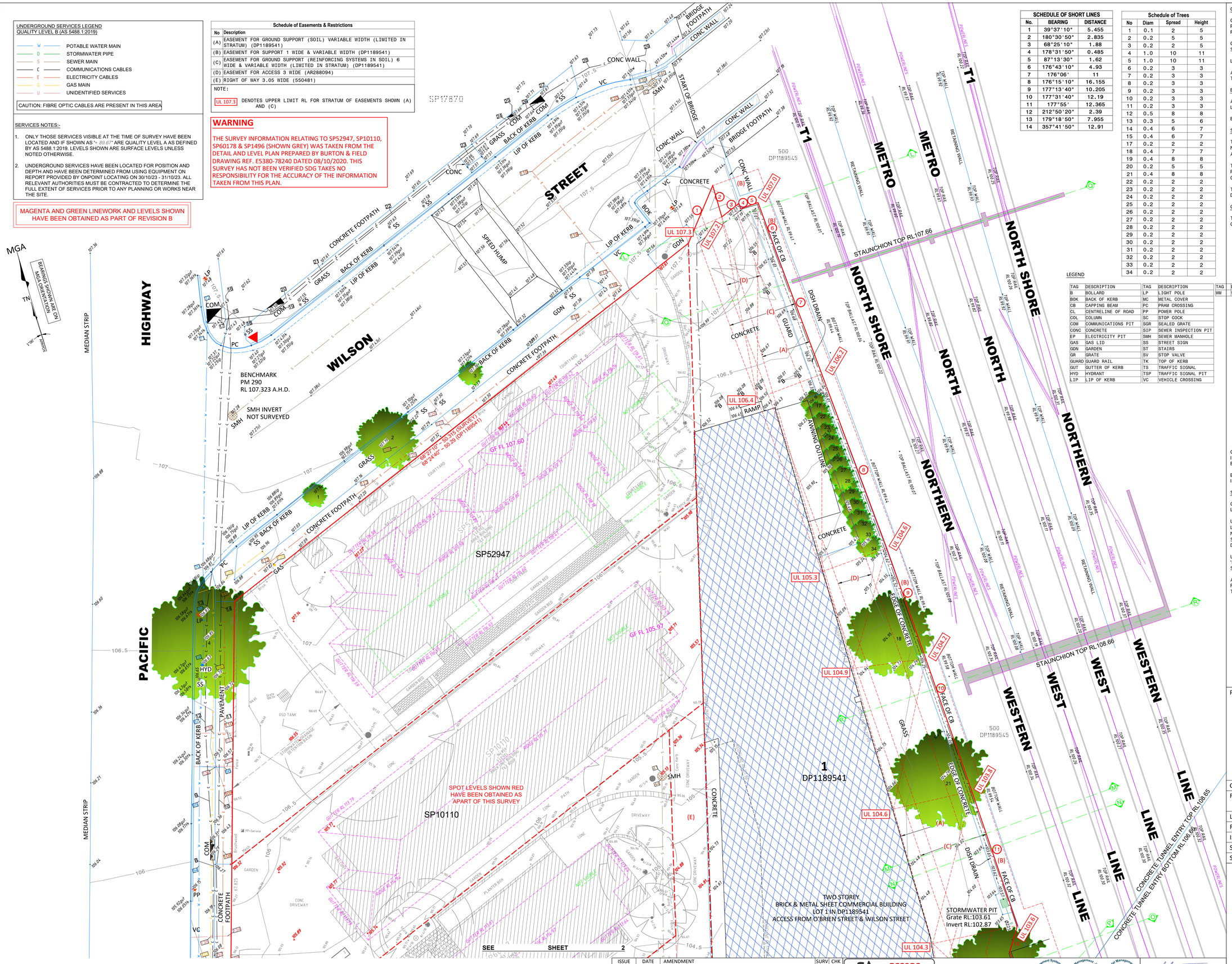
Schedule of Easements & Restrictions

No	Description
(A)	EASEMENT FOR GROUND SUPPORT (SOIL) VARIABLE WIDTH (LIMITED IN STRATUM) (DP1189541)
(B)	EASEMENT FOR SUPPORT 1 WIDE & VARIABLE WIDTH (DP1189541)
(C)	EASEMENT FOR GROUND SUPPORT (REINFORCING SYSTEMS IN SOIL) 6 WIDE & VARIABLE WIDTH (LIMITED IN STRATUM) (DP1189541)
(D)	EASEMENT FOR ACCESS 3 WIDE (AR288094)
(E)	RIGHT OF WAY 3.05 WIDE (550481)

NOTE:
UL 107.3 DENOTES UPPER LIMIT RL FOR STRATUM OF EASEMENTS SHOWN (A) AND (C)

WARNING

THE SURVEY INFORMATION RELATING TO SP52947, SP10110, SP60178 & SP1496 (SHOWN GREY) WAS TAKEN FROM THE DETAIL AND LEVEL PLAN PREPARED BY BURTON & FIELD DRAWING REF. E5380-78240 DATED 08/10/2020. THIS SURVEY HAS NOT BEEN VERIFIED SDG TAKES NO RESPONSIBILITY FOR THE ACCURACY OF THE INFORMATION TAKEN FROM THIS PLAN.



SCHEDULE OF SHORT LINES

No.	BEARING	DISTANCE
1	39°37'10"	5.455
2	180°30'50"	2.835
3	68°25'10"	1.88
4	178°31'50"	0.485
5	87°13'30"	1.62
6	176°43'10"	4.93
7	176°06'	11
8	176°15'10"	16.155
9	177°13'40"	10.205
10	177°31'40"	12.19
11	177°55'	12.365
12	212°50'20"	2.39
13	179°18'50"	7.955
14	357°41'50"	12.91

Schedule of Trees

No	Diam	Spread	Height
1	0.1	2	5
2	0.2	5	5
3	0.2	2	5
4	1.0	10	11
5	1.0	10	11
6	0.2	3	3
7	0.2	3	3
8	0.2	3	3
9	0.2	3	3
10	0.2	3	3
11	0.2	3	3
12	0.5	8	8
13	0.3	5	6
14	0.4	6	7
15	0.4	6	7
17	0.2	2	2
18	0.4	7	7
19	0.4	8	8
20	0.2	5	5
21	0.4	8	8
22	0.2	2	2
23	0.2	2	2
24	0.2	2	2
25	0.2	2	2
26	0.2	2	2
27	0.2	2	2
28	0.2	2	2
29	0.2	2	2
30	0.2	2	2
31	0.2	2	2
32	0.2	2	2
33	0.2	2	2
34	0.2	2	2

LEGEND

TAG	DESCRIPTION	TAG	DESCRIPTION	TAG	DESCRIPTION
B	BOLLARD	LP	LIGHT POLE	WM	WATER METER
BOK	BACK OF KERB	MC	METAL COVER		
CB	CAPPING BEAM	PC	PRAM CROSSING		
CL	CENTRELINE OF ROAD	PP	POWER POLE		
COL	COLUMN	SC	STOP COCK		
COM	COMMUNICATIONS PIT	SGR	SEALED GRATE		
CONC	CONCRETE	SIP	SEWER INSPECTION PIT		
EP	ELECTRICITY PIT	SMH	SEWER MANHOLE		
GAS	GAS LID	SS	STREET SIGN		
GDN	GARDEN	ST	STAIRS		
GR	GRATE	SV	STOP VALVE		
GUARD	GUARD RAIL	TK	TOP OF KERB		
GUT	GUTTER OF KERB	TS	TRAFFIC SIGNAL		
HYD	HYDRANT	TSP	TRAFFIC SIGNAL PIT		
LIP	LIP OF KERB	VC	VEHICLE CROSSING		

GENERAL NOTES

ONLY TREES GREATER THAN 2 METRES IN HEIGHT ARE SHOWN ON THIS PLAN AND THEIR POSITIONS ARE DIAGRAMMATIC ONLY AND MAY REQUIRE ADDITIONAL SURVEY WHERE CRITICAL TO DESIGN.

CONTOURS ARE INDICATIVE AT GROUND FORM ONLY. SPOT LEVELS ONLY SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION.

LEVELS ARE ON AUSTRALIAN HEIGHT DATUM (AHD).

ALL SETOUT LEVELS MUST BE REFERRED TO THE BENCH MARK SHOWN ON THIS PLAN.

BOUNDARY NOTES

A BASIC BOUNDARY SURVEY HAS BEEN DONE SUITABLE FOR DA LODGEMENT PURPOSES.

BOUNDARIES HAVE NOT BEEN MARKED.

SURVEY INFORMATION NOTES

THE ORIGIN OF COORDINATES COMES FROM PM290 E331528.198 N6259353.120 CLASS B POSITIONAL UNCERTAINTY (PU) 0.02 (MGA2020) ADOPTED FROM SCIMS DATED 02/11/2023.

THE ORIGIN OF LEVELS COMES FROM PM290 RL107.323 CLASS LA POSITIONAL UNCERTAINTY (PU) 0.02 ADOPTED FROM SCIMS DATED 02/11/2023.

THE ORIENTATION OF THIS PLAN IS MGA NORTH WHICH HAS BEEN DETERMINED BY DP1189451.

CERTIFICATE OF TITLE NOTES

THE FOLLOWING INFORMATION RELATES TO THE RESPECTIVE CERTIFICATE OF TITLE OF EACH LOTS:

- LOT 1 IN DP1189541
  (CT EDITION 7 DATED 16/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - EASEMENT FOR GROUND SUPPORT (SOIL) VARIABLE WIDTH (LIMITED IN STRATUM) SHOWN AS (A) (DP1189541)
    - EASEMENT FOR GROUND SUPPORT (REINFORCING SYSTEMS IN SOIL) 6 METRES WIDE AND VARIABLE WIDTH (LIMITED IN STRATUM) SHOWN AS (C) (DP1189541)
    - EASEMENT FOR ACCESS 3 WIDE SHOWN AS (D) (AR288094)
  - BENEFITED BY:
    - EASEMENT FOR SUPPORT 1 METRE WIDE AND VARIABLE WIDTH SHOWN AS (B) (DP1189541)
- CP/SP1496
  (CT EDITION 4 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP60178
  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - RESTRICTION(S) ON THE USE OF LAND (SP60178)
    - POSITIVE COVENANT (SP60178)
  - BENEFITED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP10110
  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - BENEFITED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP52947
  (CT EDITION 10 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - POSITIVE COVENANT (SP52947)
    - RESTRICTION(S) ON THE USE OF LAND (SP52947)

COVENANTS AND RESTRICTIONS NOTED ON THE TITLE HAVE NOT BEEN INVESTIGATED. THESE SHOULD BE INVESTIGATED PRIOR TO DESIGN TO ENSURE ANY FUTURE DEVELOPMENT COMPLIES.

BY LAWS RELATING TO EACH OF THE SCHEMES HAVE NOT BEEN INVESTIGATED.

SERVICES NOTES

ONLY THOSE SERVICES VISIBLE AT THE TIME OF SURVEY HAVE BEEN LOCATED AND ARE QUALITY LEVEL A AS DEFINED BY AS 5488.1:2019.

UNDERGROUND SERVICES HAVE BEEN LOCATED FOR BY 'ON POINT LOCATING' ON 31/10/2023 AND 01/11/2023 USING EQUIPMENT AS NOTED ON REPORT PROVIDED DATED 31/10/2023 AND 01/11/2023. THE SERVICE POSITION IS SHOWN ON THE PLAN AND THEIR RESPECTIVE DEPTH AND QUALITY ARE AS STATED IN THE TABLE.

UNDERGROUND SERVICES HAVE BEEN PLOTTED FROM 'DIAL-BEFORE'YOU-DIG' PLANS, ARE QUALITY LEVEL D AS DEFINED BY AS 5488.1:2019 AND ARE ONLY CURRENT AT THE DATE OF SEARCH.

ALL RELEVANT AUTHORITIES MUST BE CONTACTED TO DETERMINE THE FULL EXTENT OF SERVICES PRIOR TO ANY PLANNING OR WORKS NEAR THE SITE.

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PROJECT:
DETAIL AND LEVEL SURVEY OF
LOT 1 IN DP1189541, SP1496,
SP60178, SP10110 AND PART OF SP52947

849-859 PACIFIC HIGHWAY, 2 WILSON STREET
& LOT 1 O'BRIEN STREET
CHATSWOOD

CLIENT: BB WILSON PROPERTY PTY LTD	
FILE: 9062 - Detail & Level - Rev C - 849-859 Pacific Highway, 2 Wilson Street & Lot 1 O'Brien Street Chatswood	
LGA: WILLOUGHBY	
REF: 9062	CONTOURS: 0.5m
ISSUE: C	DATUM: AHD
SURVEY DATE: 20/03/2024	AZIMUTH: MGA2020
SCALE: 1:150	SHEET 3 OF 9 SHEETS

ISSUE	DATE	AMENDMENT	SURV	CHK
A	01/11/23	ORIGINAL ISSUE	PQ	MT
B	29/01/24	RIDGES AND GUTTERS OF ADJOINING LOTS ADDED	SY	MT
C	20/03/24	RAILWAY SECTION VIEWS ADDED	AZ	MT

2 4 6 8 10 15
1:150

BEFORE YOU DIG www.byda.com.au

GDA2020

MICHAEL TRIFIRO ID: SU008624
REGISTERED LAND SURVEYOR

SDG Pty Ltd
abn 85 213 523 621
Suite 1, 3 Railway Street, Baulkham Hills NSW 2153
t: (02) 9630 7955 w: sdg.net.au
Liability limited by a scheme approved
under Professional Standards Legislation

A1

SERVICES-COMMUNICATIONS			
No	Surface RL	Approx Depth	Service RL
1	104.30	0.90	103.40
2	104.54	0.90	103.64
3	105.04	0.70	104.34
4	105.15	0.60	104.55
5	105.85	0.50	105.35
6	106.01	0.40	105.61
7	106.07	0.40	105.67
8	106.26	0.50	105.76
9	106.42	0.30	106.12
10	106.48	0.60	105.88
11	106.61	0.60	106.01
12	106.56	0.30	106.26
13	106.86	0.40	106.46
14	106.86	0.60	106.26
15	107.48	0.80	106.68
16	107.53	0.80	106.73
17	107.46	0.30	107.16
18	107.53	0.30	107.23
19	107.55	0.60	106.95
20	107.52	0.50	107.02
21	107.56	0.60	106.96
22	107.61	0.80	106.81
23	107.64	0.80	106.84
24	107.62	0.30	107.32
25	107.70	0.20	107.50
26	107.66	0.70	106.96
27	107.62	0.60	107.02
28	107.55	0.50	107.05
29	107.44	0.60	106.84
30	105.90	0.40	105.50
31	105.64	0.30	105.34
32	105.34	0.40	104.94
33	105.06	0.40	104.66
34	104.84	0.40	104.44
35	104.74	0.30	104.44
36	104.44	0.40	104.04
37	104.10	0.40	103.70
38	103.74	0.40	103.34
39	103.51	0.40	103.11
40	103.42	0.60	102.82

SERVICES-SEWER			
No	Surface RL	Approx Depth	Service RL
41	105.14	2.80	102.34
42	107.38	4.10	103.28
43	103.23	2.61	100.62
44	105.13	2.90	102.23
45	103.21	2.63	100.58
46	103.33	1.50	101.83
47	103.65	1.90	101.75
138	107.38	0.98	106.40
139	107.37	3.94	103.43
140	107.36	3.83	103.53

SERVICES-GAS			
No	Surface RL	Approx Depth	Service RL
121	105.90	0.50	105.40
122	106.07	0.50	105.57
123	106.72	0.50	106.22
124	106.84	0.70	106.14
125	107.02	0.50	106.52

SERVICES-POTABLE WATER			
No	Surface RL	Approx Depth	Service RL
48	103.41	0.50	102.91
49	103.36	0.70	102.66
50	103.32	0.70	102.62
51	103.31	0.60	102.71
52	103.58	0.70	102.88
53	103.86	0.70	103.16
54	104.07	0.70	103.37
55	104.33	0.70	103.63
56	105.50	0.30	105.20
57	105.46	0.60	104.86
58	105.60	0.70	104.90
59	105.89	0.70	105.19
60	105.90	0.40	105.50
61	105.98	0.30	105.68
62	105.99	0.70	105.29
63	106.01	0.60	105.41
64	106.23	0.60	105.63
65	106.39	0.60	105.79
66	106.52	0.30	106.22
67	106.52	0.60	105.92
68	106.74	0.40	106.34
69	106.84	0.60	106.24
70	106.74	0.80	105.94
71	107.22	0.80	106.42
72	107.45	0.80	106.65

SERVICES-TRAFFIC			
No	Surface RL	Approx Depth	Service RL
73	104.32	0.60	103.72
74	104.17	0.50	103.67
75	104.40	0.50	103.90
76	104.58	0.40	104.18
77	104.59	0.30	104.29
78	104.84	0.30	104.54
79	104.99	0.50	104.49
80	105.19	0.60	104.59
81	105.31	0.50	104.81
82	105.36	0.45	104.91
83	105.31	0.45	104.86

SERVICES-UNIDENTIFIED			
No	Surface RL	Approx Depth	Service RL
126	107.29	0.60	106.69
127	107.34	0.60	106.74
128	107.23	0.60	106.63
129	107.30	0.60	106.70
130	106.57	0.50	106.07
131	106.61	0.50	106.11
132	106.50	0.50	106.00
133	106.53	0.50	106.03
134	106.15	0.40	105.75
135	106.07	0.40	105.67
136	106.12	0.30	105.82
137	106.09	0.30	105.79

SERVICES-ELECTRICTY			
No	Surface RL	Approx Depth	Service RL
84	103.23	0.80	102.43
85	103.37	0.40	102.97
86	103.37	0.50	102.87
87	103.80	0.70	103.10
88	104.03	0.50	103.53
89	104.34	0.45	103.89
90	104.33		
91	104.31	1.00	103.31
92	104.20	1.10	103.10
93	104.47	1.00	103.47
94	104.65	0.55	104.10
95	104.81	0.60	104.21
96	104.77	0.65	104.12
97	104.90	1.40	103.50
98	105.13	1.10	104.03
99	105.23	1.10	104.13
100	105.34	1.30	104.04
101	105.41	1.20	104.21
102	105.45	1.20	104.25
103	105.40	1.30	104.10
104	105.58	1.20	104.38
105	105.64	1.00	104.64
106	105.90	0.80	105.10
107	106.09	1.00	105.09
108	106.32	1.00	105.32
109	106.51	1.10	105.41
110	106.62	1.10	105.52
111	106.87	0.90	105.97
112	106.99	0.80	106.19
113	107.20	0.75	106.45
114	107.33	0.70	106.63
115	107.40	0.80	106.60
116	107.48	1.10	106.38
117	107.44	1.10	106.34
118	107.44	1.10	106.34
119	107.45	0.90	106.55
120	107.39	1.20	106.19

WARNING

ALL SERVICES LEVELS ARE OBVERT LEVELS WITH THE EXCEPTION OF SEWER AND DRAINGAGE

FOR PIPE SIZES REFER TO BYDA PLANS AND WHERE PIPE SIZING AND LEVELS ARE CRITICAL TO DESIGN, POTHOLING SHOULD BE UNDETAKEN

ISSUE	DATE	AMENDMENT	SURV	CHK
A	01/11/23	ORIGINAL ISSUE	PQ	MT
B	29/01/24	RIDGES AND GUTTERS OF ADJOINING LOTS ADDED	SY	MT
C	20/03/24	RAILWAY SECTION VIEWS ADDED	AZ	MT

BEFORE YOU DIG www.byda.com.au

GDA2020

MICHAEL TRIFIRO ID: SU008624
REGISTERED LAND SURVEYOR

GENERAL NOTES

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BOUNDARY NOTES

A BASIC BOUNDARY SURVEY HAS BEEN DONE SUITABLE FOR DA LODGEMENT PURPOSES.

BOUNDARIES HAVE NOT BEEN MARKED.

SURVEY INFORMATION NOTES

THE ORIGIN OF COORDINATES COMES FROM PM290 E331528.198 N6259353.120 CLASS B POSITIONAL UNCERTAINTY (PU) 0.02 (MGA2020) ADOPTED FROM SCIMS DATED 02/11/2023.

THE ORIGIN OF LEVELS COMES FROM PM290 RL107.323 CLASS LA POSITIONAL UNCERTAINTY (PU) 0.02 ADOPTED FROM SCIMS DATED 02/11/2023.

THE ORIENTATION OF THIS PLAN IS MGA NORTH WHICH HAS BEEN DETERMINED BY DP1189451.

CERTIFICATE OF TITLE NOTES

THE FOLLOWING INFORMATION RELATES TO THE RESPECTIVE CERTIFICATE OF TITLE OF EACH LOTS:

- LOT 1 IN DP1189541
  (CT EDITION 7 DATED 16/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - EASEMENT FOR GROUND SUPPORT (SOIL) VARIABLE WIDTH (LIMITED IN STRATUM) SHOWN AS (A) (DP1189541)
    - EASEMENT FOR GROUND SUPPORT (REINFORCING SYSTEMS IN SOIL) 6 METRES WIDE AND VARIABLE WIDTH (LIMITED IN STRATUM) SHOWN AS (C) (DP1189541)
    - EASEMENT FOR ACCESS 3 WIDE SHOWN AS (D) (AR288094)
  - BENEFITED BY:
    - EASEMENT FOR SUPPORT 1 METRE WIDE AND VARIABLE WIDTH SHOWN AS (B) (DP1189541)
- CP/SP1496
  (CT EDITION 4 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP60178
  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - RESTRICTION(S) ON THE USE OF LAND (SP60178)
    - POSITIVE COVENANT (SP60178)
  - BENEFITED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP10110
  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - BENEFITED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP52947
  (CT EDITION 10 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - POSITIVE COVENANT (SP52947)
    - RESTRICTION(S) ON THE USE OF LAND (SP52947)

COVENANTS AND RESTRICTIONS NOTED ON THE TITLE HAVE NOT BEEN INVESTIGATED. THESE SHOULD BE INVESTIGATED PRIOR TO DESIGN TO ENSURE ANY FUTURE DEVELOPMENT COMPLIES.

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PROJECT:
DETAIL AND LEVEL SURVEY OF
LOT 1 IN DP1189541, SP1496,
SP60178, SP10110 AND PART OF SP52947

849-859 PACIFIC HIGHWAY, 2 WILSON STREET
& LOT 1 O'BRIEN STREET
CHATSWOOD

CLIENT: BB WILSON PROPERTY PTY LTD
FILE: 9062 - Detail & Level - Rev C - 849-859 Pacific Highway, 2 Wilson Street & Lot 1 O'Brien Street Chatswood
LGA: WILLOUGHBY

REF: 9062	CONTOURS: 0.5m
ISSUE: C	DATUM: AHD
SURVEY DATE: 20/03/2024	AZIMUTH: MGA2020
SCALE: N/A	SHEET 4 OF 9 SHEETS

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t: (02) 9630 7955 w: sdg.net.au
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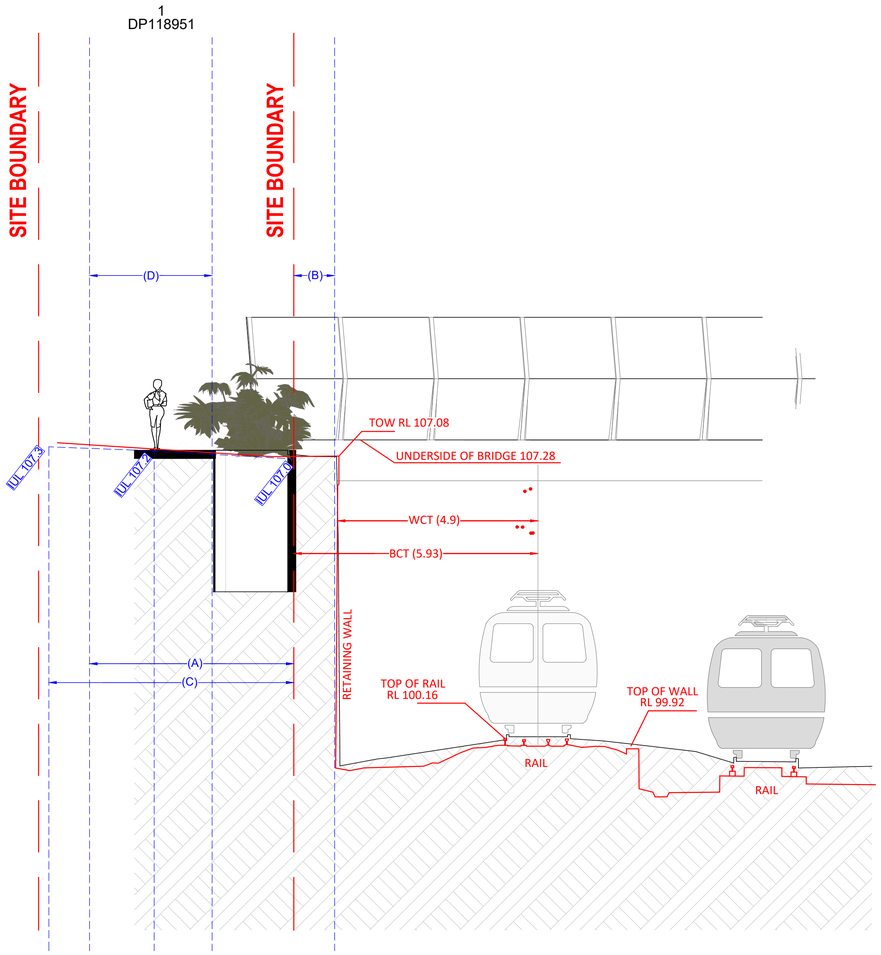
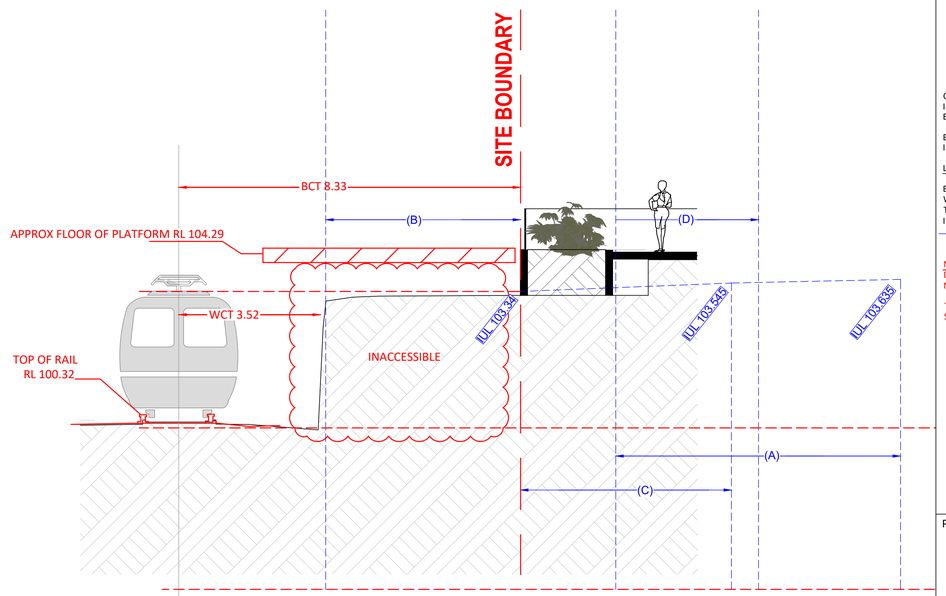
A1

• Denotes ELECTRICITY WIRES



SECTION VIEW Ⓛ-Ⓛ



SECTION VIEW Ⓟ-Ⓟ

Schedule of Easements & Restrictions

No	Description
(A)	EASEMENT FOR GROUND SUPPORT (SOIL) VARIABLE WIDTH (LIMITED IN STRATUM) (DP1189541)
(B)	EASEMENT FOR SUPPORT 1 WIDE & VARIABLE WIDTH (DP1189541)
(C)	EASEMENT FOR GROUND SUPPORT (REINFORCING SYSTEMS IN SOIL) 6 WIDE & VARIABLE WIDTH (LIMITED IN STRATUM) (DP1189541)
(D)	EASEMENT FOR ACCESS 3 WIDE (AR288094)

NOTE:

IUL 107.3 DENOTES INTERPOLATED UPPER LIMIT RL FOR STRATUM OF EASEMENTS SHOWN (A) AND (C)

GENERAL NOTES

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BOUNDARIES HAVE NOT BEEN MARKED.

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THE ORIGIN OF LEVELS COMES FROM PM290 RL107.323 CLASS LA POSITIONAL UNCERTAINTY (PU) 0.02 ADOPTED FROM SCIMS DATED 02/11/2023.

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CERTIFICATE OF TITLE NOTES

THE FOLLOWING INFORMATION RELATES TO THE RESPECTIVE CERTIFICATE OF TITLE OF EACH LOTS:

- LOT 1 IN DP1189541
  (CT EDITION 7 DATED 16/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - EASEMENT FOR GROUND SUPPORT (SOIL) VARIABLE WIDTH (LIMITED IN STRATUM) SHOWN AS (A) (DP1189541)
    - EASEMENT FOR GROUND SUPPORT (REINFORCING SYSTEMS IN SOIL) 6 METRES WIDE AND VARIABLE WIDTH (LIMITED IN STRATUM) SHOWN AS (C) (DP1189541)
    - EASEMENT FOR ACCESS 3 WIDE SHOWN AS (D) (AR288094)
  - BENEFITED BY:
    - EASEMENT FOR SUPPORT 1 METRE WIDE AND VARIABLE WIDTH SHOWN AS (B) (DP1189541)
- CP/SP1496
  (CT EDITION 4 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP60178
  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - RESTRICTION(S) ON THE USE OF LAND (SP60178)
    - POSITIVE COVENANT (SP60178)
  - BENEFITED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP10110
  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - BENEFITED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP52947
  (CT EDITION 10 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - POSITIVE COVENANT (SP52947)
    - RESTRICTION(S) ON THE USE OF LAND (SP52947)

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BY LAWS RELATING TO EACH OF THE SCHEMES HAVE NOT BEEN INVESTIGATED.

LEGEND

BCT denotes BOUNDARY TO CENTERLINE OF TRACK
WCT denotes WALL TO CENTERLINE OF TRACK
TOW denotes TOP OF WALL
IUL denotes INTERPOLATED UPPER LIMIT
- - - - denotes APPROXIMATE EASEMENT POSITION

NOTE:
DESIGN ELEVATIONS PROVIDED DIGITALLY BY PBD ARCHITECTS DRAWING NUMBER DA801 ISSUE 1 DATED 6/3/2024

THE BOUNDARY LINE WAS ADPOPTED FOR THE POSITIONING OF THE SECTION

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PROJECT:
DETAIL AND LEVEL SURVEY OF
LOT 1 IN DP1189541, SP1496,
SP60178, SP10110 AND PART OF SP52947

849-859 PACIFIC HIGHWAY, 2 WILSON STREET
& LOT 1 O'BRIEN STREET
CHATSWOOD

CLIENT: BB WILSON PROPERTY PTY LTD

FILE: 9062 - Detail & Level - Rev C - 849-859 Pacific Highway, 2 Wilson Street & Lot 1 O'Brien Street Chatswood

LGA: WILLOUGHBY

REF: 9062	CONTOURS: 0.5m
ISSUE: C	DATUM: AHD
SURVEY DATE: 20/03/2024	AZIMUTH: MGA2020
SCALE: 1:75	SHEET 5 OF 9 SHEETS

ISSUE	DATE	AMENDMENT	SURV	CHK
A	01/11/23	ORIGINAL ISSUE	PQ	MT
B	29/01/24	RIDGES AND GUTTERS OF ADJOINING LOTS ADDED	SY	MT
C	20/03/24	RAILWAY SECTION VIEWS ADDED	AZ	MT

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GDA2020

MICHAEL TRIFIRO ID: SU008624
REGISTERED LAND SURVEYOR

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abn 85 213 523 621
Suite 1, 3 Railway Street, Baulkham Hills NSW 2153
t: (02) 9630 7955 w: sdg.net.au
Liability limited by a scheme approved under Professional Standards Legislation

A1

Schedule of Easements & Restrictions	
No	Description
(A)	EASEMENT FOR GROUND SUPPORT (SOIL) VARIABLE WIDTH (LIMITED IN STRATUM) (DP1189541)
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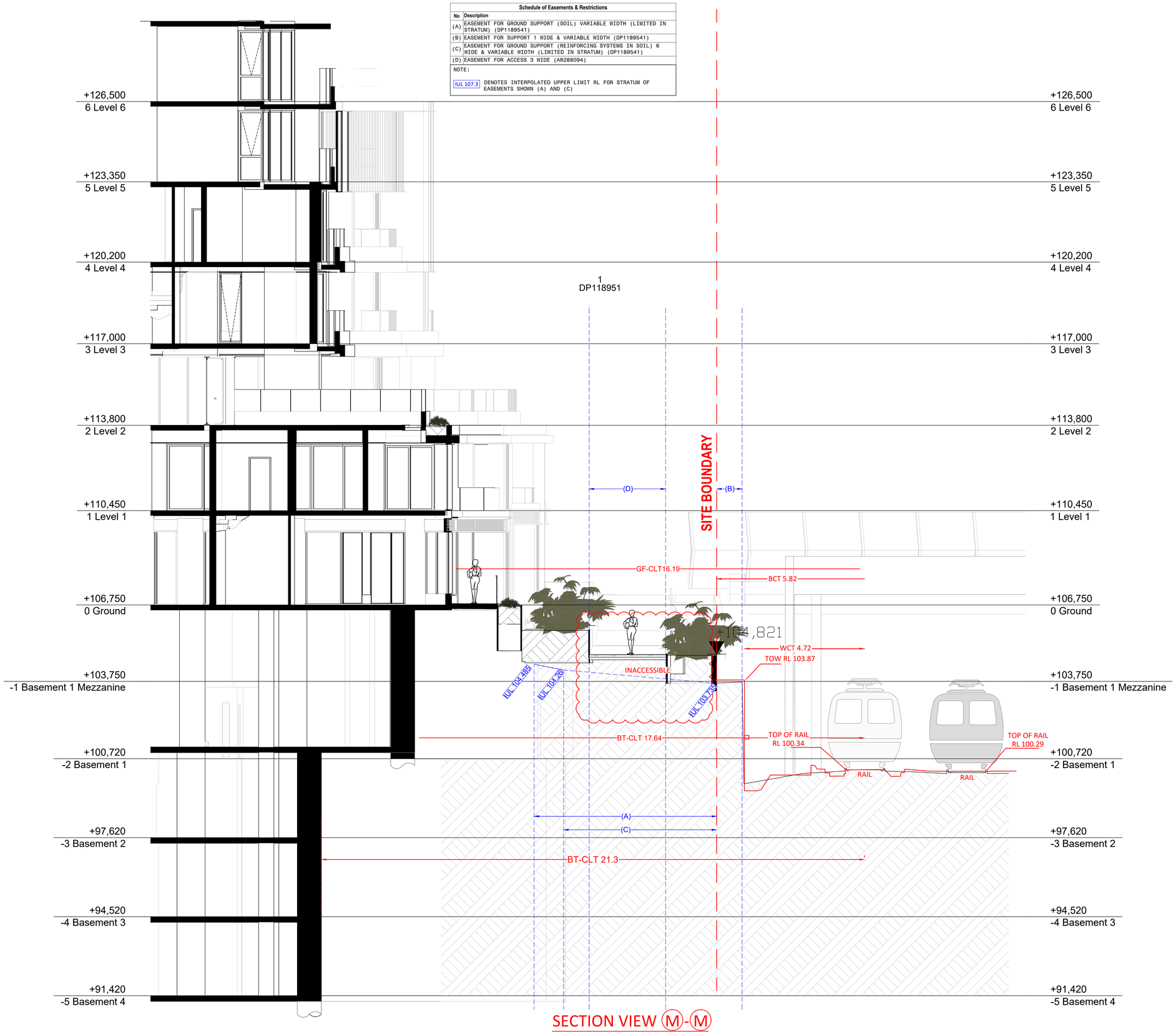
(C)	EASEMENT FOR GROUND SUPPORT (REINFORCING SYSTEMS IN SOIL) 6 WIDE & VARIABLE WIDTH (LIMITED IN STRATUM) (DP1189541)
(D)	EASEMENT FOR ACCESS 3 WIDE (AR288094)

NOTE:

IUL 107.3 DENOTES INTERPOLATED UPPER LIMIT RL FOR STRATUM OF EASEMENTS SHOWN (A) AND (C)



SECTION VIEW M-M

GENERAL NOTES

ONLY TREES GREATER THAN 2 METRES IN HEIGHT ARE SHOWN ON THIS PLAN AND THEIR POSITIONS ARE DIAGRAMMATIC ONLY AND MAY REQUIRE ADDITIONAL SURVEY WHERE CRITICAL TO DESIGN.

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BOUNDARY NOTES

A BASIC BOUNDARY SURVEY HAS BEEN DONE SUITABLE FOR DA LODGEMENT PURPOSES.

BOUNDARIES HAVE NOT BEEN MARKED.

SURVEY INFORMATION NOTES

THE ORIGIN OF COORDINATES COMES FROM PM290 E331528.198 N6259353.120 CLASS B POSITIONAL UNCERTAINTY (PU) 0.02 (MGA2020) ADOPTED FROM SCIMS DATED 02/11/2023.

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THE FOLLOWING INFORMATION RELATES TO THE RESPECTIVE CERTIFICATE OF TITLE OF EACH LOTS:

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  (CT EDITION 7 DATED 16/10/2023 SEARCH DATE 07/11/2023)
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  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
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    - RESTRICTION(S) ON THE USE OF LAND (SP52947)

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NOTE:
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849-859 PACIFIC HIGHWAY, 2 WILSON STREET
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CLIENT: BB WILSON PROPERTY PTY LTD
FILE: 9062 - Detail & Level - Rev C - 849-859 Pacific Highway, 2 Wilson Street & Lot 1 O'Brien Street Chatswood
LGA: WILLOUGHBY

REF: 9062	CONTOURS: 0.5m
ISSUE: C	DATUM: AHD
SURVEY DATE: 20/03/2024	AZIMUTH: MGA2020
SCALE: 1:75	SHEET 6 OF 9 SHEETS

ISSUE	DATE	AMENDMENT	SURV	CHK
A	01/11/23	ORIGINAL ISSUE	PQ	MT
B	29/01/24	RIDGES AND GUTTERS OF ADJOINING LOTS ADDED	SY	MT
C	20/03/24	RAILWAY SECTION VIEWS ADDED	AZ	MT

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GDA2020

MICHAEL TRIFIRO ID: SU008624
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t: (02) 9630 7955 w: sdg.net.au
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A1

Schedule of Easements & Restrictions	
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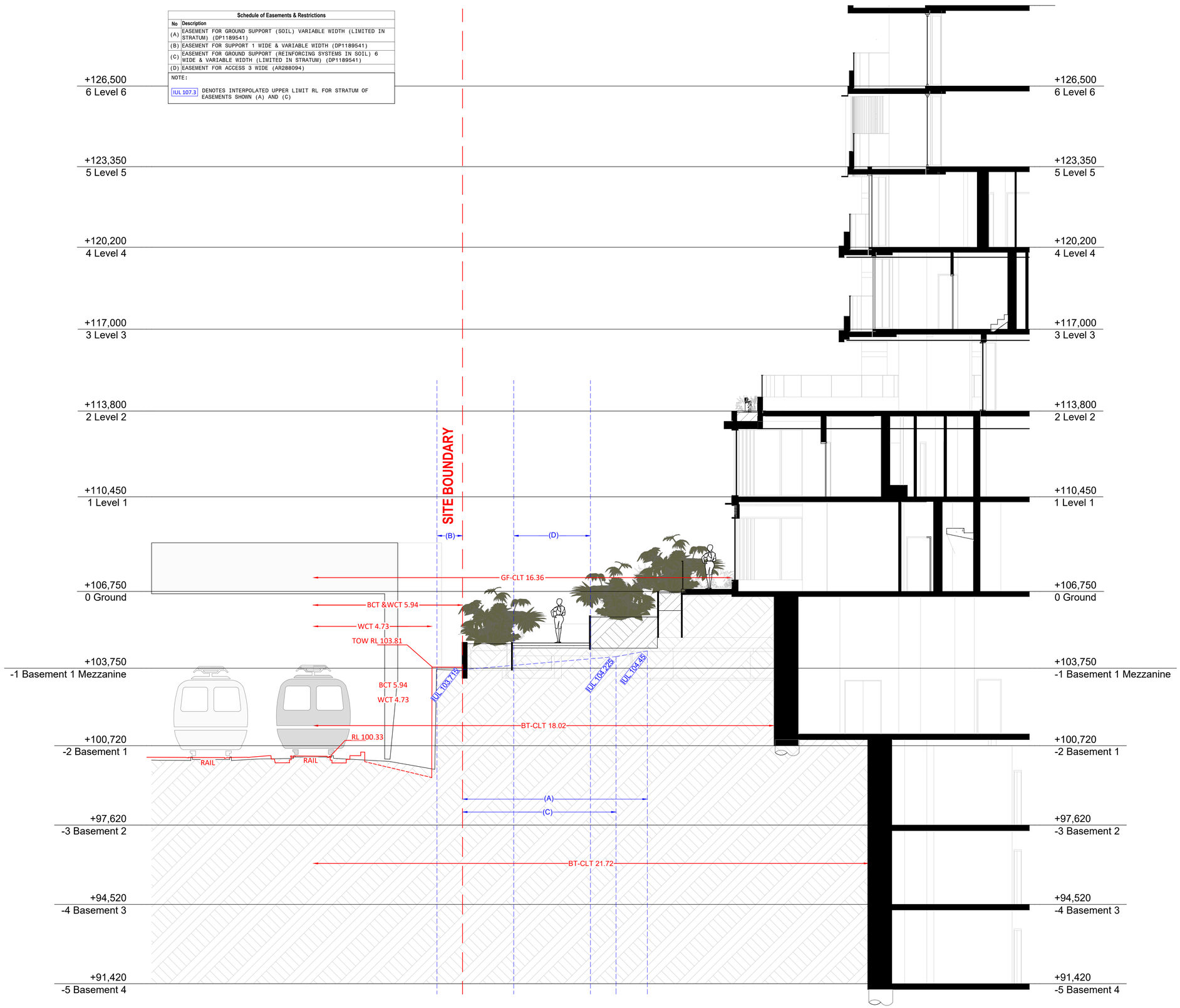

SECTION VIEW Ⓝ-Ⓝ

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GDA2020

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REGISTERED LAND SURVEYOR

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  - BENEFITED BY:
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  (CT EDITION 4 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP60178
  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
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    - POSITIVE COVENANT (SP60178)
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- CP/SP52947
  (CT EDITION 10 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
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    - RESTRICTION(S) ON THE USE OF LAND (SP52947)

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- - - -	denotes APPROXIMATE EASEMENT POSITION

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PROJECT:
DETAIL AND LEVEL SURVEY OF
LOT 1 IN DP1189541, SP1496,
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849-859 PACIFIC HIGHWAY, 2 WILSON STREET
& LOT 1 O'BRIEN STREET
CHATSWOOD

CLIENT: BB WILSON PROPERTY PTY LTD

FILE: 9062 - Detail & Level - Rev C - 849-859 Pacific Highway, 2 Wilson Street & Lot 1 O'Brien Street Chatswood

LGA: WILLOUGHBY

REF: 9062	CONTOURS: 0.5m
ISSUE: C	DATUM: AHD
SURVEY DATE: 20/03/2024	AZIMUTH: MGA2020
SCALE: 1:75	SHEET 7 OF 9 SHEETS

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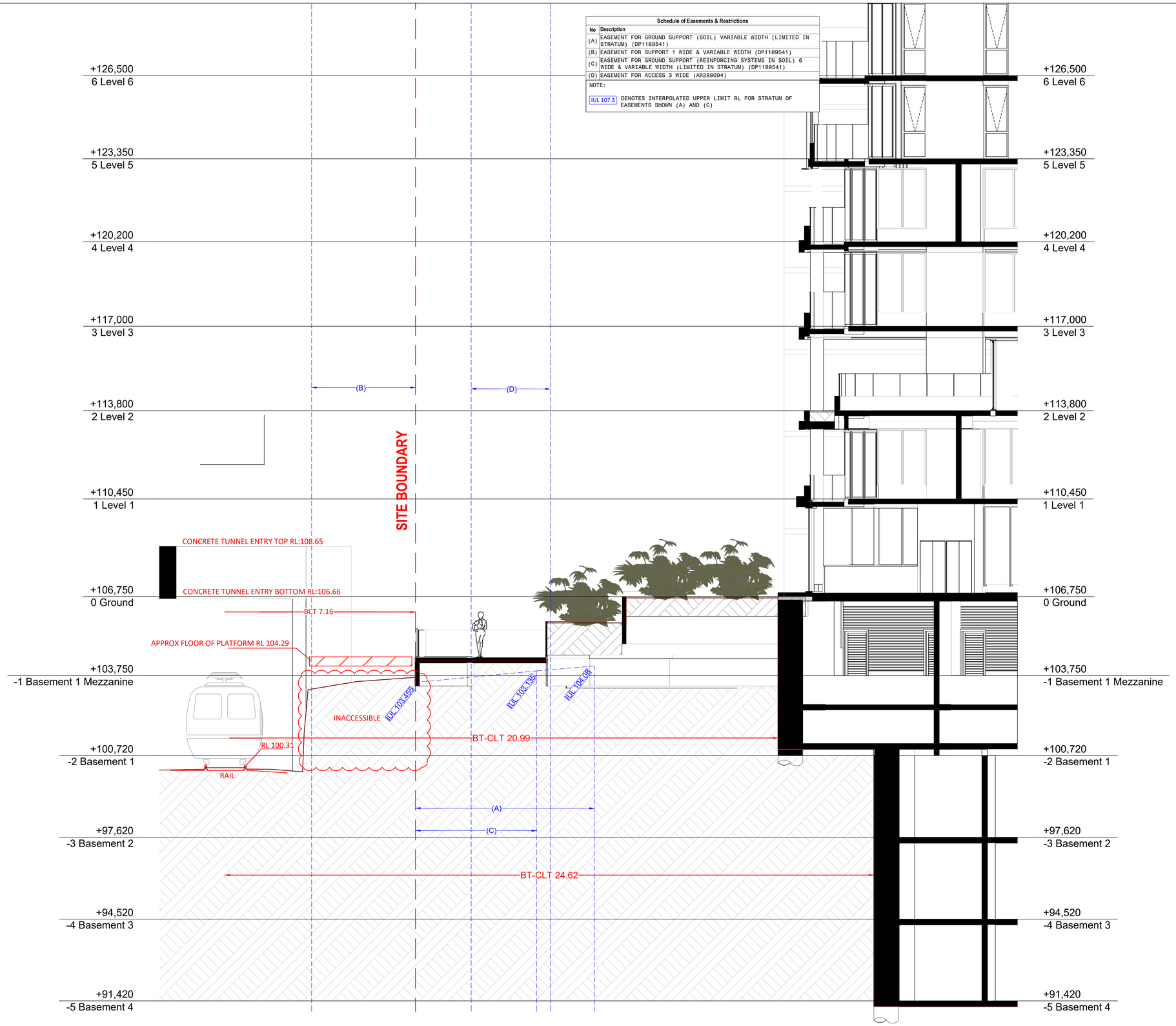

SECTION VIEW Ⓞ-Ⓞ

Schedule of Easements & Restrictions

No	Description
(A)	EASEMENT FOR GROUND SUPPORT (SOIL) VARIABLE WIDTH (LIMITED IN STRATUM) (DP1189541)
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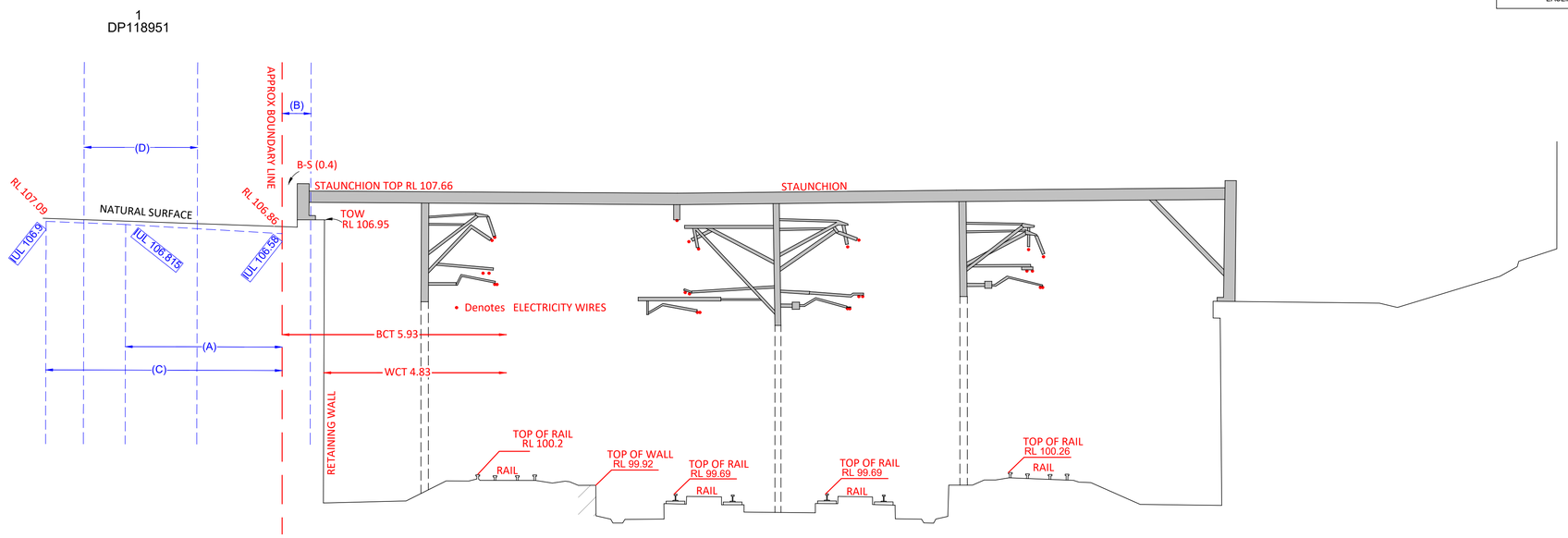
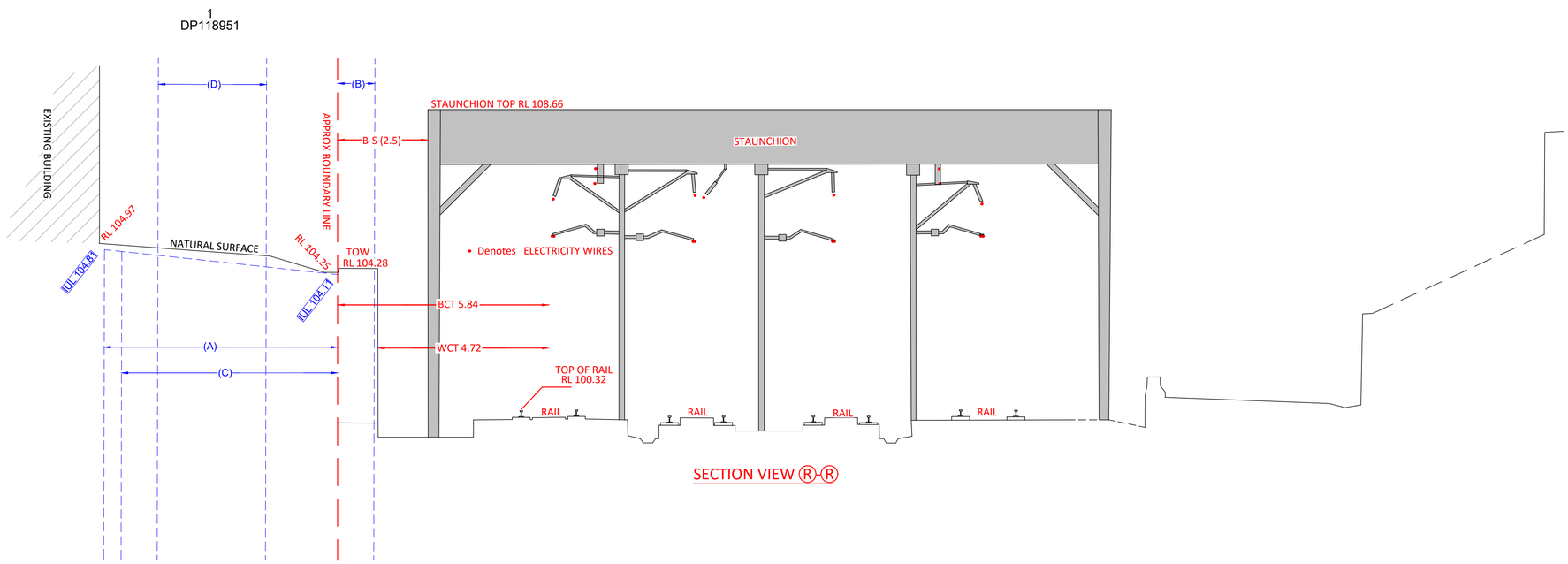


SECTION VIEW Ⓠ-Ⓠ



SECTION VIEW Ⓡ-Ⓡ

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CERTIFICATE OF TITLE NOTES

THE FOLLOWING INFORMATION RELATES TO THE RESPECTIVE CERTIFICATE OF TITLE OF EACH LOTS:

- LOT 1 IN DP1189541
  (CT EDITION 7 DATED 16/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - EASEMENT FOR GROUND SUPPORT (SOIL) VARIABLE WIDTH (LIMITED IN STRATUM) SHOWN AS (A) (DP1189541)
    - EASEMENT FOR GROUND SUPPORT (REINFORCING SYSTEMS IN SOIL) 6 METRES WIDE AND VARIABLE WIDTH (LIMITED IN STRATUM) SHOWN AS (C) (DP1189541)
    - EASEMENT FOR ACCESS 3 WIDE SHOWN AS (D) (AR288094)
  - BENEFITED BY:
    - EASEMENT FOR SUPPORT 1 METRE WIDE AND VARIABLE WIDTH SHOWN AS (B) (DP1189541)
- CP/SP1496
  (CT EDITION 4 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP60178
  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - RESTRICTION(S) ON THE USE OF LAND (SP60178)
    - POSITIVE COVENANT (SP60178)
  - BENEFITED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP10110
  (CT EDITION 6 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - BENEFITED BY:
    - RIGHT OF WAY 3.05 WIDE SHOWN AS (E) (550481)
- CP/SP52947
  (CT EDITION 10 DATED 17/10/2023 SEARCH DATE 07/11/2023)
  - AFFECTED BY:
    - POSITIVE COVENANT (SP52947)
    - RESTRICTION(S) ON THE USE OF LAND (SP52947)

COVENANTS AND RESTRICTIONS NOTED ON THE TITLE HAVE NOT BEEN INVESTIGATED. THESE SHOULD BE INVESTIGATED PRIOR TO DESIGN TO ENSURE ANY FUTURE DEVELOPMENT COMPLIES.

BY LAWS RELATING TO EACH OF THE SCHEMES HAVE NOT BEEN INVESTIGATED.

LEGEND

BCT denotes BOUNDARY TO CENTERLINE OF TRACK
WCT denotes WALL TO CENTERLINE OF TRACK
TOW denotes TOP OF WALL
B-S denotes BOUNDARY TO STAUNCHION
IUL denotes INTERPOLATED UPPER LIMIT
– – – – denotes APPROXIMATE EASEMENT POSITION

NOTE:
DESIGN ELEVATIONS PROVIDED DIGITALLY BY PBD ARCHITECTS DRAWING NUMBER DA801 ISSUE 1 DATED 6/3/2024

THE BOUNDARY LINE WAS ADPOPTED FOR THE POSITIONING OF THE SECTION

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PROJECT:
DETAIL AND LEVEL SURVEY OF
LOT 1 IN DP1189541, SP1496,
SP60178, SP10110 AND PART OF SP52947

849-859 PACIFIC HIGHWAY, 2 WILSON STREET
& LOT 1 O'BRIEN STREET
CHATSWOOD

CLIENT: BB WILSON PROPERTY PTY LTD

FILE: 9062 - Detail & Level - Rev C - 849-859 Pacific Highway, 2 Wilson Street & Lot 1 O'Brien Street Chatswood

LGA: WILLOUGHBY

REF: 9062	CONTOURS: 0.5m
ISSUE: C	DATUM: AHD
SURVEY DATE: 20/03/2024	AZIMUTH: MGA2020
SCALE: 1:75	SHEET 9 OF 9 SHEETS

ISSUE	DATE	AMENDMENT	SURV	CHK
A	01/11/23	ORIGINAL ISSUE	PQ	MT
B	29/01/24	RIDGES AND GUTTERS OF ADJOINING LOTS ADDED	SY	MT
C	20/03/24	RAILWAY SECTION VIEWS ADDED	AZ	MT

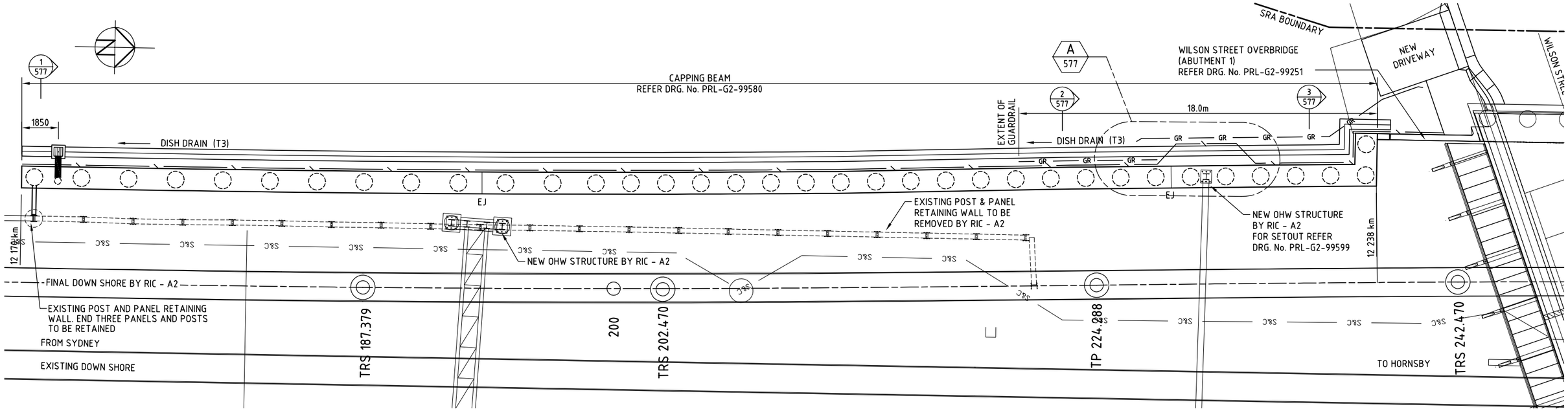
BEFORE YOU DIG www.byda.com.au

GDA2020

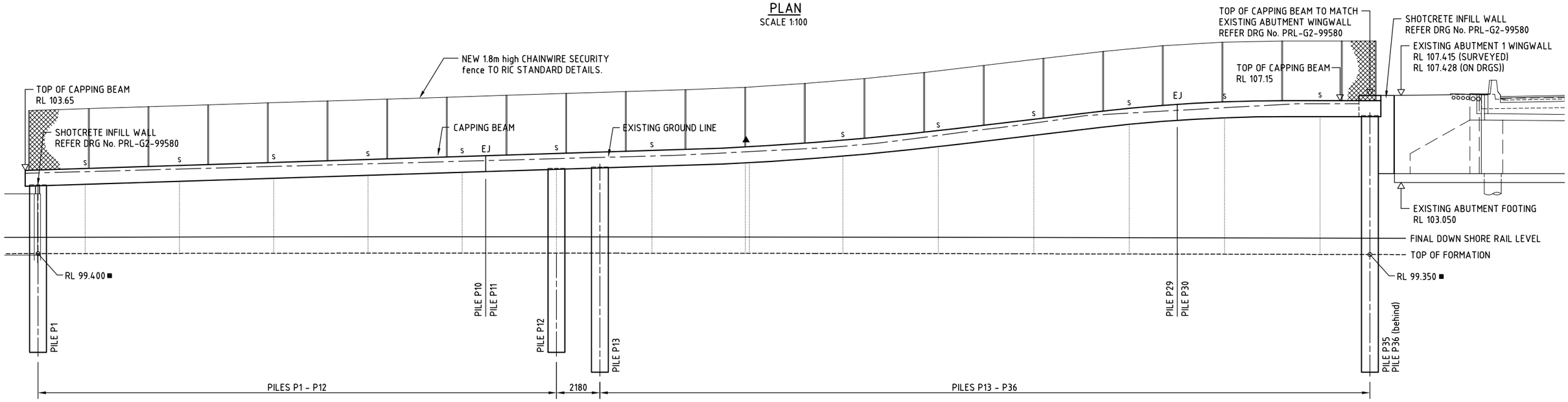
Global-Mark.com.au

MICHAEL TRIFIRO ID: SU008624
REGISTERED LAND SURVEYOR

SDG Pty Ltd
abn 85 213 523 621
Suite 1, 3 Railway Street, Baulkham Hills NSW 2153
t: (02) 9630 7955 w: sdg.net.au
Liability limited by a scheme approved under Professional Standards Legislation



PLAN
SCALE 1:100



ELEVATION
SCALE 1:100

LEGEND

- EJ ....EXPANSION JOINT
- ▲ ....PRIMARY CALIBRATION-URBAN DESIGN
- s ....SECONDARY CALIBRATION-URBAN DESIGN
- —S&C— ....SIGNAL & COMMUNICATIONS CABLING (TO BE RELOCATED BY RIC)
- —\—\— ....NEW CHAINWIRE FENCE (TO RIC STANDARD)
- —GR— ....NEW 'W' BEAM GUARDRAIL (TO RTA MODEL DRAWING Nos. MD.R132.A01.A1 & MD.R132.B01.A1)
- DISH DRAIN ....NEW DISH DRAIN (TYPE 3) (REFER DRAWING No. PRL-G2-99715 FOR DETAIL)
- ▣ ....NEW, (450x450x600 DEEP) PRECAST CONC. PIT WITH HEAVY DUTY 'V' GRATE INLET.
- ....Ø225 UPVC PIPE & DROPPER

Scales

0 2 4

2 1

(1:100 BEFORE REDUCTION)

SCALE IN METRES (AT A1 SHEET SIZE)

NOTES

GENERAL

1. DIMENSIONS ARE NOT BE SCALED FROM THIS DRAWING.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE CHAINAGES & REDUCED LEVELS ARE IN METRES
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING THE LOCATION OF ALL SERVICES AFFECTED BY THE WORKS PRIOR TO COMMENCEMENT OF ANY EXCAVATION.
4. LOCATION OF SERVICES SHOWN ON DRAWINGS IS INDICATIVE AND SHALL BE VERIFIED BY THE CONTRACTOR.
5. TOP OF FORMATION LEVEL AT BASE OF RETAINING WALL TO BE NOT LOWER THAN THE RL SHOWN ■ ON ELEVATION.
6. EXCAVATION IN FRONT OF PILE WALL NOT TO EXCEED 500mm BELOW FORMATION LEVELS.
7. SAFETY SCREENS TO FUTURE DETAIL.

DESIGN

1. DESIGN CODE : AUSTRALIAN BRIDGE DESIGN CODE.
2. DESIGN LOADING : T44 TRUCK LOADING
3. CONSTRUCTION SURCHARGE 20 kPa

SURVEY

1. ALL LEVELS ARE TO AUSTRALIAN HEIGHT DATUM (AHD).
2. ALL CO-ORDINATES ARE TO MAP GRID OF AUSTRALIA (MGA).
3. WHERE KILOMETRAGE IS USED TO INDICATE A START OR END POINT IT IS MEASURED PERPENDICULAR TO THE FINAL DOWN SHORE

SECURITY FENCE

1. NEW 1.8m HIGH SECURITY FENCE TO BE CONSTRUCTED IN ACCORDANCE WITH RIC STANDARDS AP6841 & C4501 AND RIC DRAWINGS 207-1353, SHEET 1; 207-1353, SHEET 2 AND 207-1353, SHEET 4.

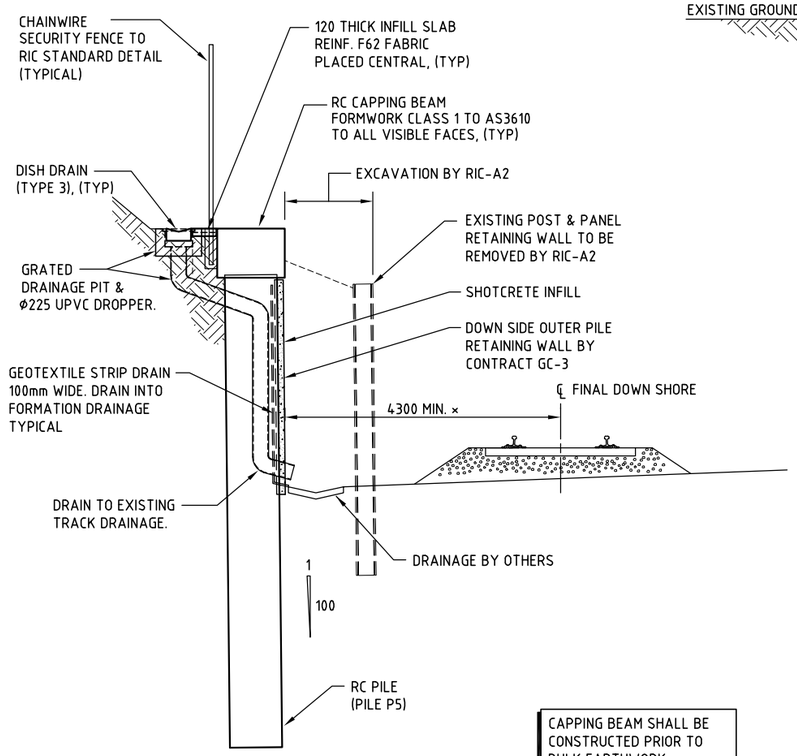
REFERENCES

TYPICAL WALL SECTIONS	DRG No PRL-G2-99577
PILE SETOUT	DRG No PRL-G2-99578
PILE DETAILS	DRG No PRL-G2-99579
CAPPING BEAM - CONCRETE	DRG No PRL-G2-99580
CAPPING BEAM - REINFORCEMENT	DRG No PRL-G2-99581
OHW STRUCTURES HOLDING DOWN BOLT DETAILS	DRG No PRL-G2-99599

NOTE:
EXCAVATION & SHOTCRETE INFILL NOT COMPLETED AT TIME OF ISSUE

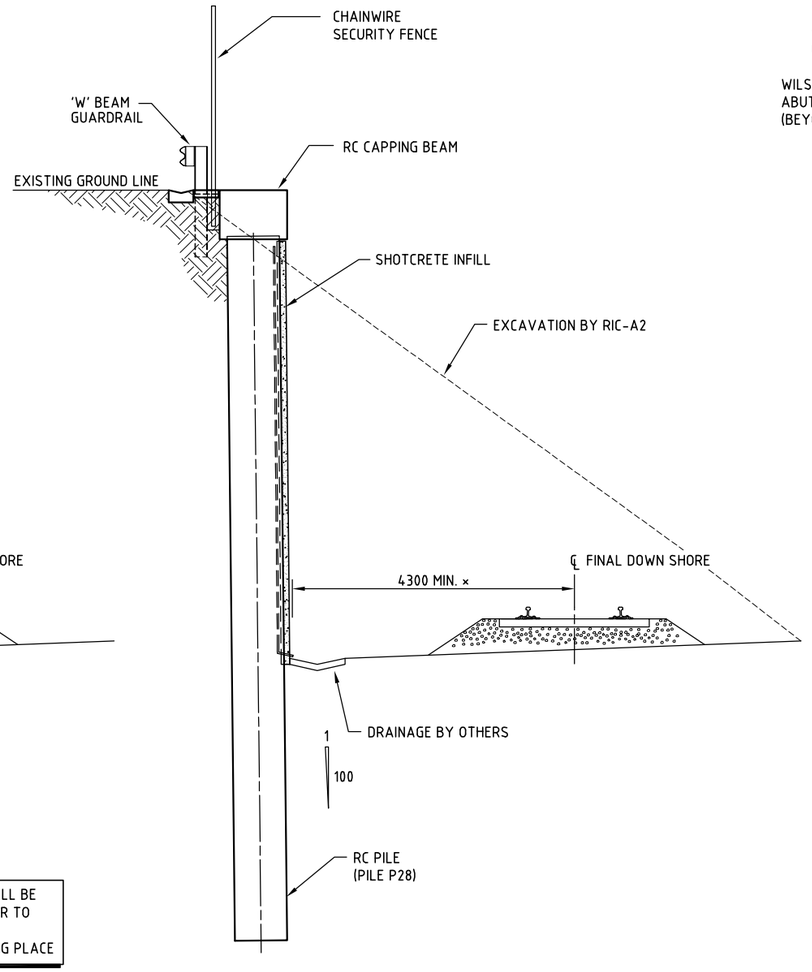
WORK AS EXECUTED
THIS DRAWING SHOWS WORK AS EXECUTED. ANY DEPARTURES FROM THE ORIGINAL DESIGN DETAILS ARE BASED SOLELY ON INFORMATION PROVIDED BY JOHN HOLLAND PTY LTD.

RIC/SRA EDMS ID CV0214762

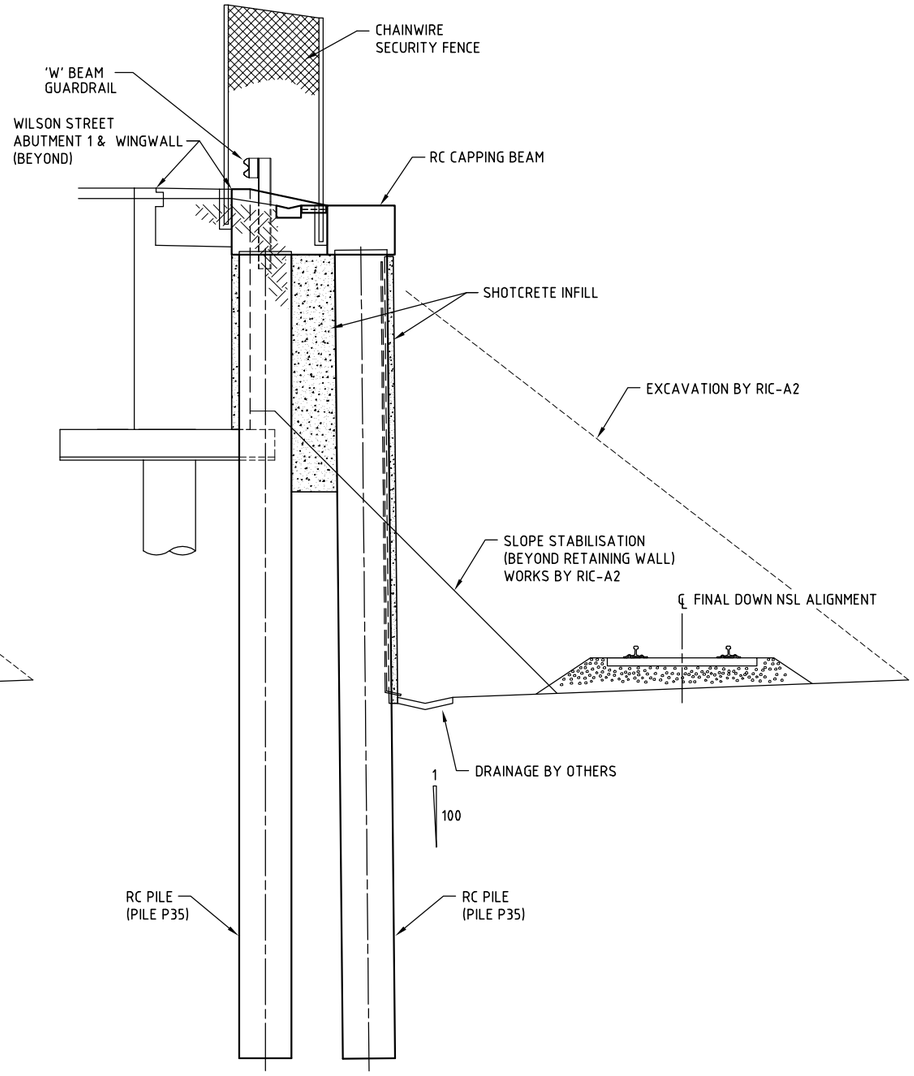


SECTION 1 / 575
SCALE 1:50

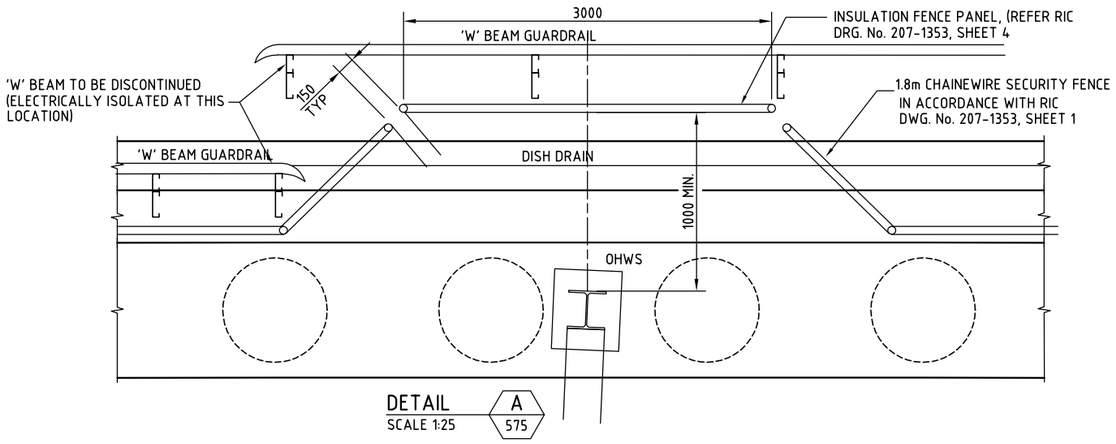
CAPPING BEAM SHALL BE CONSTRUCTED PRIOR TO BULK EARTHWORK EXCAVATION TAKING PLACE



SECTION 2 / 575
SCALE 1:50



SECTION 3 / 575
SCALE 1:50



DETAIL A / 575
SCALE 1:25

Scales
0 1000 2000
1000 500
(1:50 BEFORE REDUCTION)
SCALE IN MILLIMETRES (AT A1 SHEET SIZE)

NOTES

GENERAL

REFER TO DRG No PRL-G2-99575

× DIMENSION NOT TO BE USED FOR SETOUT

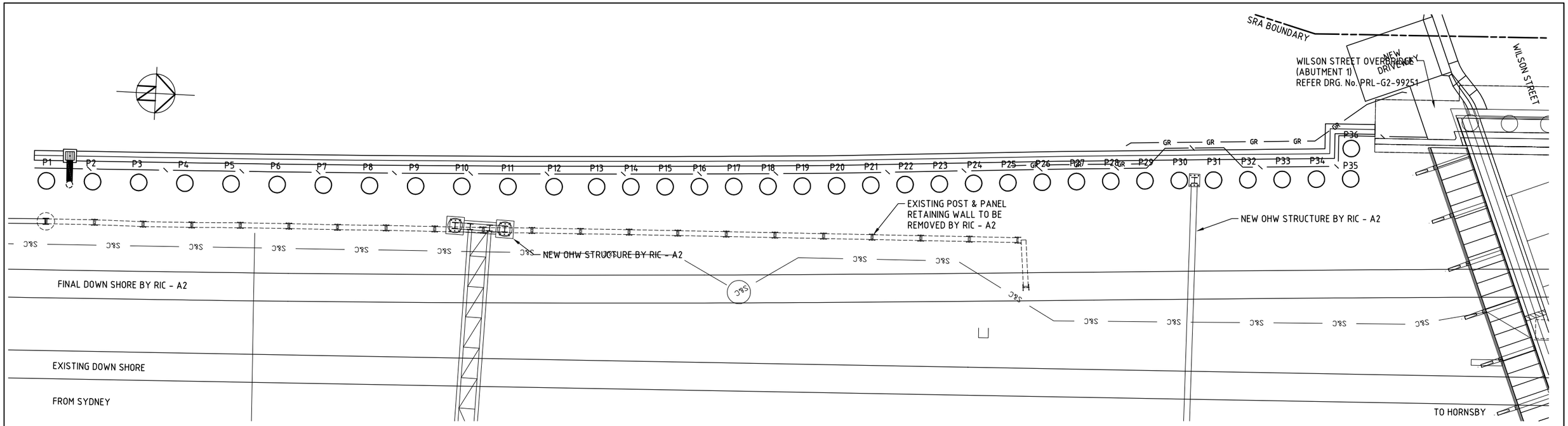
REFERENCES

GENERAL ARRANGEMENT	DRG No PRL-G2-99575
PILE SET OUT	DRG No PRL-G2-99578
PILE DETAILS	DRG No PRL-G2-99579
CAPPING BEAM - CONCRETE	DRG No PRL-G2-99580
CAPPING BEAM - REINFORCEMENT	DRG No PRL-G2-99581

NOTE:
EXCAVATION & SHOTCRETE INFILL NOT COMPLETED AT TIME OF ISSUE

WORK AS EXECUTED
THIS DRAWING SHOWS WORK AS EXECUTED. ANY DEPARTURES FROM THE ORIGINAL DESIGN DETAILS ARE BASED SOLELY ON INFORMATION PROVIDED BY JOHN HOLLAND PTY LTD.

RIC/SRA EDMS ID CV0214763



PILE SETOUT

SCALE 1:100

TABLE 1

PILE No	EASTING	NORTHING	DIAMETER	CUT OFF LEVEL	CONTRACT LEVEL	× ACTUAL FOUNDING LEVEL
P1	331 577.167	6 259 284.036	850	102.920	94.50	94.50
P2	331 577.085	6 259 286.405	850	102.995	94.50	94.50
P3	331 577.002	6 259 288.773	850	103.070	94.50	94.50
P4	331 576.917	6 259 291.142	850	103.145	94.50	94.50
P5	331 576.830	6 259 293.510	850	103.225	94.50	94.50
P6	331 576.739	6 259 295.879	850	103.300	94.50	94.50
P7	331 576.645	6 259 298.247	850	103.375	94.50	94.50
P8	331 576.548	6 259 300.615	850	103.450	94.50	94.50
P9	331 576.446	6 259 302.982	850	103.525	94.50	94.50
P10	331 576.339	6 259 305.350	850	103.600	94.50	94.50
P11	331 576.228	6 259 307.717	850	103.675	94.50	94.50
P12	331 576.112	6 259 310.085	850	103.750	94.50	94.50
P13	331 576.002	6 259 312.262	850	103.820	93.50	93.50
P14	331 575.910	6 259 314.020	850	103.875	93.50	93.50
P15	331 575.816	6 259 315.777	850	103.930	93.50	93.50
P16	331 575.719	6 259 317.535	850	103.990	93.50	93.50
P17	331 575.620	6 259 319.292	850	104.060	93.50	93.50
P18	331 575.519	6 259 321.049	850	104.185	93.50	93.50
P19	331 575.416	6 259 322.806	850	104.310	93.50	93.50
P20	331 575.308	6 259 324.563	850	104.450	93.50	93.50
P21	331 575.186	6 259 326.318	850	104.610	93.50	93.50
P22	331 575.063	6 259 328.074	850	104.790	93.50	93.50
P23	331 574.940	6 259 329.830	850	104.985	93.50	93.50
P24	331 574.818	6 259 331.585	850	105.195	93.50	93.50
P25	331 574.695	6 259 333.341	850	105.405	93.50	93.50
P26	331 574.572	6 259 335.097	850	105.615	93.50	93.50
P27	331 574.450	6 259 336.853	850	105.820	93.50	93.50
P28	331 574.339	6 259 338.609	850	106.015	93.50	93.50
P29	331 574.228	6 259 340.366	850	106.175	93.50	93.50
P30	331 574.118	6 259 342.122	850	106.270	93.50	93.50
P31	331 574.008	6 259 343.879	850	106.350	93.50	93.50
P32	331 573.899	6 259 345.635	850	106.400	93.50	93.50
P33	331 573.791	6 259 347.392	850	106.400	93.50	93.50
P34	331 573.684	6 259 349.149	850	106.400	93.50	93.50
P35	331 573.578	6 259 350.906	850	106.400	93.50	93.50
P36	331572.021	6 259 350.853	850	106.400	93.50	93.50

Scales

0 2000 4000

2000 1000

(1:100 BEFORE REDUCTION)
SCALE IN MILLIMETERS
(AT A1 SHEET SIZE)

NOTES

GENERAL

1. DIMENSIONS ARE NOT TO BE SCALE FROM THE DRAWING.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE CHAINAGES & REDUCED LEVELS ARE IN METRES
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING THE LOCATION OF ALL SERVICES AFFECTED BY THE WORKS PRIOR TO COMMENCEMENT OF ANY EXCAVATION.
4. LOCATION OF SERVICES SHOWN ON DRAWINGS IS INDICATIVE AND SHALL BE VERIFIED BY THE CONTRACTOR.

DESIGN

1. DESIGN CODE : AUSTRALIAN BRIDGE DESIGN CODE-1996.
2. DESIGN LOADING : CONSTRUCTION SURCHARGE 20 kPa, T44 TRUCK

SURVEY

1. ALL LEVELS ARE TO AUSTRALIAN HEIGHT DATUM (AHD).
2. ALL CO-ORDINATES ARE TO MAP GRID OF AUSTRALIA (MGA).
3. SETOUT POINT IS CENTRE OF PILE AT CUT OFF LEVEL.
4. PILES SHALL BE SURVEYED AFTER INSTALLATION TO DETERMINE DEVIATIONS FORM DESIGN SETOUT.

REFERENCES

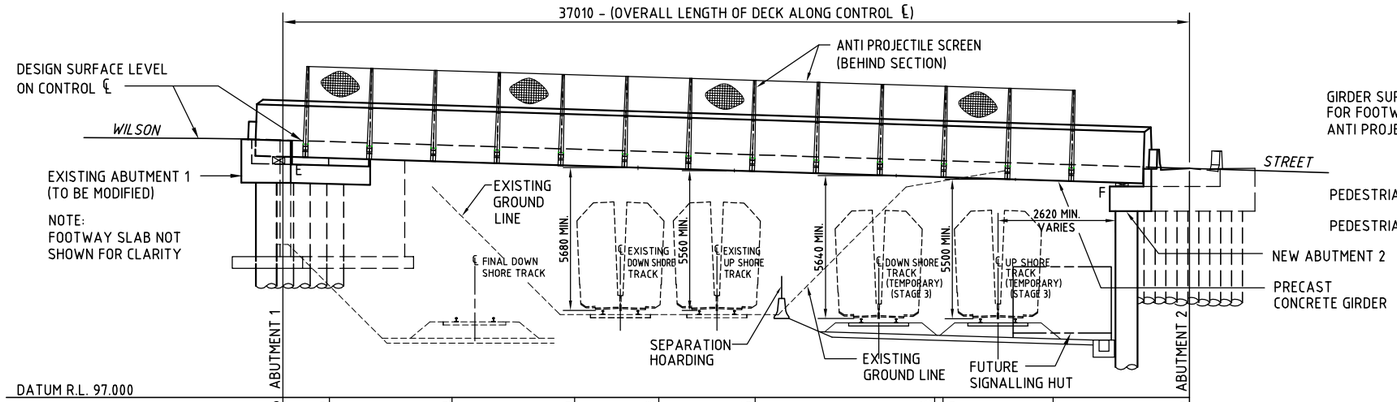
GENERAL ARRANGEMENT..... DRG No. PRL-G2-99575
PILE DETAILS..... DRG No. PRL-G2-99579

× COLUMNS FOR "ACTUAL FOUNDING LEVELS" AND "NATURE OF FOUNDING MATERIAL" TO BE COMPLETED BY THE CONTRACTOR (INCLUDING ANY VARIATION IN CONTRACT LEVEL SHOWN) AND SUBMITTED AS AN "AS BUILT" DRAWING

NOTE:
EXCAVATION & SHOTCRETE INFILL NOT COMPLETED AT TIME OF ISSUE

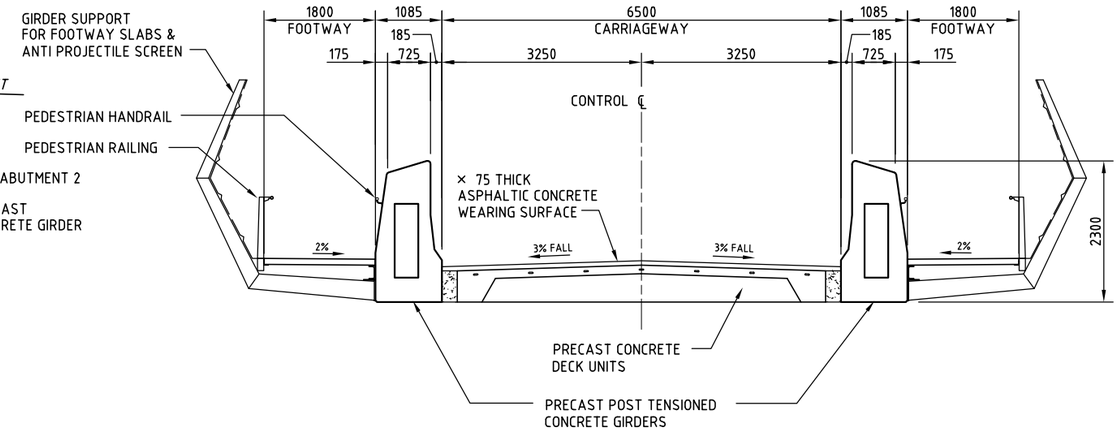
WORK AS EXECUTED
THIS DRAWING SHOWS WORK AS EXECUTED. ANY DEPARTURES FROM THE ORIGINAL DESIGN DETAILS ARE BASED SOLELY ON INFORMATION PROVIDED BY JOHN HOLLAND PTY LTD.

RIC/SRA EDMS ID CV0214764

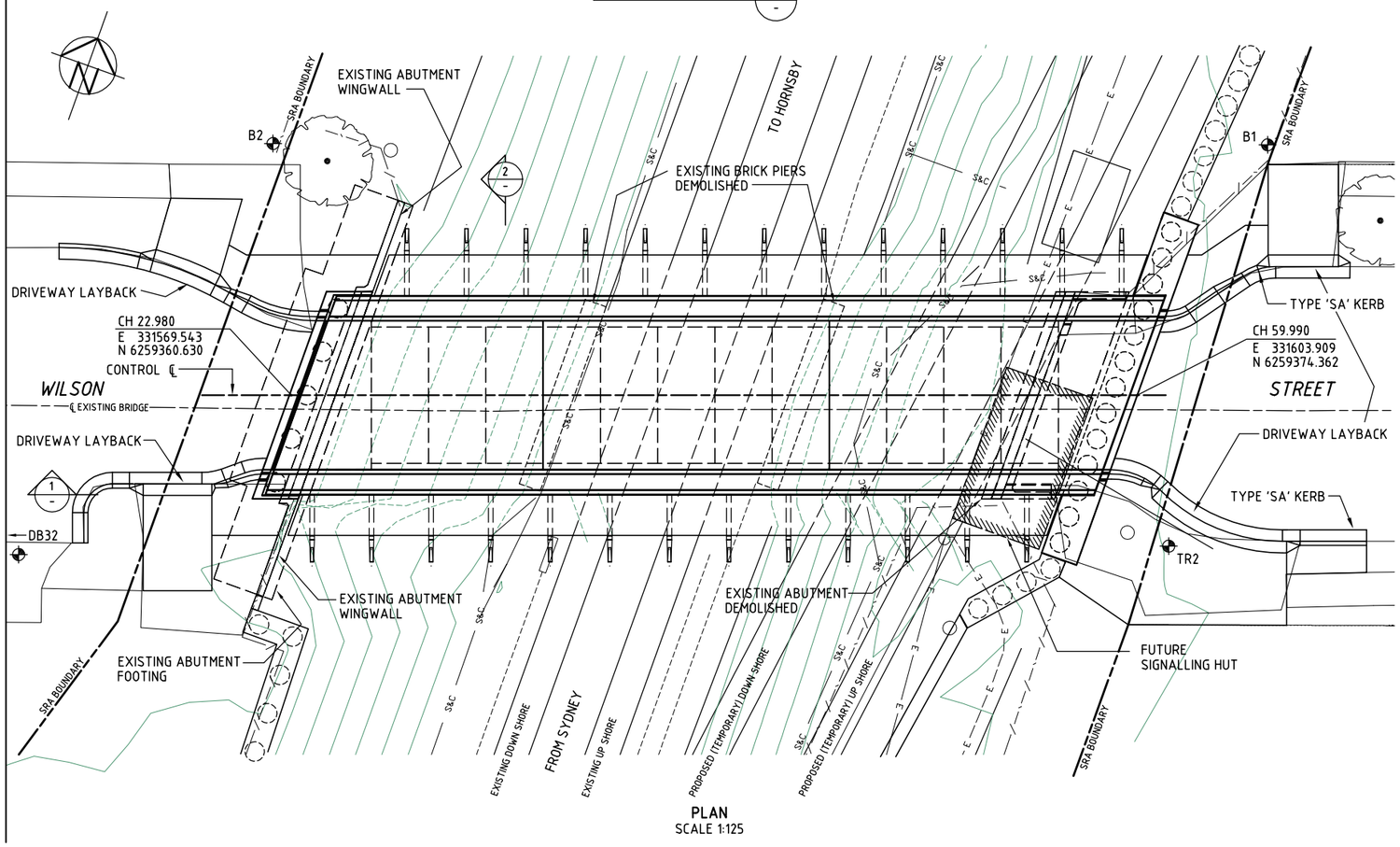


	ABUTMENT 1									ABUTMENT 2
DATUM R.L. 97.000										
DESIGN SURFACE LEVEL ON CONTROL ℄	107.446	107.386	107.236	107.086	106.983	106.865	106.646	106.636	106.501	106.336
EXISTING SURFACE LEVEL ON CONTROL ℄	107.319	107.297	107.260	107.206				106.773		106.230
CHAINAGE ON CONTROL ℄ (ADOPTED)	22.980	25.000	30.000	35.000	38.425	42.350	49.665	50.000	54.490	59.990
					℄ EXIST. DN. SHORE TRACK	℄ EXIST. UP SHORE TRACK	℄ (TEMP.) DN. SHORE TRACK		℄ (TEMP.) UP SHORE TRACK	

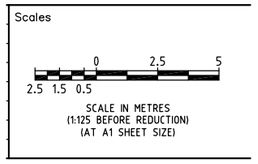
SECTIONAL ELEVATION 1 / -

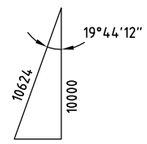


SECTION 2 / -
SCALE 1:50

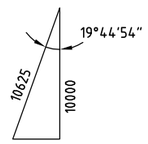


PLAN
SCALE 1:125





SKEW DIAGRAM ABUTMENT 1
NOT TO SCALE



SKEW DIAGRAM ABUTMENT 2
NOT TO SCALE

LEGEND

EXISTING UTILITIES

—— E ——.....OVERHEAD/UNDERGROUND ELECTRICITY (TO BE RELOCATED BY RIC)

——S&C ——.....SIGNAL & COMMUNICATION CABLING (TO BE RELOCATED BY RIC)

——/——.....EXISTING FENCE LINE

B1 .....DENOTES APPROXIMATE BORE HOLE LOCATIONS

NOTES

GENERAL

SCALE 1:125 UNLESS NOTED OTHERWISE.
DIMENSIONS ARE NOT TO BE SCALED FROM THE DRAWINGS.
DIMENSIONS ARE IN MILLIMETRES,
REDUCED LEVELS ARE TO AUSTRALIAN HEIGHT DATUM (AHD)
CHAINAGES AND REDUCED LEVELS ARE IN METRES.
E DENOTES EXPANSION END
F DENOTES FIXED END

× DENOTES THICKNESS INCLUDES 70mm NOM. THICKNESS AC AND SPRAYED BITUMINOUS WATERPROOF MEMBRANE WITH 10mm COVER AGGREGATE.

DESIGN SPECIFICATION

DESIGN LOADING: AUSTRALIAN BRIDGE DESIGN CODE 1996 T44 LOADING.
EARTHQUAKE ACCELERATION COEFFICIENT 0.08.

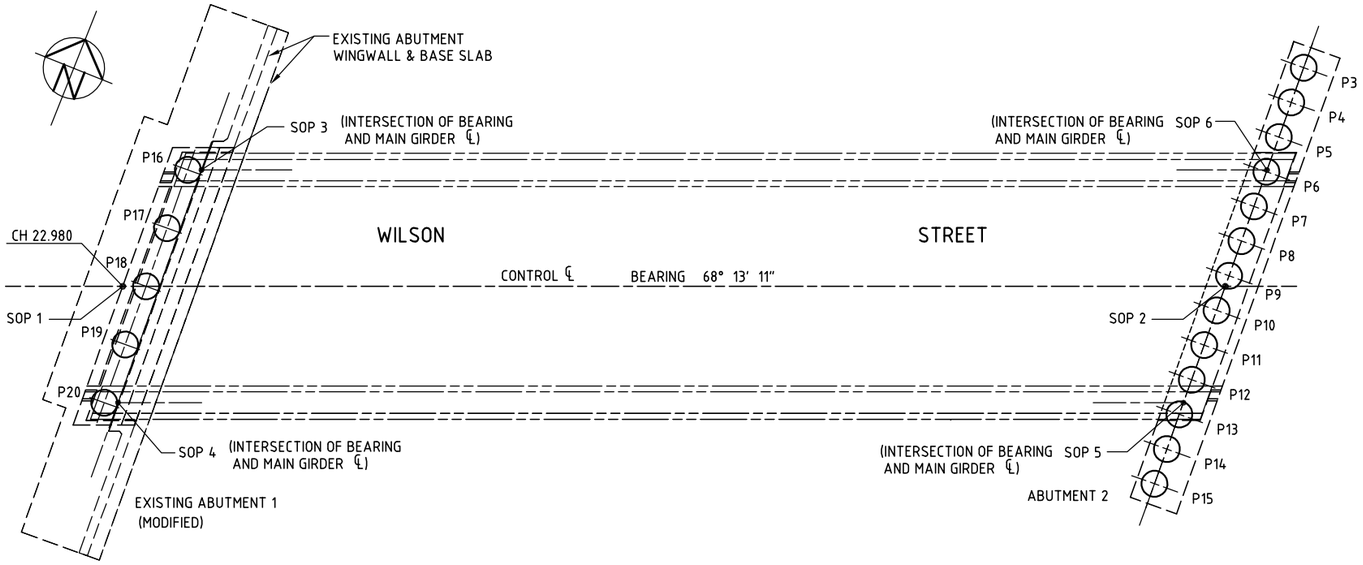
REFERENCE

PILE SETOUT DETAILS.....PRL-G2-99252
WILSON STREET LONGITUDINAL SECTION.....PRL-G2-99283

WORK AS EXECUTED

THIS DRAWING SHOWS WORK AS EXECUTED. ANY DEPARTURES FROM THE ORIGINAL DESIGN DETAILS ARE BASED SOLELY ON INFORMATION PROVIDED BY JOHN HOLLAND PTY LTD.

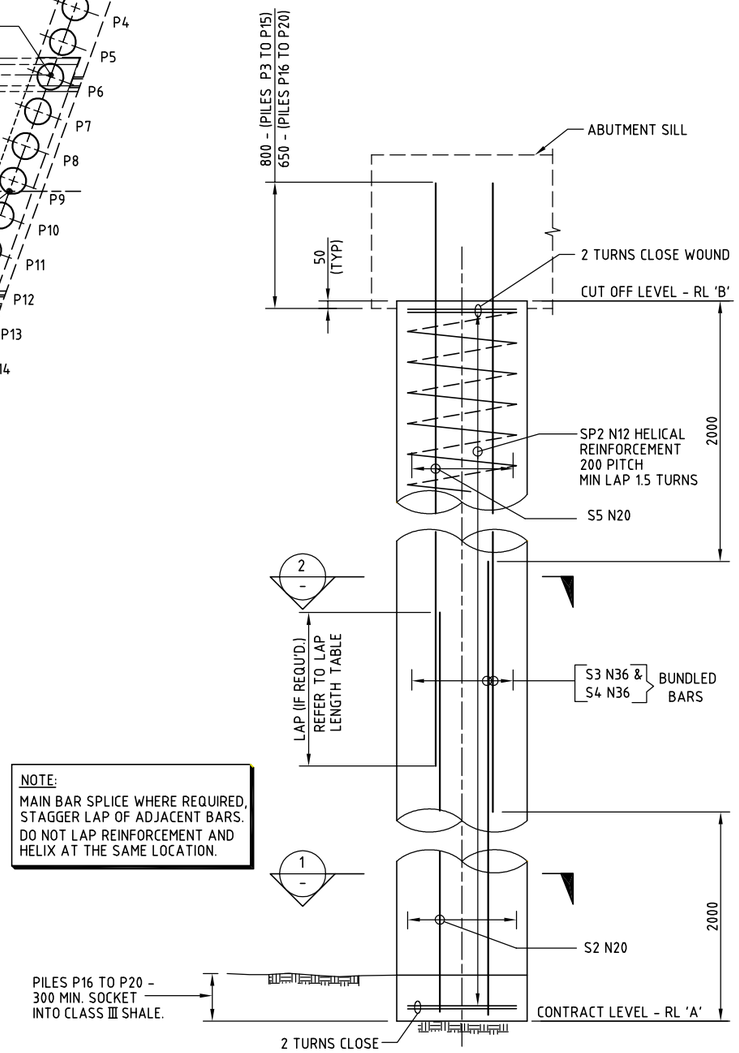
RIC/SRA EDMS ID CV0214640



PLAN
SCALE 1:100

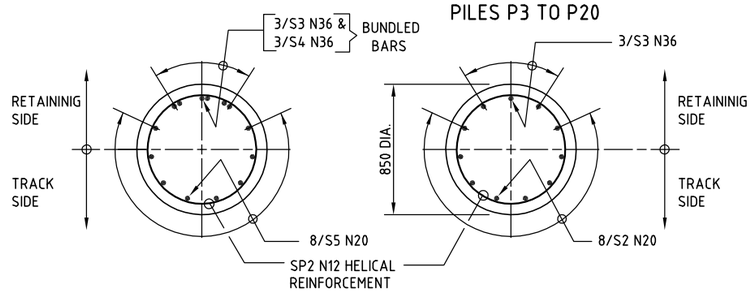
PILE SCHEDULE & DECK SET-OUT							
LOCATION	PILE No.	POINT	CO-ORDINATES		CUT OFF LEVEL RL 'B' (m)	CONTRACT LEVEL - RL 'A' (m)	
			EASTING	NORTHING		CONTRACT	ACTUAL
DECK SETOUT		SOP 1	331569.543	6259360.630	-	-	-
		SOP 2	331602.913	6259373.964	-	-	-
		SOP 3	331570.519	6259365.105	-	-	-
		SOP 4	331570.805	6259357.050	-	-	-
		SOP 5	331603.056	6259369.937	-	-	-
		SOP 6	331602.770	6259377.991	-	-	-
EXISTING ABUTMENT 1 (MODIFIED)	P1		NOT USED				
	P2		NOT USED				
	P16		331570.105	6259364.939	105.715	96.300	96.300
	P17		331570.177	6259362.926	105.735	96.300	96.300
	P18		331570.248	6259360.912	105.755	96.300	96.300
	P19		331570.320	6259358.899	105.775	96.300	96.300
	P20		331570.391	6259356.885	105.795	96.300	96.300
ABUTMENT 2	P 3		331602.644	6259381.526	104.375	94.500	94.500
	P 4		331602.686	6259380.327	104.395	94.500	94.500
	P 5		331602.729	6259379.127	104.410	94.500	94.500
	P 6		331602.772	6259377.928	104.425	94.500	94.500
	P 7		331602.814	6259376.729	104.440	94.500	94.500
	P 8		331602.857	6259375.530	104.460	94.500	94.500
	P 9		331602.899	6259374.330	104.475	94.500	94.500
	P10		331602.942	6259373.131	104.490	94.500	94.500
	P11		331602.984	6259371.932	104.510	94.500	94.500
	P12		331603.027	6259370.733	104.525	94.500	94.500
	P13		331603.069	6259369.533	104.540	94.500	94.500
	P14		331603.112	6259368.334	104.555	94.500	94.500
	P15		331603.154	6259367.135	104.575	94.500	94.500

NOTE:
PILES TO BE CONSTRUCTED WITH A MAXIMUM OUT OF VERTICALITY TOLERANCE OF 1%



NOTE:
MAIN BAR SPLICE WHERE REQUIRED, STAGGER LAP OF ADJACENT BARS. DO NOT LAP REINFORCEMENT AND HELIX AT THE SAME LOCATION.

ELEVATION SCALE 1:20
PILES P3 TO P20



SECTION 2 -

SECTION 1 -

NOTES

GENERAL

REFER DRG. No. PRL-G2-99251

PILES

1. PILES ARE DESIGNED IN ACCORDANCE WITH AS 2159-1995 AND THE AUSTRALIAN BRIDGE DESIGN CODE-1996.
2. THE PILES SHALL BE BORED CAST-IN-PLACE REINFORCED CONCRETE PILES (WITHOUT PERMANENT CASING), DERIVING LOAD CAPACITY FROM END BEARING, LATERAL RESISTANCE AND SHAFT FRICTION.
3. GEOTECHNICAL INFORMATION REFERRED TO IN THE SPECIFICATION MUST BE STUDIED BY THE CONTRACTOR TO APPRECIATE POTENTIAL CONSTRUCTION DIFFICULTIES.
4. FOUNDING MATERIAL DESIGN PARAMETERS ARE IN ACCORDANCE WITH THE INTERPETIVE GEOTECHNICAL REPORT BY GOLDER ASSOCIATES PTY LTD FROM MARCH 2003.
5. CONTRACT LEVELS SHALL BE CONFIRMED ON SITE BY A GEOTECHNICAL ENGINEER.
6. THE CONTRACTOR SHALL SUBMIT ALL THE RELEVANT PILING DETAILS TO THE PRINCIPAL IN ACCORDANCE WITH THE SPECIFICATIONS.

PILE CONSTRUCTION

1. PILES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATION.
2. SOCKET ROUGHNESS CATEGORY TO BE R2 OR BETTER CORRESPONDING TO GROOVES OF DEPTH 1 - 4mm AND WIDTH GREATER THAN 2mm AT SPACING OF 50mm TO 200mm.
3. MINIMUM CLEARANCE TO PILE RIG SHALL BE 3.7m HORIZONTALLY FROM CENTRELINE OF ADJACENT TRACK. CONTRACTOR MUST SUBMIT WITH TENDER A LETTER INDICATING WHETHER PILES CAN BE CONSTRUCTED WITHOUT INFRINGING THIS DISTANCE. THE CONTRACTOR SHALL REFER TO SPECIAL CONDITIONS OF CONTRACT AND OBTAIN ALL NECESSARY APPROVALS FROM THE PRINCIPAL'S REPRESENTATIVE.
4. THE CONTRACTOR MUST SUBMIT COMPLETE DETAILS OF PILING RIG AND CLEARANCES TO THE PRINCIPAL TWO (2) WEEKS PRIOR TO COMMENCEMENT OF THE PILING SO THAT THE PRINCIPAL CAN DETERMINE THE TYPE OF TRACK PROTECTION NECESSARY FOR THIS WORK.

TESTING OF PILE

1. TESTING OF PILES SHALL BE IN ACCORDANCE WITH THE SPECIFICATION.

CONCRETE

1. ALL CONCRETE WORK SHALL COMPLY WITH THE SPECIFICATION.
2. CONCRETE 28 DAY COMPRESSIVE STRENGTH f'c = 40 MPa.
3. EXPOSURE CLASSIFICATION = B1.
4. SHOTCRETE LINING SHALL BE APPLIED TO THE EXPOSED FACE OF THE PILES REFER UPSIDE OUTER PILE RETAINING WALL DRAWINGS FOR TYPICAL DETAILS.

REINFORCEMENT

1. ALL REINFORCEMENT BARS SHALL BE IN ACCORDANCE WITH AS/NZS 4671:2001 WHERE ALL BARS ARE GRADE 500 DEFORMED RIBBED BAR UNO.
2. DESIGNATION OF REINFORCING BARS : 10/S1 N24-200 EF
   - No. OF BARS
   - BAR SHAPE NOTATION
   - DUCTILITY CLASS AND DIA
   - SPACING OF BARS
   - LOCATION COMMENT
3. CLEAR COVER TO PILE REINFORCEMENT SHALL BE 75mm
4. COGS AND HOOKS SHALL BE IN ACCORDANCE WITH AUSTRALIAN BRIDGE DESIGN CODE 1996.
5. SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN POSITIONS SHOWN OR AS APPROVED IN WRITING BY THE PRINCIPAL'S REPRESENTATIVE.
6. BAR SHAPES SHALL BE IN ACCORDANCE WITH AS/NZS 1100.501:2002.
7. THE FOLLOWING ABBREVIATIONS APPLY TO THE LOCATION OF REINFORCEMENT :

   EW - EACH WAY
   EF - EACH FACE
   NF - NEAR FACE
   FF - FAR FACE
   T - TOP FACE
   B - BOTTOM FACE
   C - CENTRALLY PLACED

8. BAR LAPS SHALL BE AS FOLLOWS UNO;

BAR SIZE	LAPS (mm)	BAR SIZE	LAPS (mm)
N12	400	N28	1000
N16	500	N32	1300
N20	650	N36	1500
N24	750	N40	1700

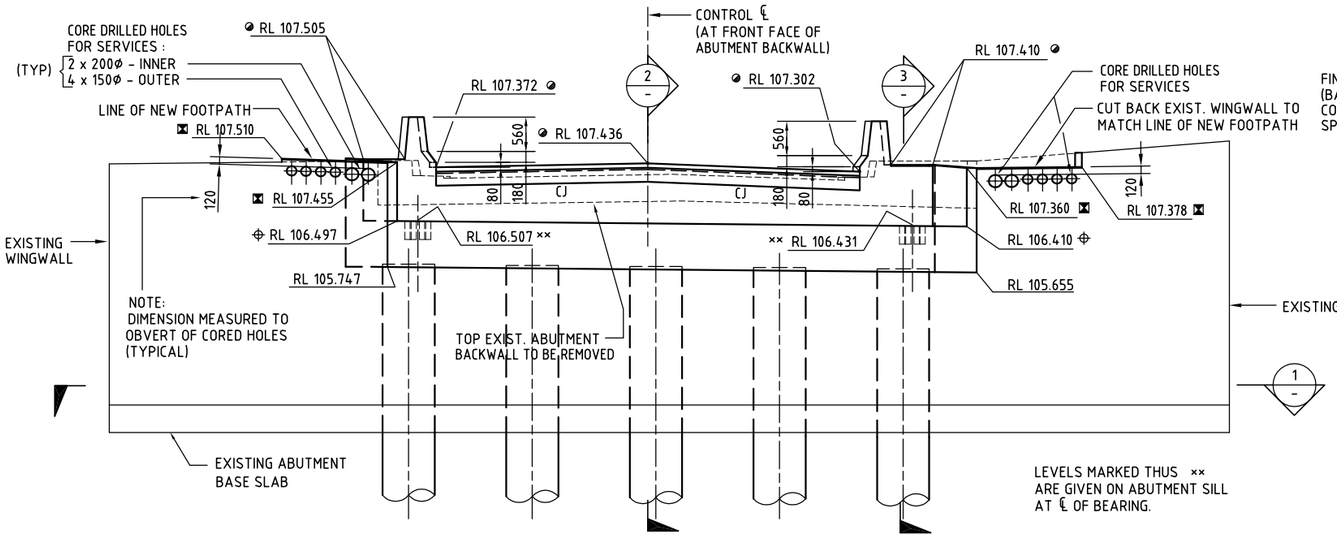
REFERENCE

GENERAL ARRANGEMENT . . . PRL-G2-99251

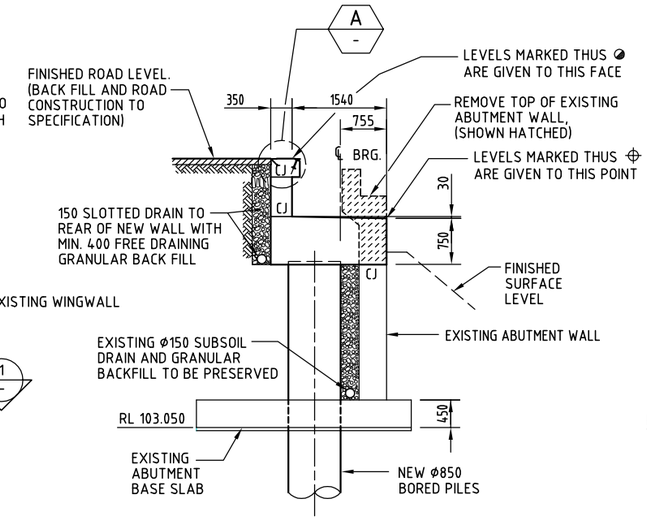
WORK AS EXECUTED
THIS DRAWING SHOWS WORK AS EXECUTED. ANY DEPARTURES FROM THE ORIGINAL DESIGN DETAILS ARE BASED SOLELY ON INFORMATION PROVIDED BY JOHN HOLLAND PTY LTD.

RIC/SRA EDMS ID CV0214641

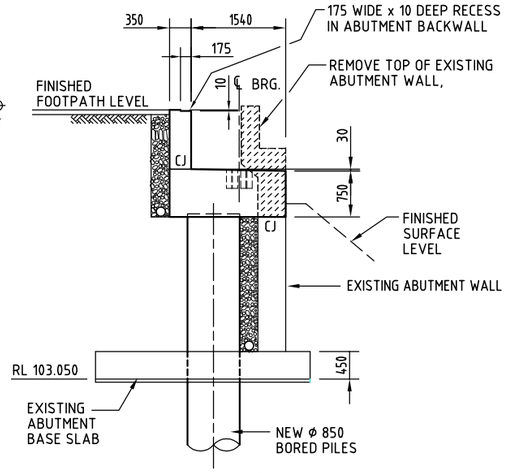
Scales
0 2 4
2 1 (1:100 BEFORE REDUCTION)
SCALE IN METRES
0 400 800mm
400 200 (1:20 BEFORE REDUCTION)
SCALE IN MILLIMETRES
(AT A1 SHEET SIZE)



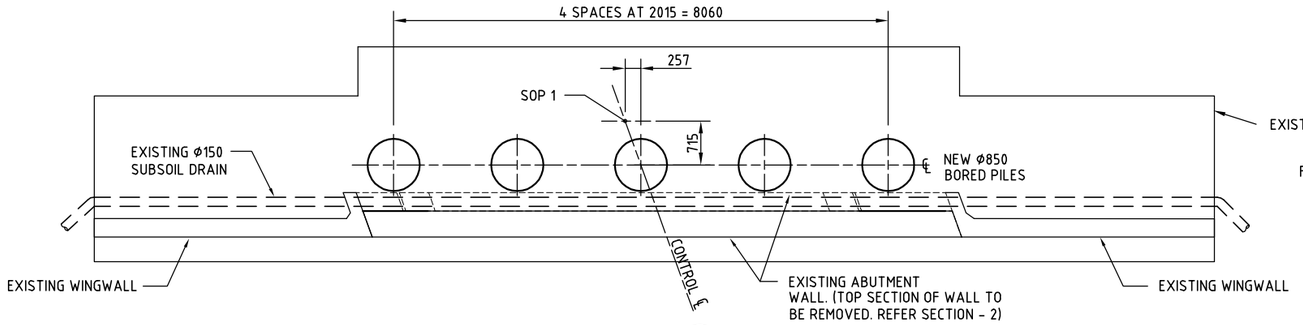
ELEVATION



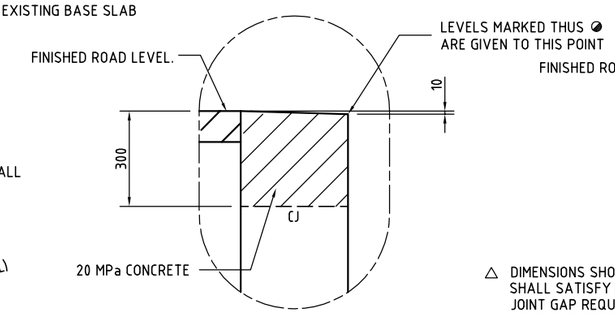
SECTION 2



SECTION 3

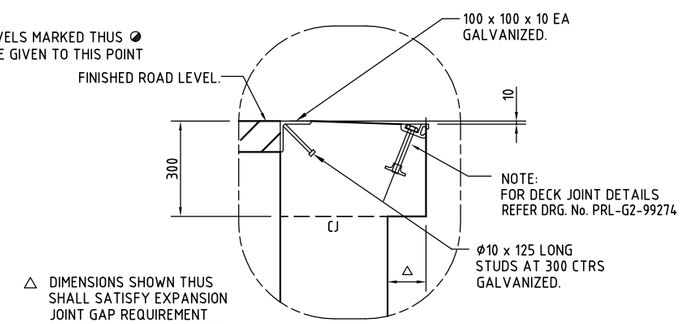


PLAN SECTION 1



DETAIL A
SCALE 1:10

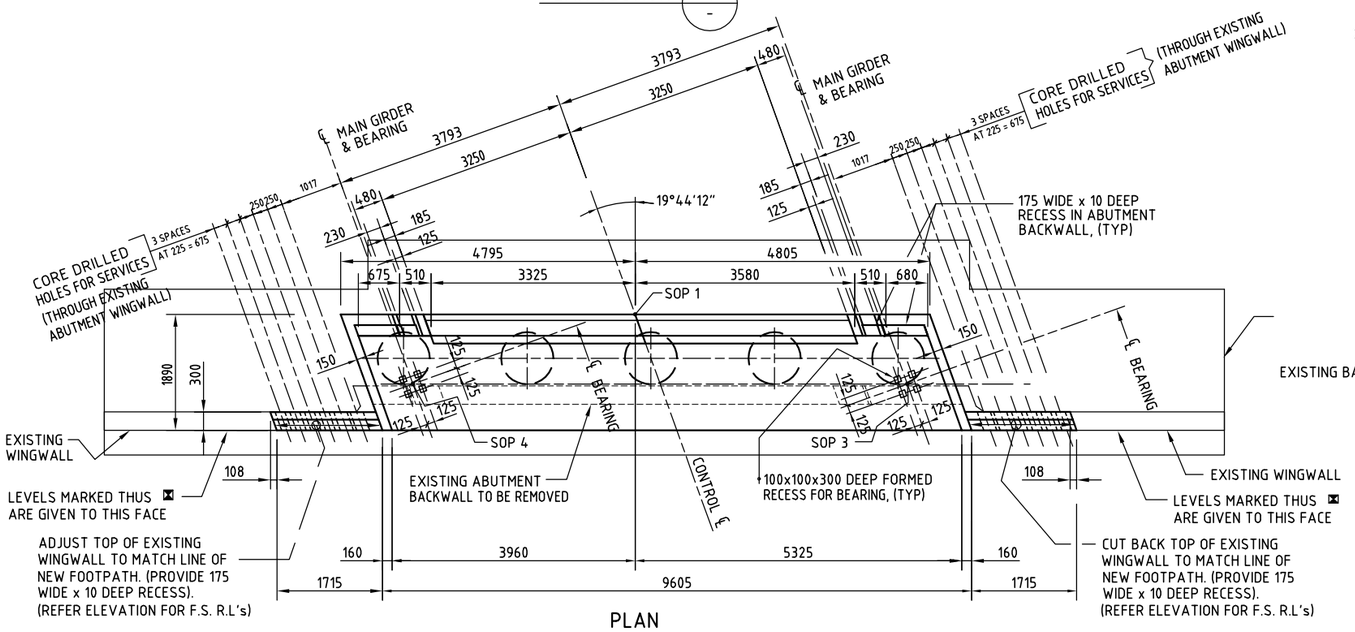
(SHOWING TEMPORARY ABUTMENT BACKWALL OUTLINE)
NOTE: PRIOR TO INSTALLATION OF EXPANSION JOINT DEMOLISH PART OF BACKWALL ABOVE C.J. AND REBUILD TO SUIT EXPANSION REQUIREMENTS.



△ DIMENSIONS SHOWN THUS SHALL SATISFY EXPANSION JOINT GAP REQUIREMENT AT TIME OF INSTALLATION REFER DWG PRL-G2-99274.

DETAIL A
SCALE 1:10

(SHOWING FINAL ABUTMENT BACKWALL OUTLINE)
NOTE: PLAN AND ELEVATION DRAWN FOR FINAL ABUTMENT BACKWALL OUTLINE)



PLAN

Scales
0 200 400mm
(1:10 BEFORE REDUCTION)
0 1 2
(1:50 BEFORE REDUCTION)
SCALE IN METRES (U.N.O.)
(AT A1 SHEET SIZE)

NOTE:
WHERE NEW CONCRETE IS PLACED IN CONTACT WITH EXISTING CONCRETE SURFACES SHALL BE SCABBLED FREE OF DIRT AND DUST AND TREATED AS CJ

NOTES

GENERAL

SCALE 1:50 UNLESS NOTED OTHERWISE.
DIMENSIONS ARE NOT TO BE SCALED FROM THE DRAWINGS.
DIMENSIONS ARE IN MILLIMETRES,
CHAINAGES AND REDUCED LEVELS ARE IN METRES.
CONCRETE EXPOSURE CLASSIFICATION: B1.
MINIMUM 28 DAY COMPRESSIVE STRENGTH OF ALL CONCRETE SHALL BE 40MPa.
EDGES SHALL BE CHAMFERED 20x20 AND RE-ENTRANT ANGLES FILLETED 20x20 UNLESS SPECIFIED OTHERWISE.

REFERENCE

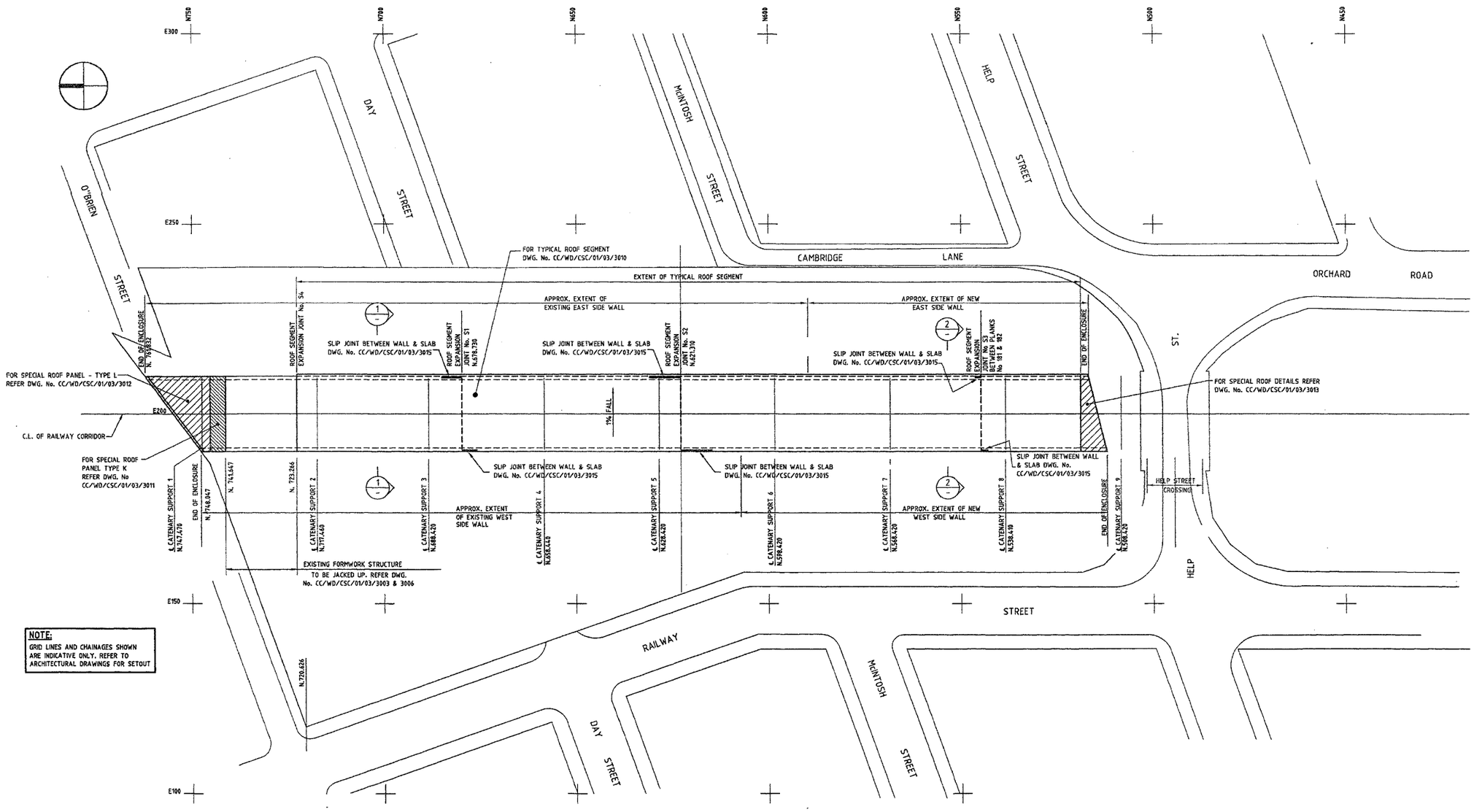
GENERAL ARRANGEMENT.....PRL-G2-99251
PILE SETOUT AND DETAILS...PRL-G2-99252
ABUTMENT 1-REINFORCEMENT..PRL-G2-99256
DECK JOINT DETAILS.....PRL-G2-99274

WORK AS EXECUTED
THIS DRAWING SHOWS WORK AS EXECUTED. ANY DEPARTURES FROM THE ORIGINAL DESIGN DETAILS ARE BASED SOLELY ON INFORMATION PROVIDED BY JOHN HOLLAND PTY LTD.

RIC/SRA EDMS ID CV0214642

NOTES:

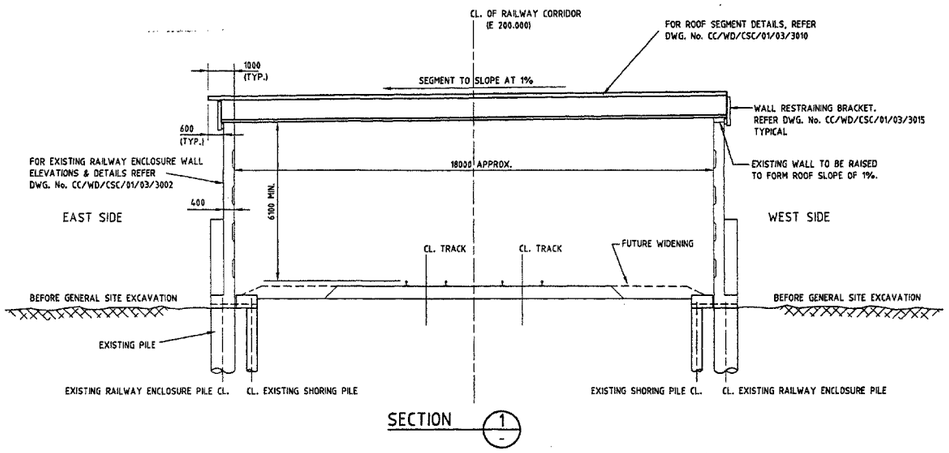
1. SCALES AS SHOWN.
2. DIMENSIONS ARE IN MILLIMETRES, CHAINAGES AND REDUCED LEVELS ARE IN METRES.
3. REDUCED LEVELS ARE TO AUSTRALIAN HEIGHT DATUM.
4. ENCLOSURE ROOF STRUCTURE SHALL BE GENERALLY CONSTRUCTED IN SEGMENTS USING 1000 DEEP x 970 WIDE PRETENSIONED CONCRETE 'I' SECTIONS CRANED INTO POSITION ON TOP OF EXISTING & NEW IN-SITU REINFORCED CONCRETE WALLS. SEGMENTS SHALL BE PLACED SIDE BY SIDE WITH 20mm NOM. GAP AND CONNECTED WITH SITE WELDED REINFORCEMENT IN REBATES LOCATED AT THE TOP OF FLANGES.
5. FOR STRUCTURAL NOTES REFER TO DRAWING NUMBER CC/WD/CSC/01/03/3045



NOTE:
GRID LINES AND CHAINAGES SHOWN ARE INDICATIVE ONLY. REFER TO ARCHITECTURAL DRAWINGS FOR SETOUT

RAILWAY ENCLOSURE PLAN

SCALE 1 : 500

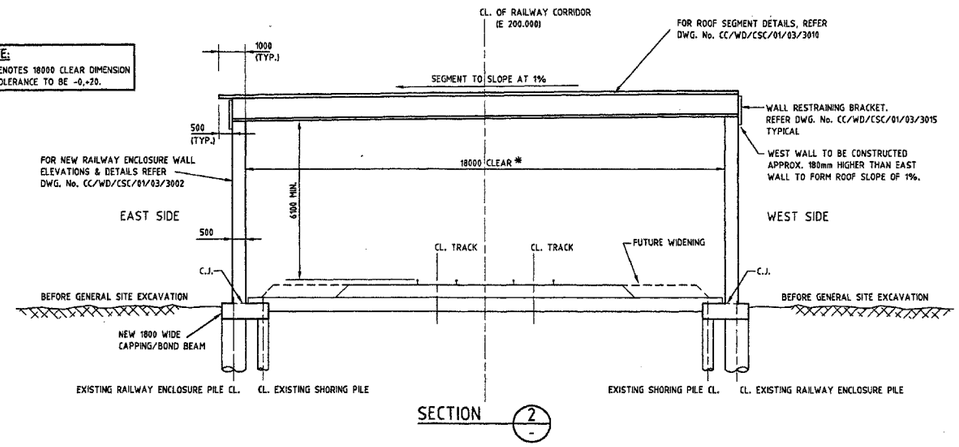


SECTION 1

TYPICAL RAILWAY ENCLOSURE SECTION AT EXISTING WALLS

SCALE 1 : 100

NOTE:
* DENOTES 18000 CLEAR DIMENSION TOLERANCE TO BE -0,+20.



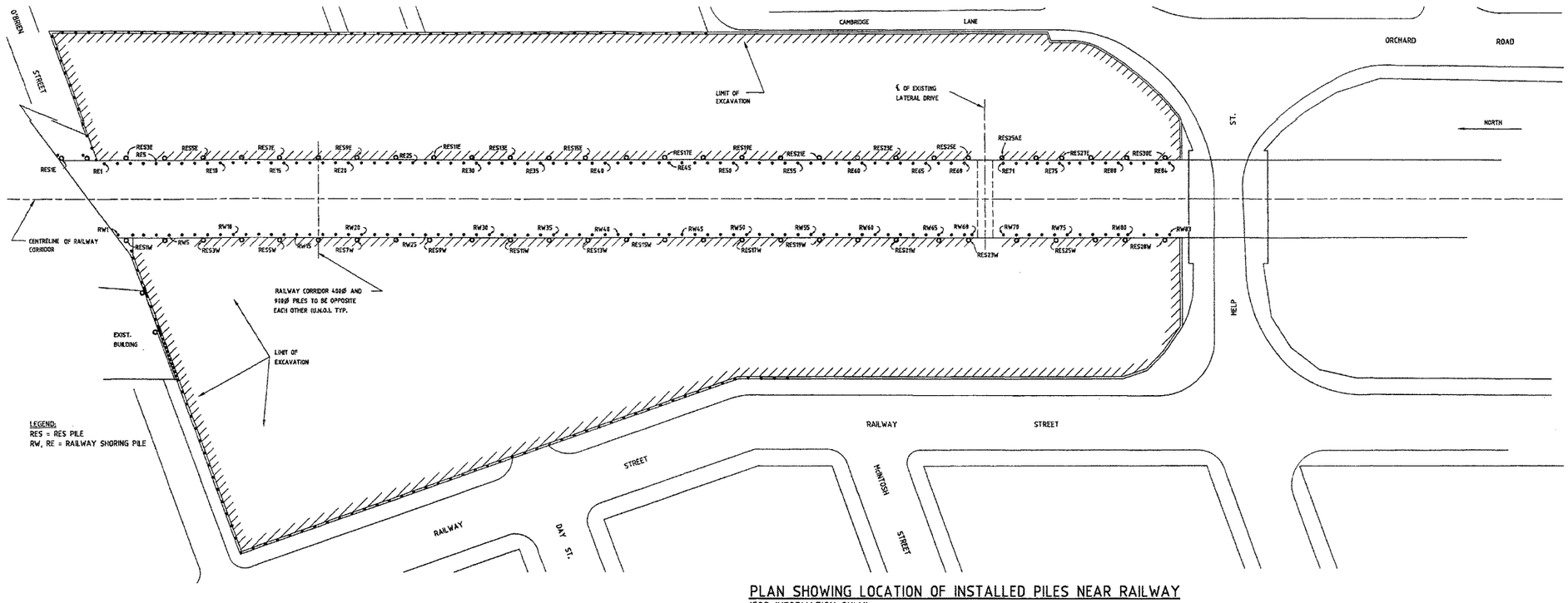
SECTION 2

TYPICAL RAILWAY ENCLOSURE SECTION AT NEW WALLS

SCALE 1 : 100

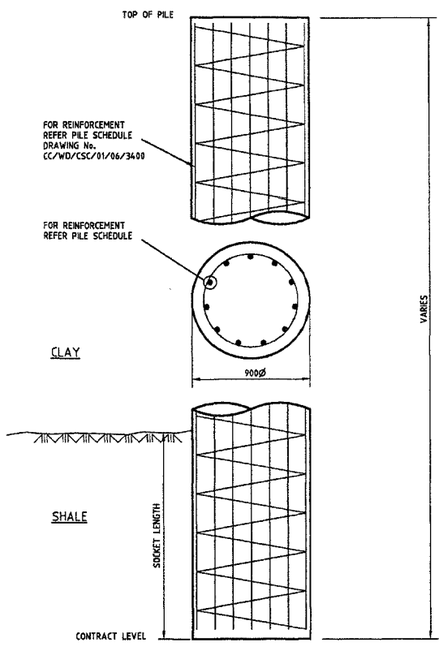
WORK AS EXECUTED

EDMS CV0278720 WARNING SCANNED IMAGE

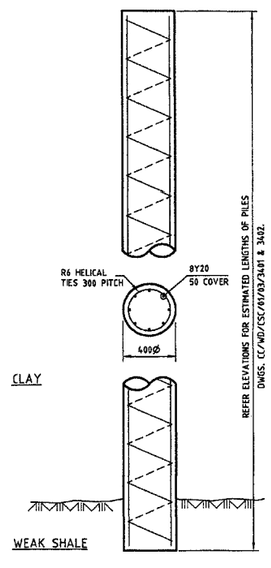


PLAN SHOWING LOCATION OF INSTALLED PILES NEAR RAILWAY

(FOR INFORMATION ONLY)



TYPICAL RES PILE REINFORCEMENT DETAIL

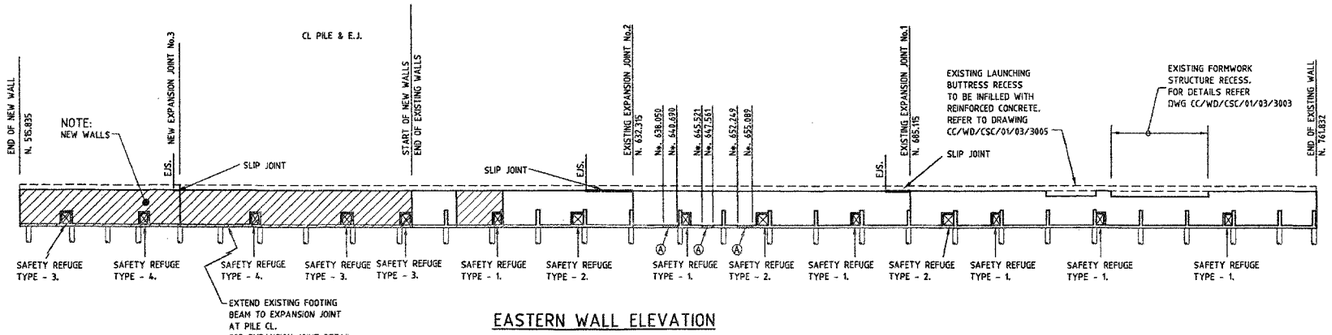


TYPICAL RAILWAY CORRIDOR SHORING PILE REINFORCEMENT DETAIL

1. ALL RAILWAY CORRIDOR SHORING PILES EMBEDDED 400 MIN. INTO WEAK SHALE OR TO R.L. SHOWN ON THE ELEVATIONS WHICH EVER IS THE DEEPER.

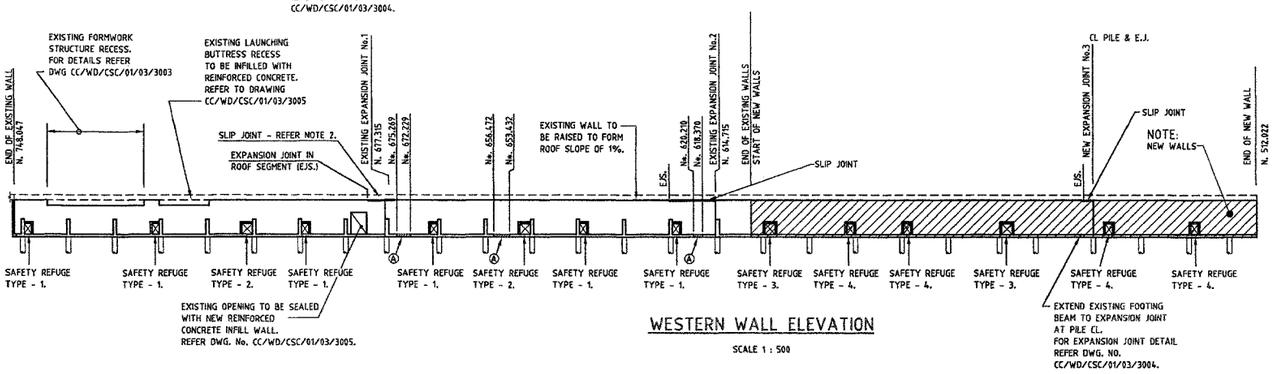
EDMS CV0278721 WARNING SCANNED IMAGE

WORK AS EXECUTED



EASTERN WALL ELEVATION

SCALE 1 : 500



WESTERN WALL ELEVATION

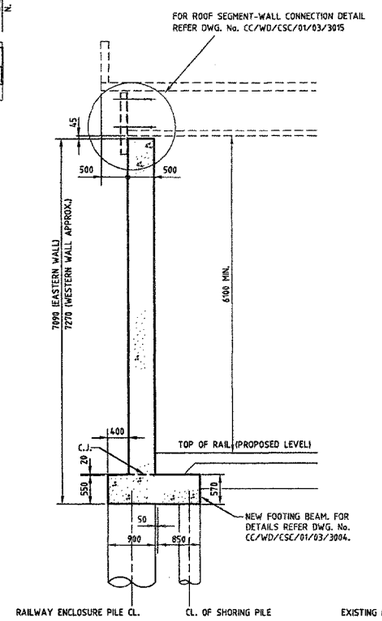
SCALE 1 : 500

NOTES:

1. No CO-ORDINATES OF RECESS IN WALL FLANGE TO ACCOMMODATE PREVIOUSLY PROPOSED TOWER COLUMNS.
2. FOR DETAILS OF SLIP JOINT BETWEEN WALL AND ROOF SEGMENT REFER TO DRAWING No. CC/WD/CSC/01/03/3015.
3. Ⓐ - DENOTES EXISTING FLANGE RECESS TO BE FILLED WITH REINFORCED CONCRETE LINK BEAM .

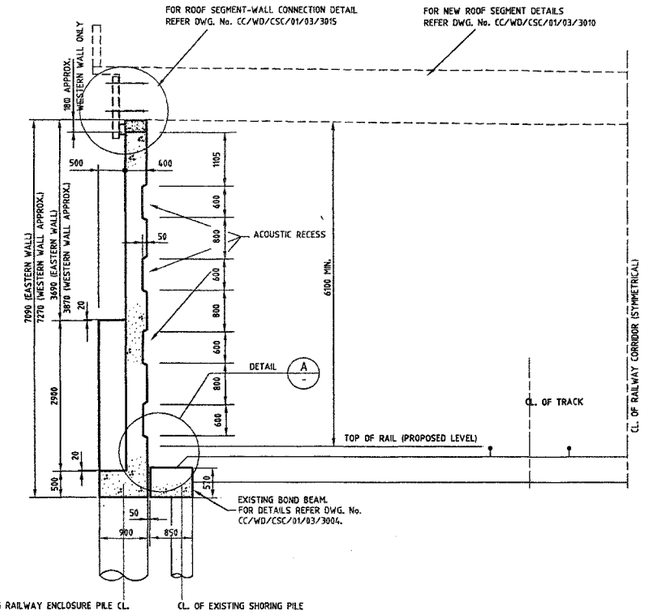
NOTES:

1. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF EXISTING CONCRETE 32 MPa. & NEW CONCRETE SHALL BE 40 MPa. MAXIMUM SIZE AGGREGATE OF 20. MAXIMUM SLUMP 80.
2. HORIZONTAL CONSTRUCTION JOINT MAY BE PROVIDED IF REQUIRED - REFER SPECIFICATION.
3. CO-ORDINATES OF WALLS EXPANSION JOINTS ARE GIVEN FOR THE TOP OF WALL.
4. FOR STRUCTURAL NOTES REFER TO DWG. No. CC/WD/CSC/01/03/3045.



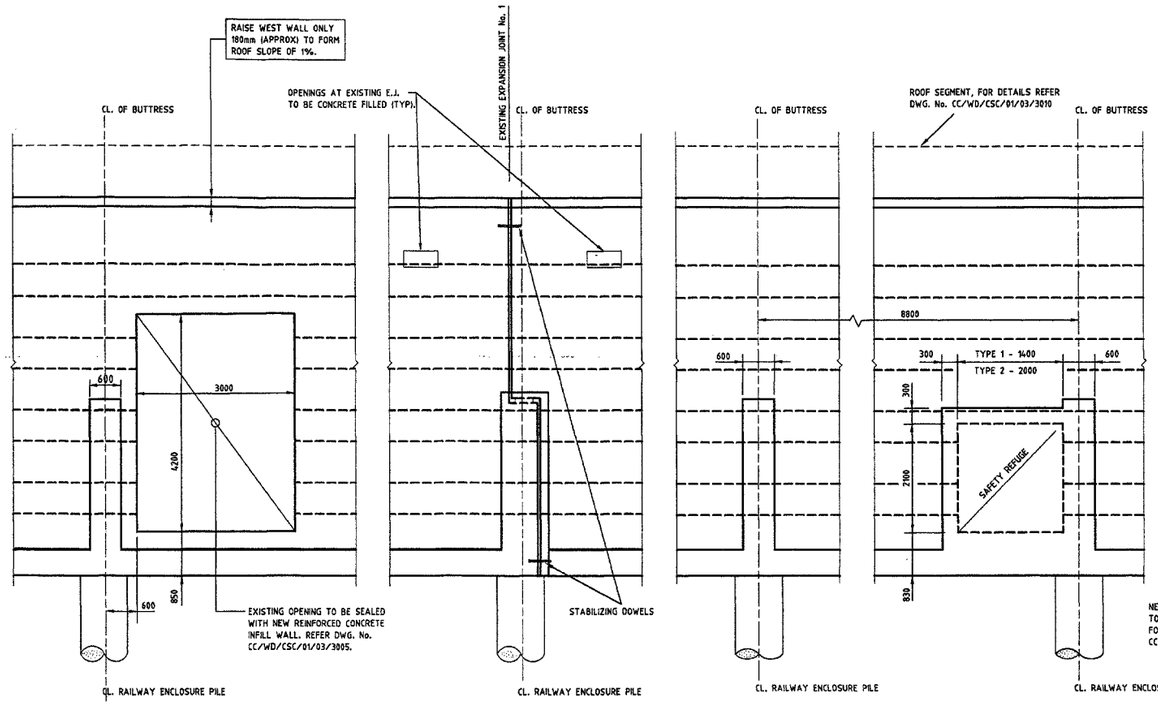
TYPICAL SECTION THROUGH NEW WALL

SCALE 1 : 50



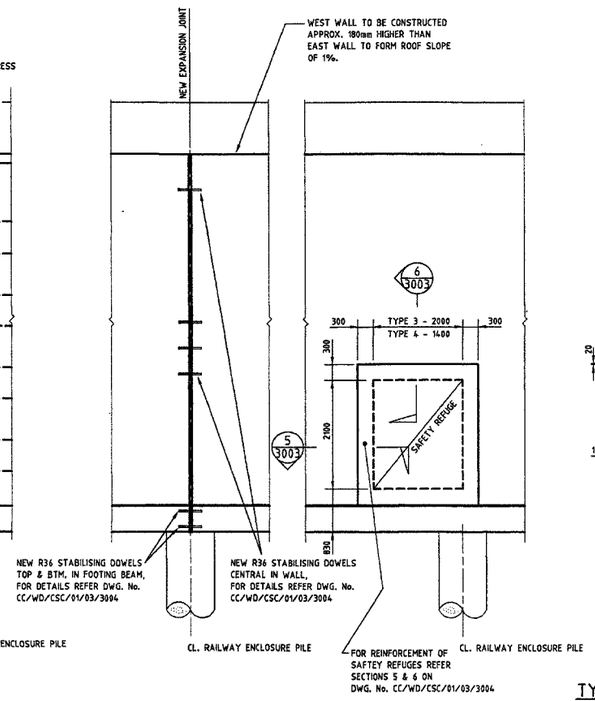
TYPICAL SECTION THROUGH EXISTING WALL

SCALE 1 : 50



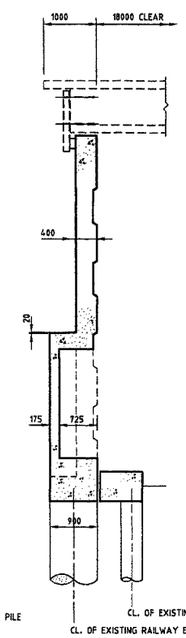
TYPICAL PART ELEVATION EXISTING WALL

SCALE 1:50



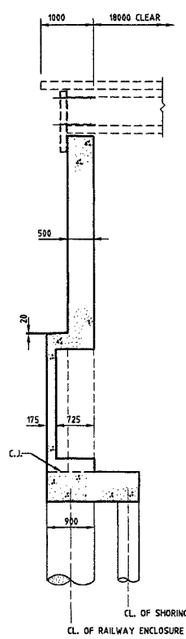
TYPICAL PART ELEVATION NEW WALL

SCALE 1:50



TYPICAL SECTION THROUGH EXISTING SAFETY REFUGES TYPES 1 & 2

SCALE 1 : 50

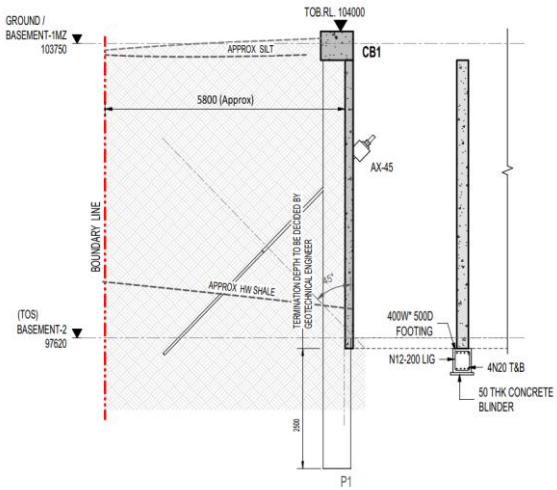


TYPICAL SECTION THROUGH NEW SAFETY REFUGES TYPES 3 & 4

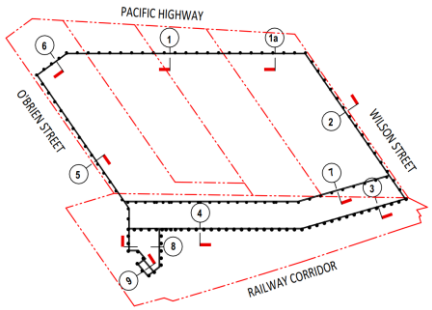
SCALE 1 : 50

EDMS CV0278722 WARNING SCANNED IMAGE

WORK AS EXECUTED

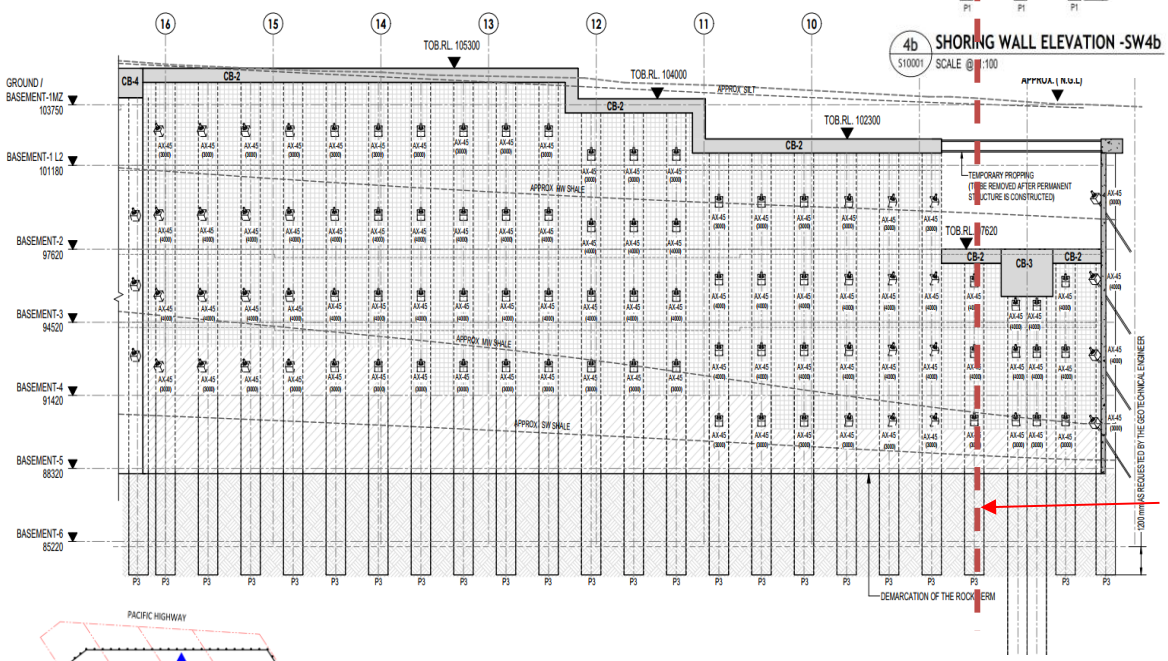


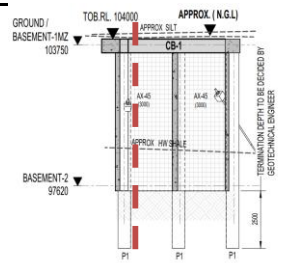
09 510001 **SECTION-9**
SCALE @ 1:50



Typical cross-section view of upper shoring wall

(extract of Cardigal Group Drawing S10020 Rev H, dated 09/05/25, Project Ref. 01-100084)

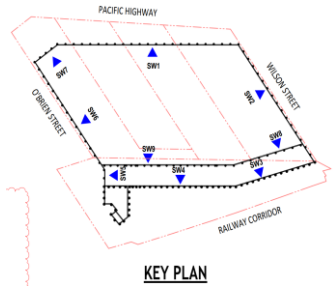




4b 510001 **SHORING WALL ELEVATION -SW4b**
SCALE @ 1:100

Location of design cross section

DESIGN SECTION 1



KEY PLAN

04 510001 **SHORING WALL ELEVATION -SW4**
SCALE @ 1:100

Elevation view showing indicative location of design cross-section

(extract of Cardigal Group Drawing S10011 Rev H, dated 09/05/25, Project Ref. 01-100084)

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

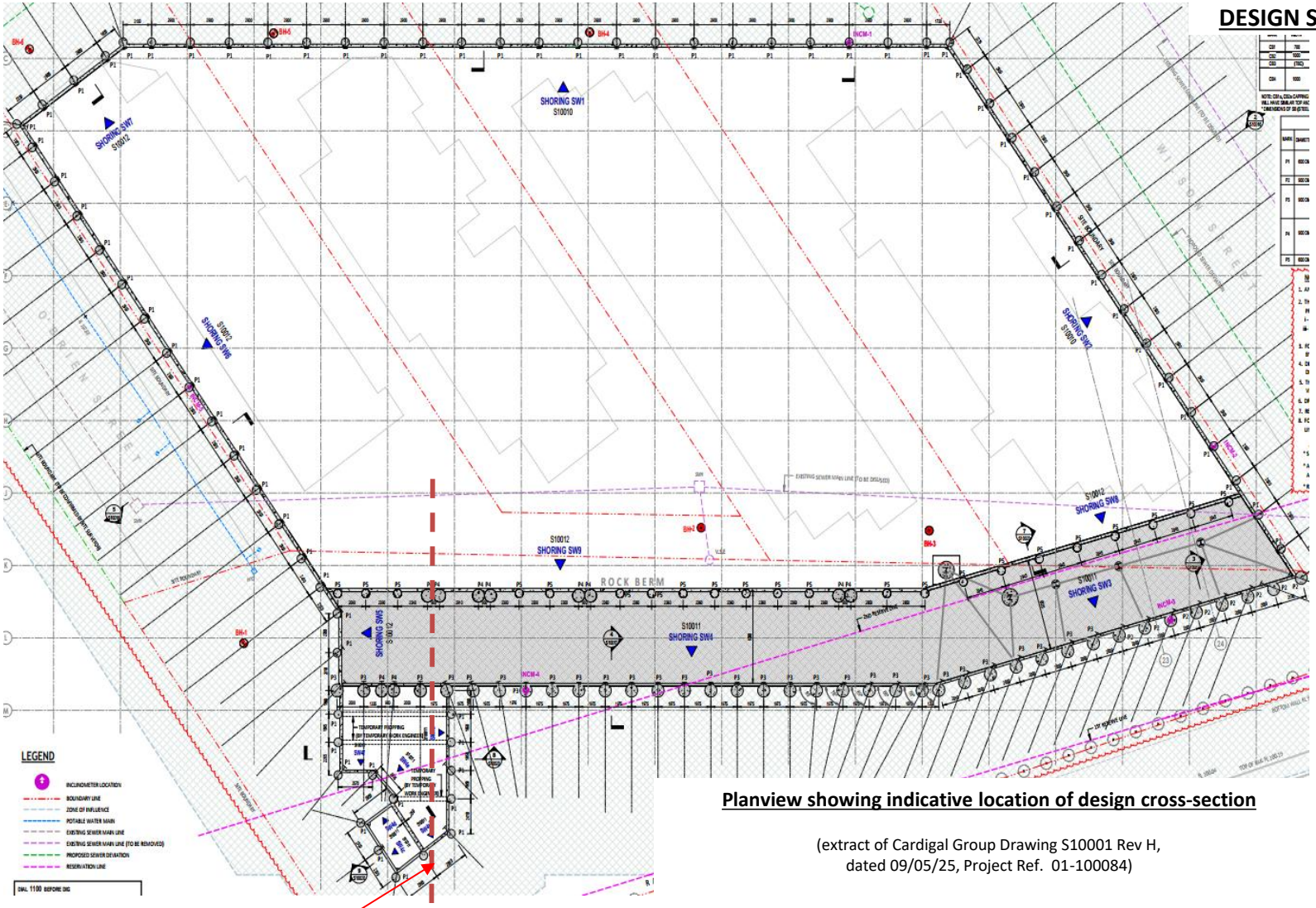
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

TITLE
Proposed shoring system - structural input

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS1-1

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 1



Planview showing indicative location of design cross-section

(extract of Cardigal Group Drawing S10001 Rev H, dated 09/05/25, Project Ref. 01-100084)

Location of design cross section

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

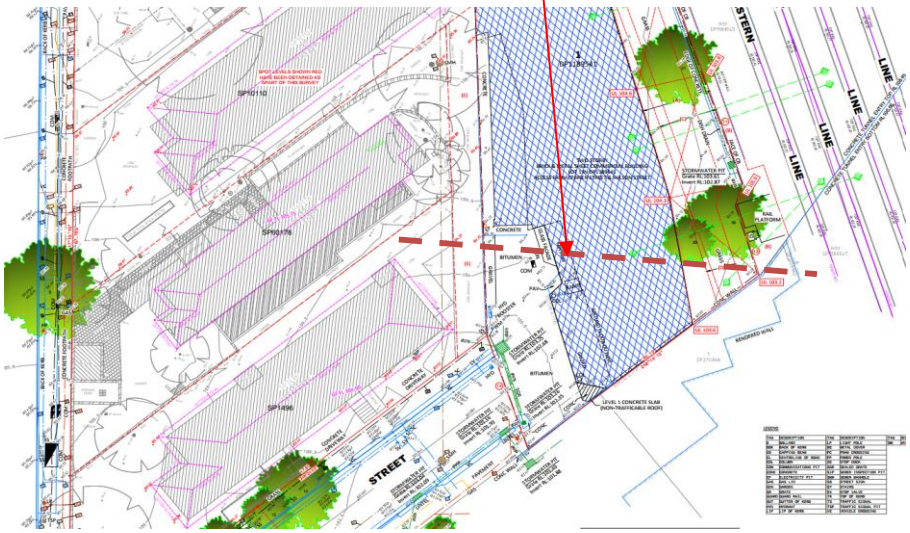
TITLE
Proposed shoring system - plan view

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS1-2

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

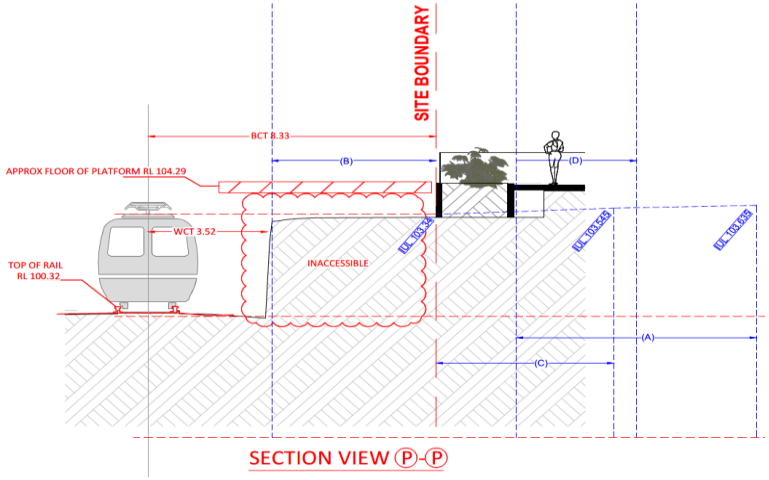
DESIGN SECTION 1

Location of design cross section



Survey plan of the site and surroudings, showing location of design cross-section

(extract of SDS Pty Ltd Drawing 6 of 9, REF: 9062 Rev C, dated 20/03/24)



Cross-section P-P showing proposed development in relation to railway assets

(extract of SDS Pty Ltd Drawing 5 of 9, REF: 9062 Rev C, dated 20/03/24)

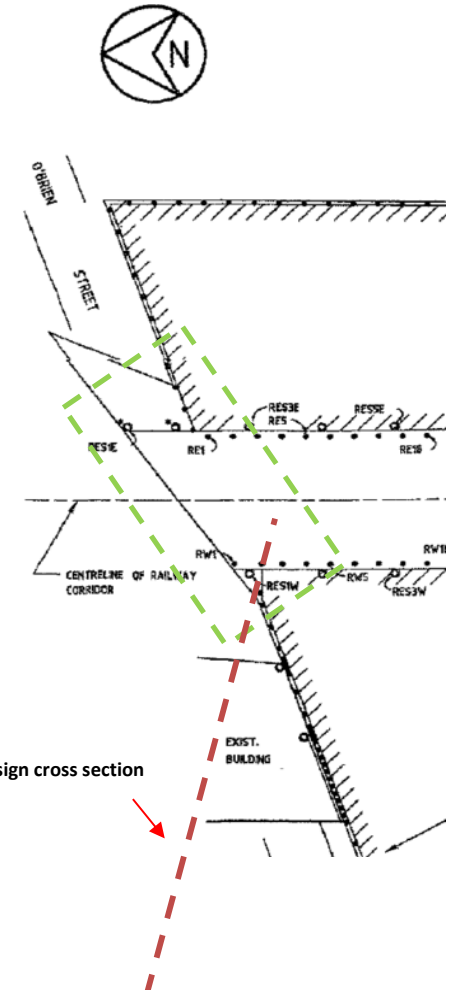
CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**Survey/architectural drawings - geometric input**

FORTIFY GEOTECH

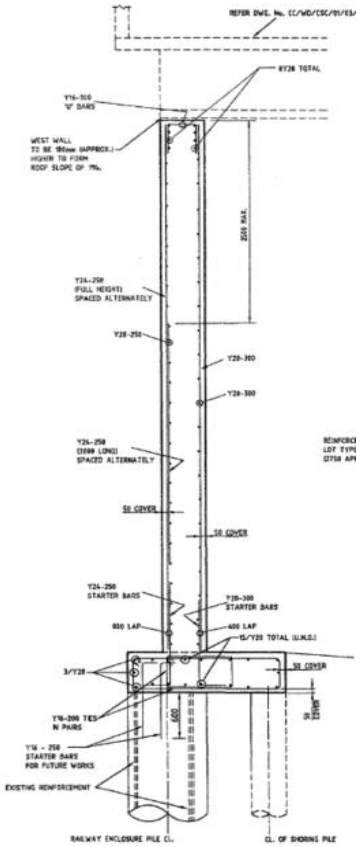
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS1-3

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw



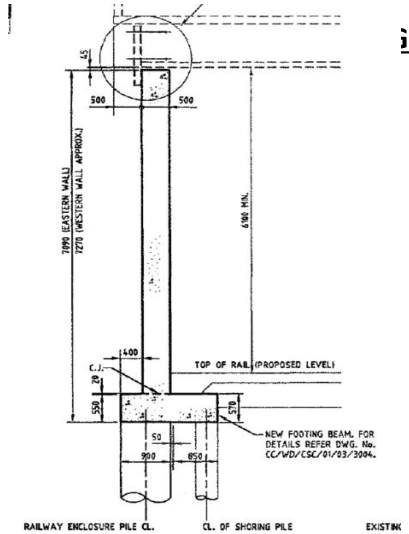
Location of design cross section



SECTION AT NEW WALL

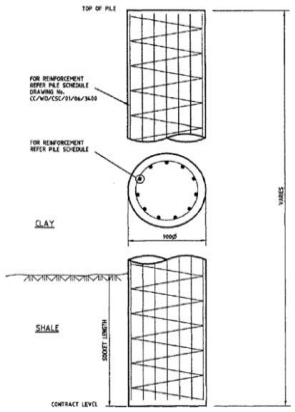
SCALE 1:25

GN SECTION 1

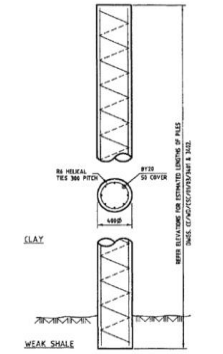


TYPICAL SECTION THROUGH NEW WALL

SCALE 1 : 50



TYPICAL RES PILE REINFORCEMENT DETAIL



TYPICAL RAILWAY CORRIDOR SHORING PILE REINFORCEMENT DETAIL

As-built records

(extracts of Railway Enclosure Structure - Pacific Place, Railway Street Chastwood C, dated October 2001)

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**Existing railway assets as-builts**

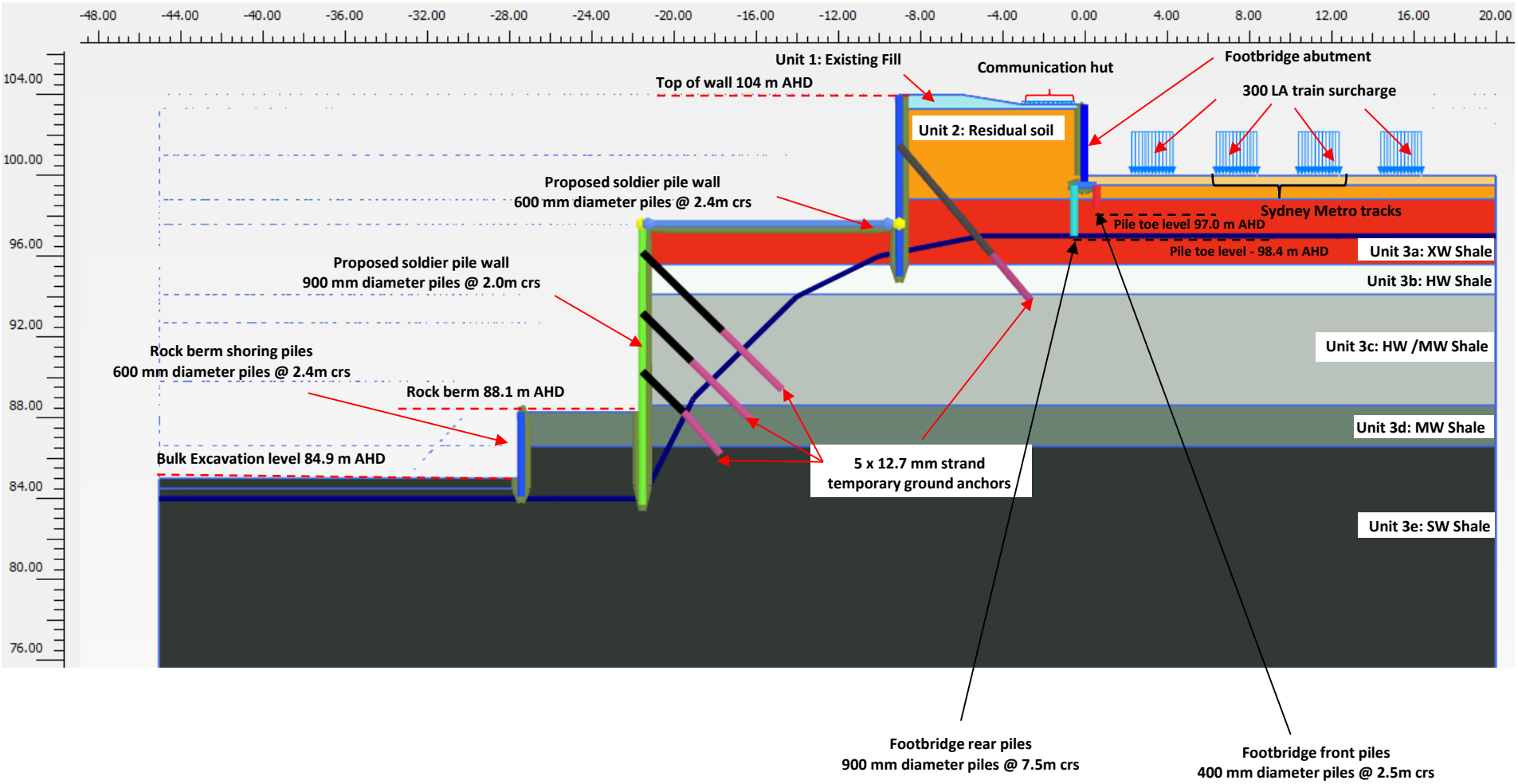
FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS1-4

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 1



CLIENT	PROJECT
BB Wilson	849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

TITLE
PLAXIS 2D - Model overview

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS1-5

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 1

Stage no:		Construction stage	Surcharge/Loading	Structural EI stiffness of new piled wall
1		Establish initial conditions	/	N/A
2		Current housing development	Dwelling (20 kPa) & pedestrian (5 kPa) surcharge	
3		Railway trench excavation	As above	
4		Railway operation	Dwelling (20 kPa), pedestrian (5 kPa) surcharges & LA300 train surcharge	
5		Demolition of current housing development	LA300 train surcharge	
6		Install outer soldier pile wall	As above	0.9 EI
7		1st level of excavation	As above	
8		Installation of 1st level of ground anchors	As above	
9		2nd level of excavation	As above	
10		Install inner solder pile wall	As above	
11		3rd level of excavation	As above	
12		Installation of 2nd level of ground anchors	As above	
13		4th level of excavation	As above	
14		Installation of 3rd level of ground anchors	As above	
15		5th level of excavation	As above	
16		Installation of 4th level of ground anchors	As above	
17		6th level of excavation (Top of rock berm)	As above	
18		Install rock berm shoring wall	As above	
19		Excavation to bulk excavation level	As above	
	19.1	Over-excavation scenario	As above	
20		Change to long-term structural properties	As above	0.6 EI
21		Install Basement -5 slab	As above	
22		Install Basement -4 slab	As above	
23		Deactivate 4th level of ground anchors	As above	
24		Install Basement -3 slab	As above	
25		Deactivate 3rd level of ground anchors	As above	
26		Install Basement -2 slab	As above	
27		Deactivate 2nd level of ground anchors	As above	
28		Install Basement -1MZ slab	As above	
29		Deactivate 1st level of ground anchors	As above	
30		Application of 20kPa surcharge for future railway operations	Railway (20 kPa) surcharge & LA300 train surcharge	

CLIENT
BB Wilson

PROJECT
849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

TITLE
PLAXIS 2D - Construction staging

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS1-6

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 1

Existing railway asset

Plate - Stem (500 mm)

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	15.00E6
EA_2	kN/m	15.00E6
E_1	kN/m²	38.73E6
E_2	kN/m²	38.73E6
EI	kN m²/m	187.5E3
ν (nu)		0.2000
d	m	0.3873

Plate - Base (550 mm)

General * | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	16.50E6
EA_2	kN/m	16.50E6
E_1	kN/m²	38.73E6
E_2	kN/m²	38.73E6
EI	kN m²/m	249.6E3
ν (nu)		0.2000
d	m	0.4260

Embedded beam - 400mm @ 2.5 crs

General | Mechanical

Property	Unit	Value
Properties		
$L_{spacing}$	m	2.500
Cross section type		Predefined
Predefined cross section type		Solid circular beam
Diameter	m	0.4000
A	m²	0.1257
I	m⁴	1.257E-3
Stiffness		
E	kN/m²	30.00E3

Embedded beam - 900mm @ 7.5 crs

General | Mechanical

Property	Unit	Value
Properties		
$L_{spacing}$	m	7.500
Cross section type		Predefined
Predefined cross section type		Solid circular beam
Diameter	m	0.9000
A	m²	0.6362
I	m⁴	0.03221
Stiffness		
E	kN/m²	30.00E3

Proposed shoring system

Plate - 900mm @ 2.0m ST

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	10.43E6
EA_2	kN/m	10.43E6
E_1	kN/m²	14.12E6
E_2	kN/m²	14.12E6
EI	kN m²/m	475.0E3
ν (nu)		0.2000
d	m	0.7391

Plate - 900mm @ 2.0m LT

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	10.43E6
EA_2	kN/m	10.43E6
E_1	kN/m²	17.28E6
E_2	kN/m²	17.28E6
EI	kN m²/m	317.0E3
ν (nu)		0.2000
d	m	0.6038

Plate - 900mm @ 2.4m LT

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	8.694E6
EA_2	kN/m	8.694E6
E_1	kN/m²	14.40E6
E_2	kN/m²	14.40E6
EI	kN m²/m	264.0E3
ν (nu)		0.2000
d	m	0.6036

Plate - 900mm @ 2.4m ST

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	8.694E6
EA_2	kN/m	8.694E6
E_1	kN/m²	11.76E6
E_2	kN/m²	11.76E6
EI	kN m²/m	396.0E3
ν (nu)		0.2000
d	m	0.7393

CLIENT
BB Wilson

PROJECT
849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

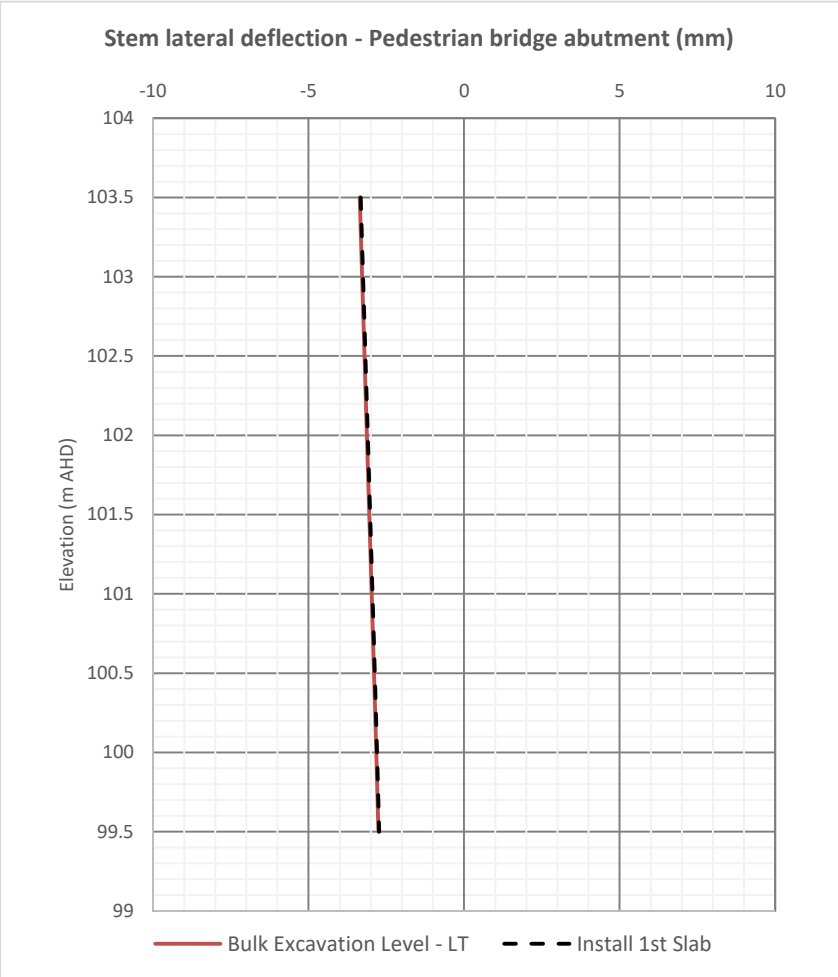
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

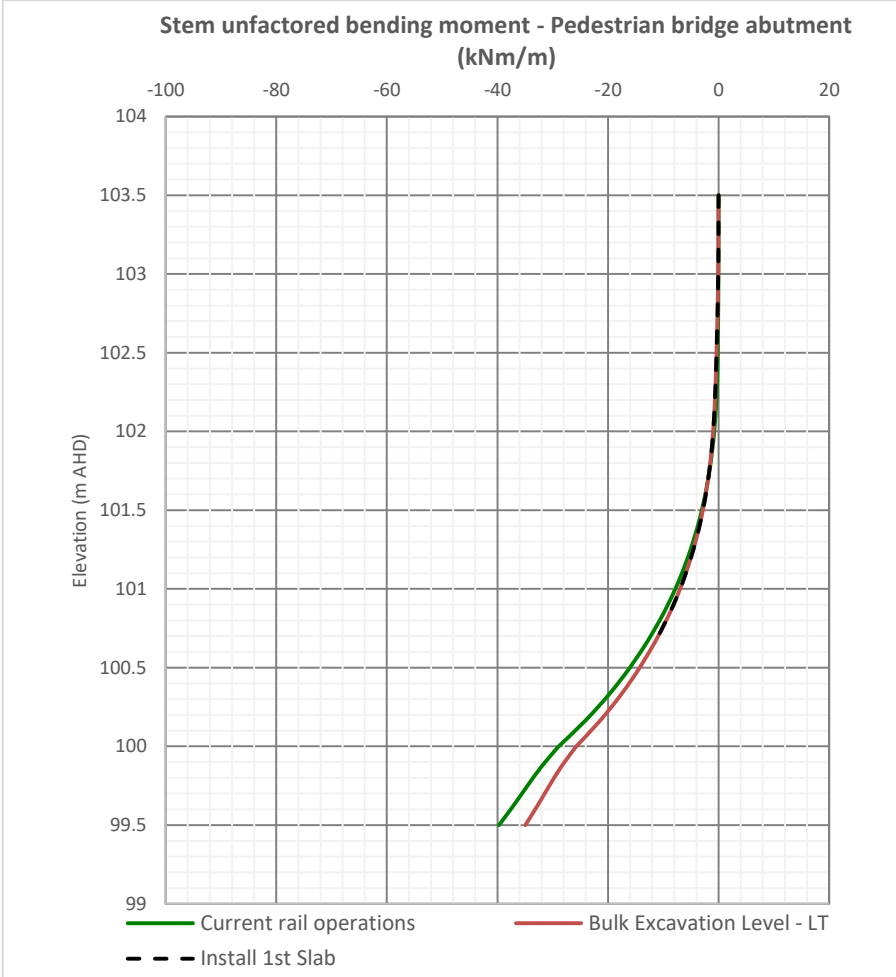
TITLE
PLAXIS 2D - Structural elements properties

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS1-7

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 1





Notes:
1. Structural actions are per pile and unfactored

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**PLAXIS 2D - Existing railway wall outputs**

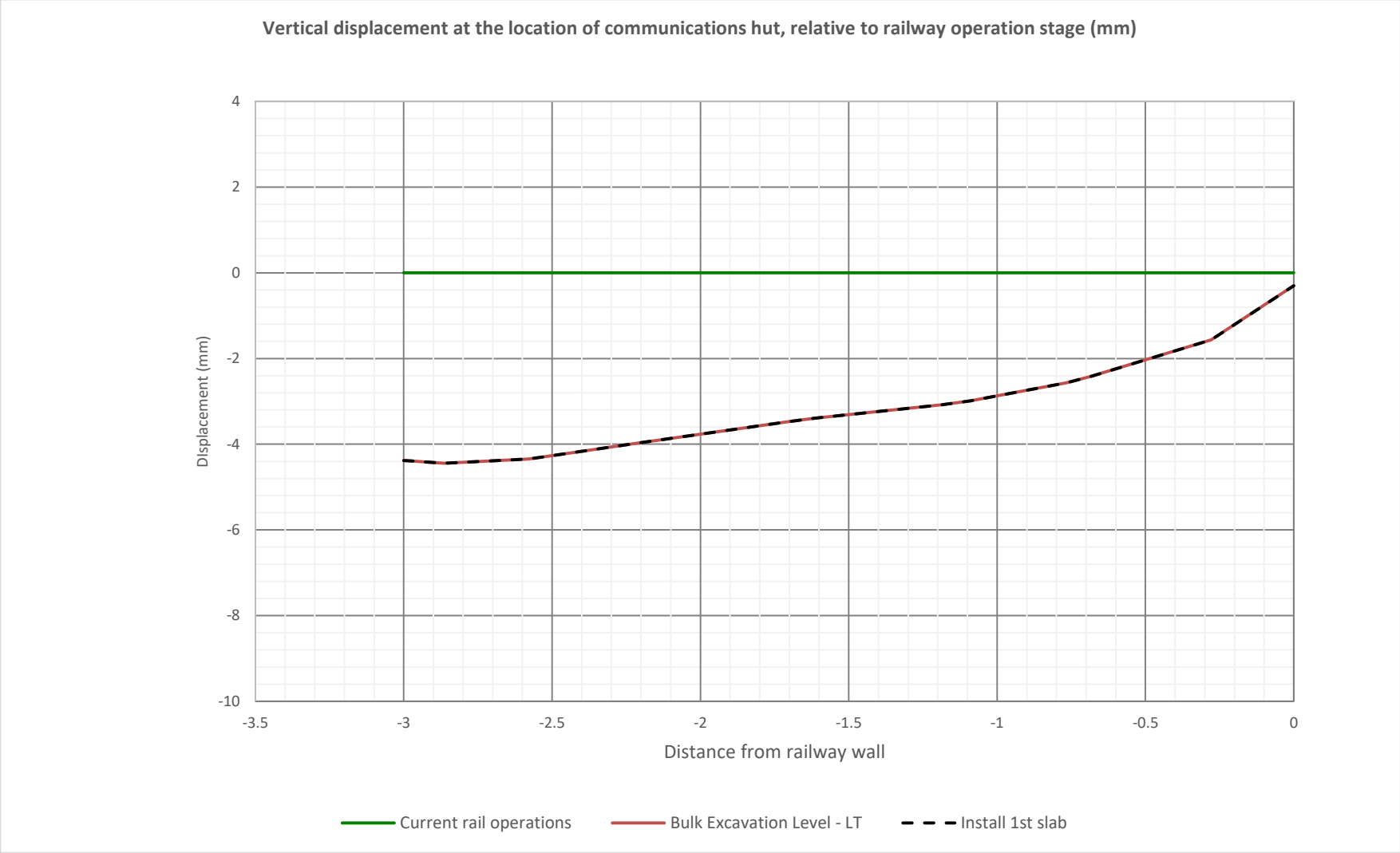
FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS1-8

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 1



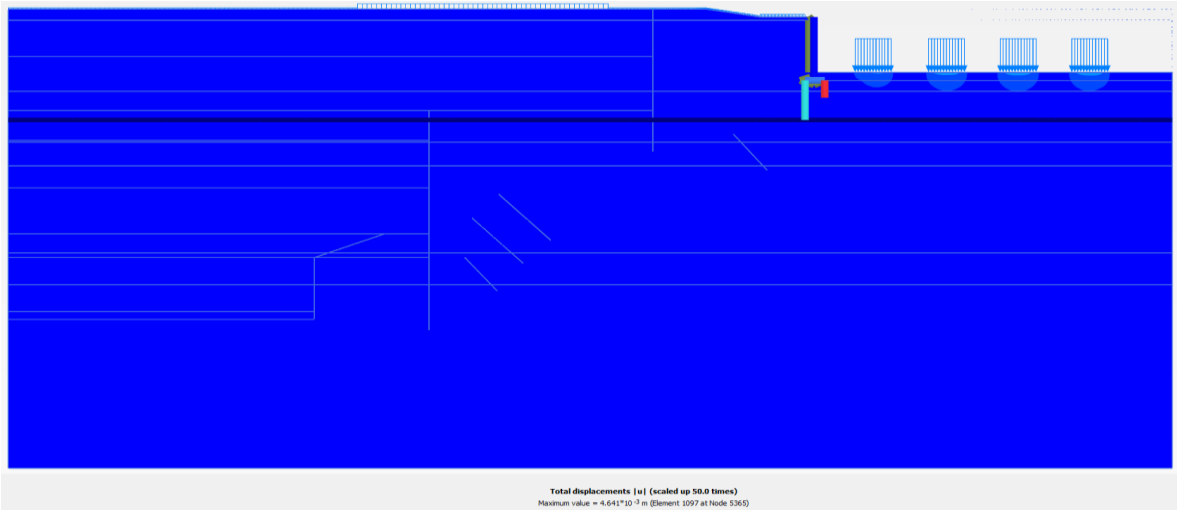
Notes:
1. Structural actions are per pile and unfactored

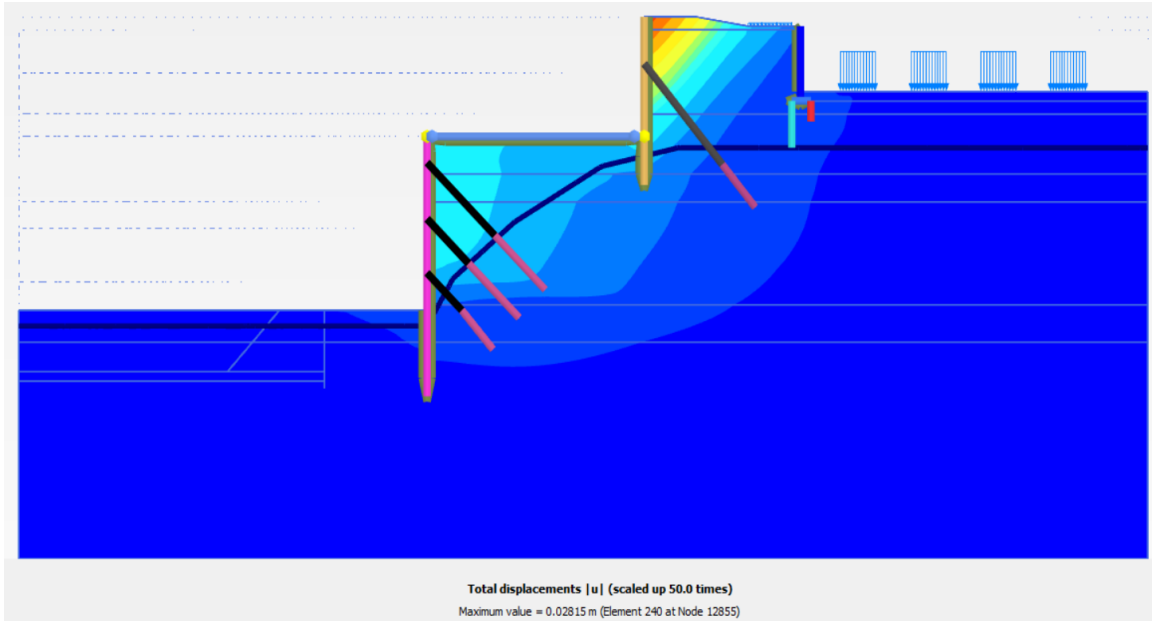
CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM
TITLE	**PLAXIS 2D - Settlement at existing Sydney Trains communication hut location**

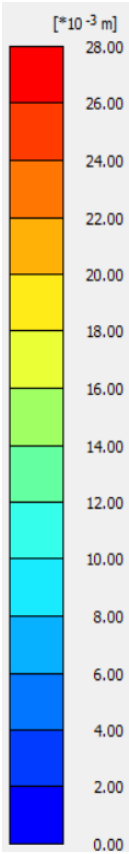
PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS1-9

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 1







Railway operation stage (current)

Impact of proposed works (6th level of excavation)

File Name: #

CLIENT
BB Wilson

PROJECT
849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

TITLE
PLAXIS 2D - Displacement field XY 1/2

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	GS1-10

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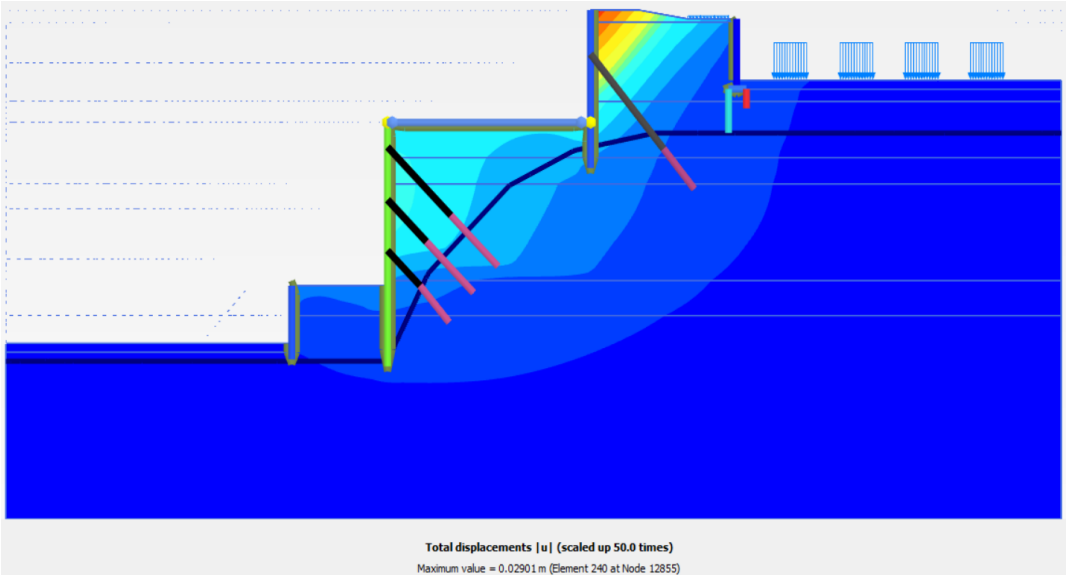
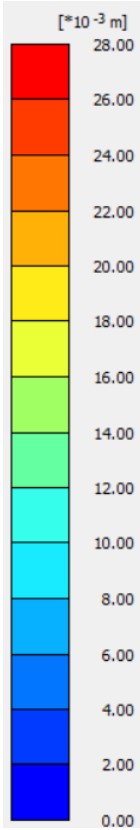
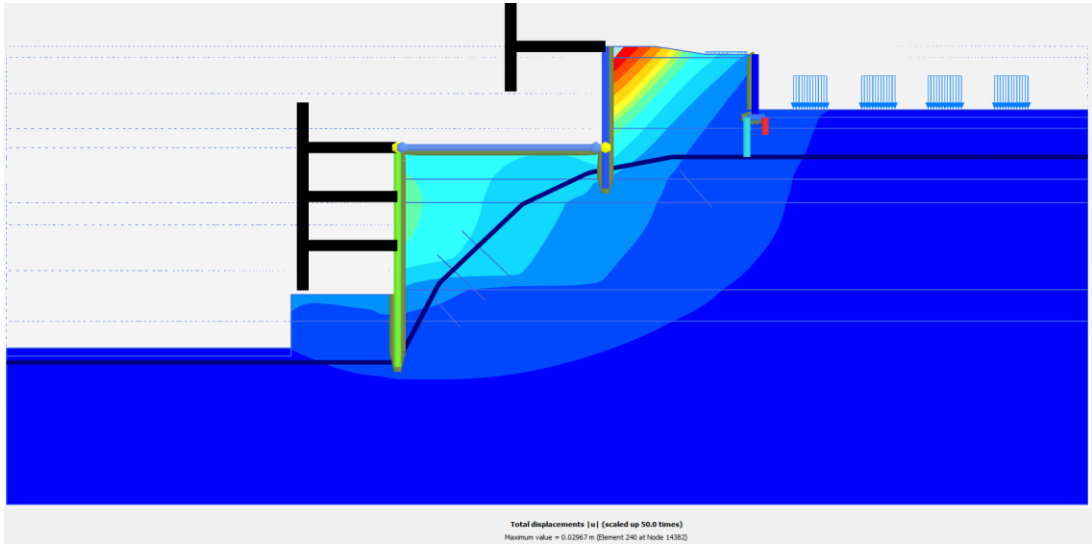
DESIGN SECTION 1





Impact of proposed works (end of excavation)



Impact of proposed works (removal of last ground anchor level)

File Name: #

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**PLAXIS 2D - Displacement field XY 2/2**

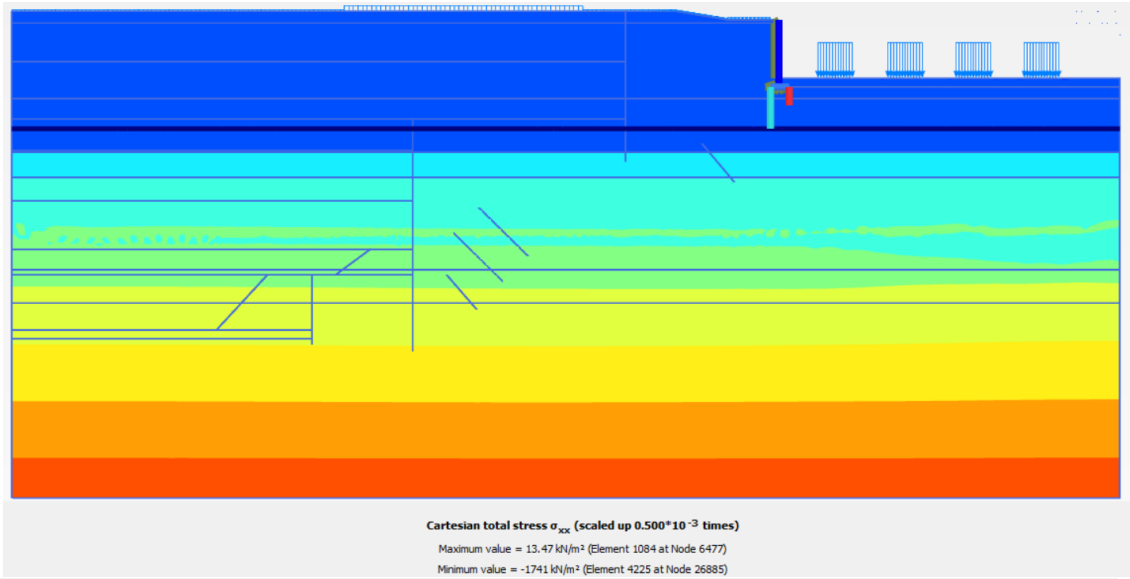
FORTIFY GEOTECH

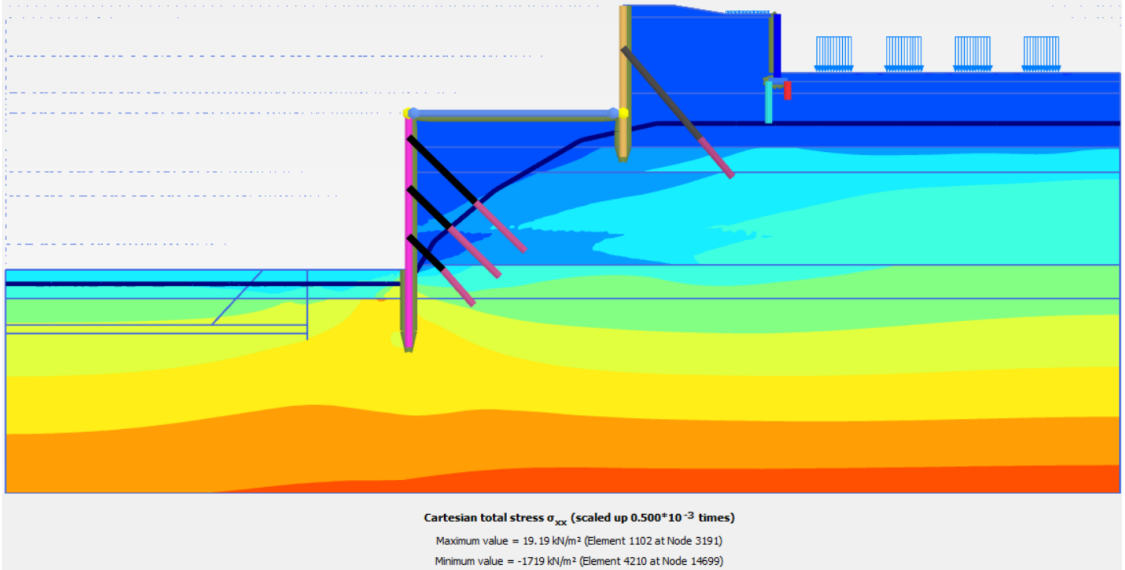
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

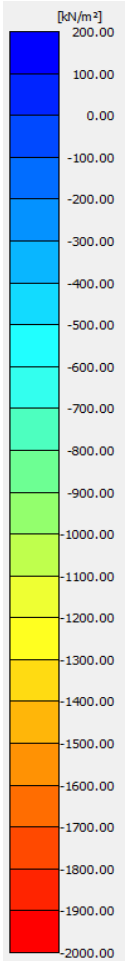
PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	S1-11

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 1







Railway operation stage (current)

Impact of proposed works (6th of excavation)

File Name: #

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**PLAXIS 2D - Stress field XX 1/2**

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	(S1-12

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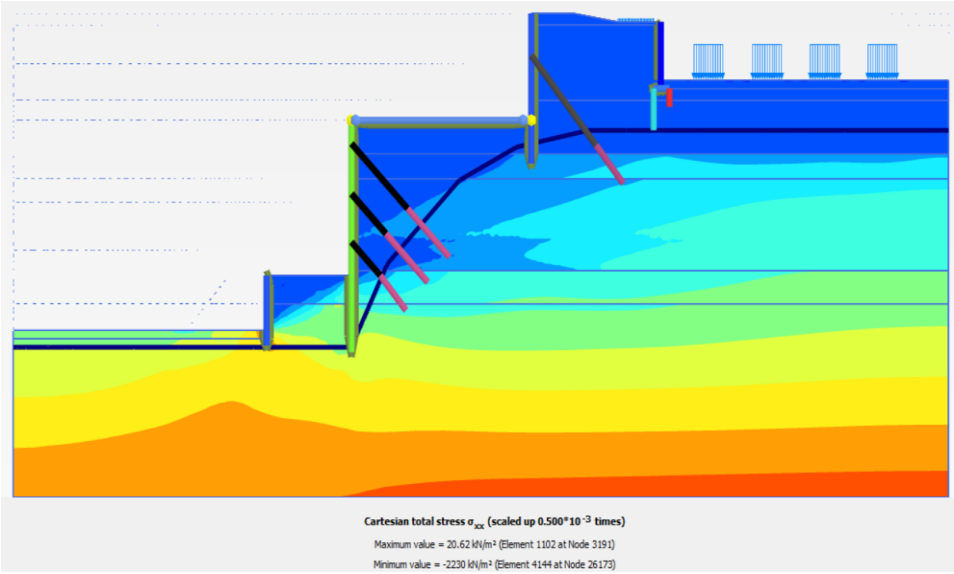
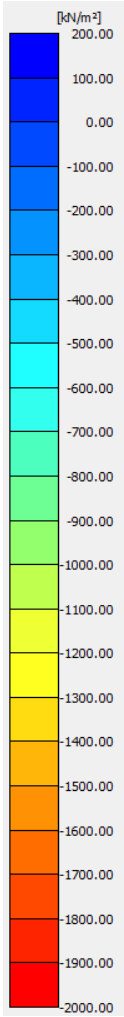
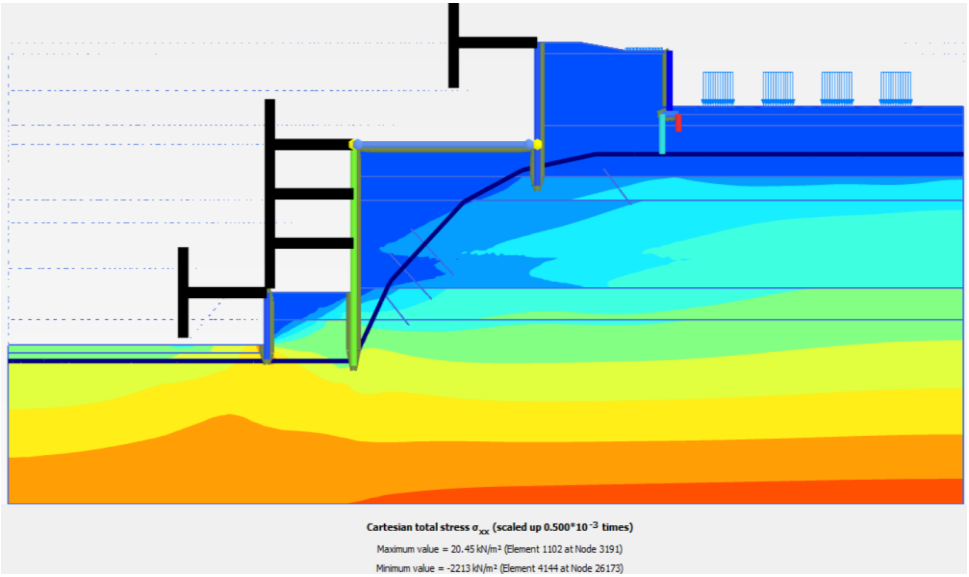
DESIGN SECTION 1





Impact of proposed works (end of excavation)



Impact of proposed works (removal of last level of anchors)

File Name: #

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**PLAXIS 2D - Stress field XX 2/2**

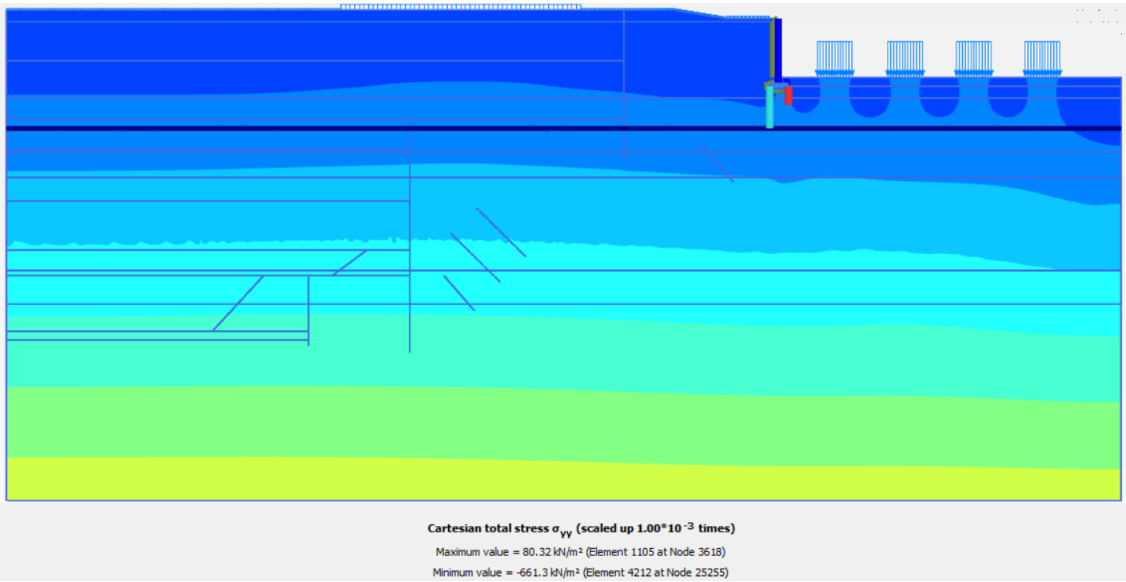
FORTIFY GEOTECH

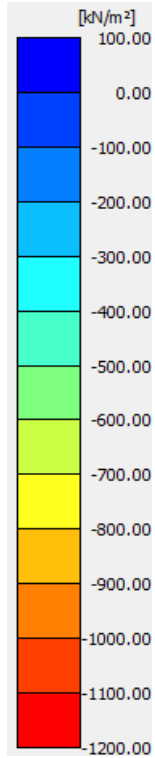
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	S1-13

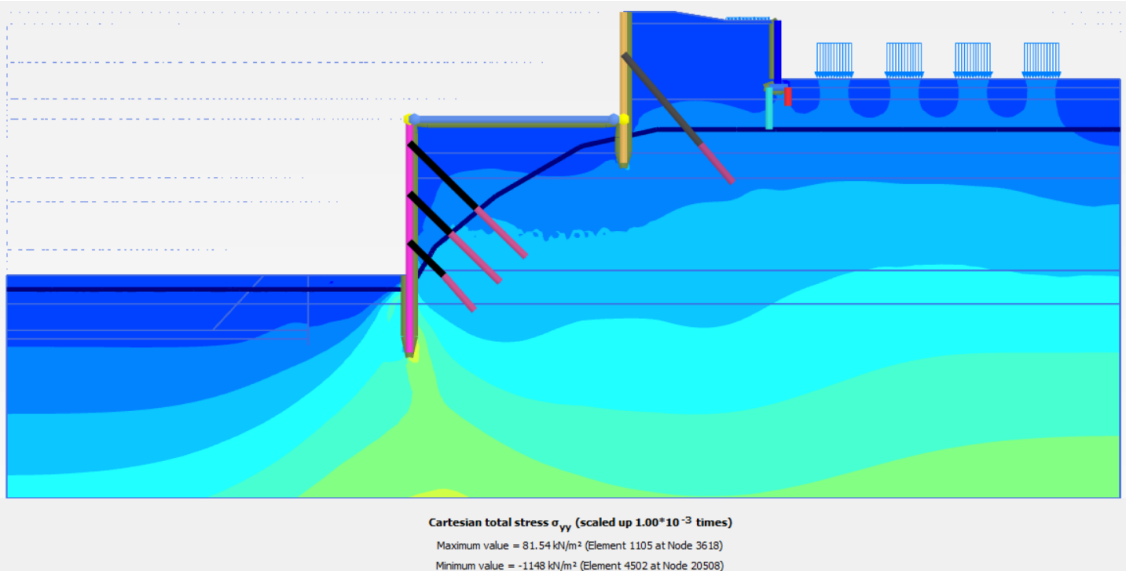
https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 1





Railway operation stage (current)



Impact of proposed works (6th of excavation)

File Name: #

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**PLAXIS 2D - Stress field YY 1/2**

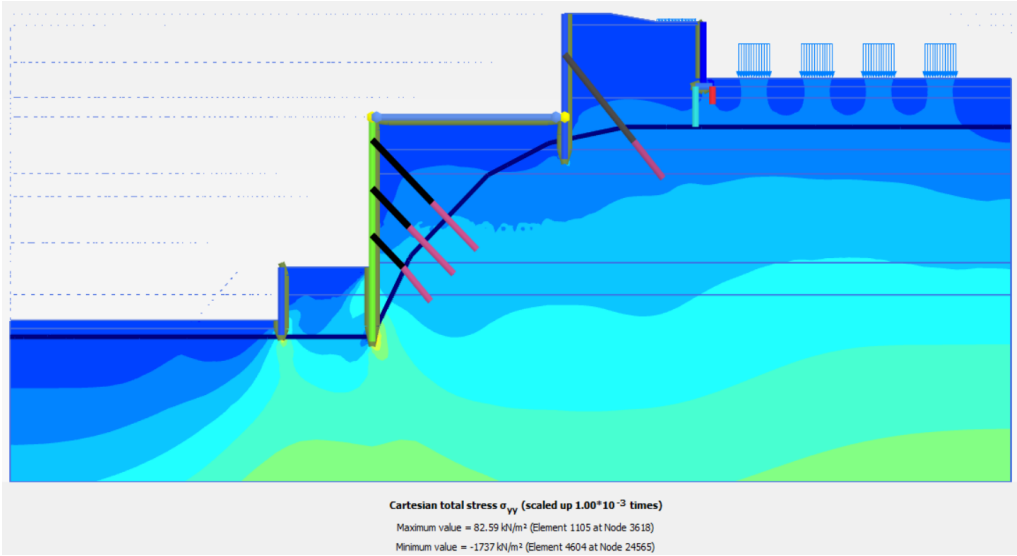
FORTIFY GEOTECH

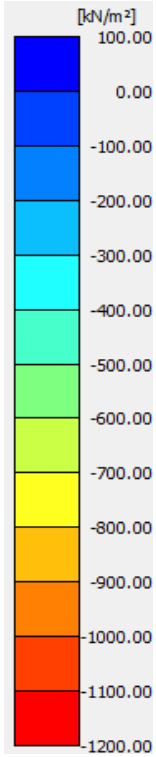
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	S1-14

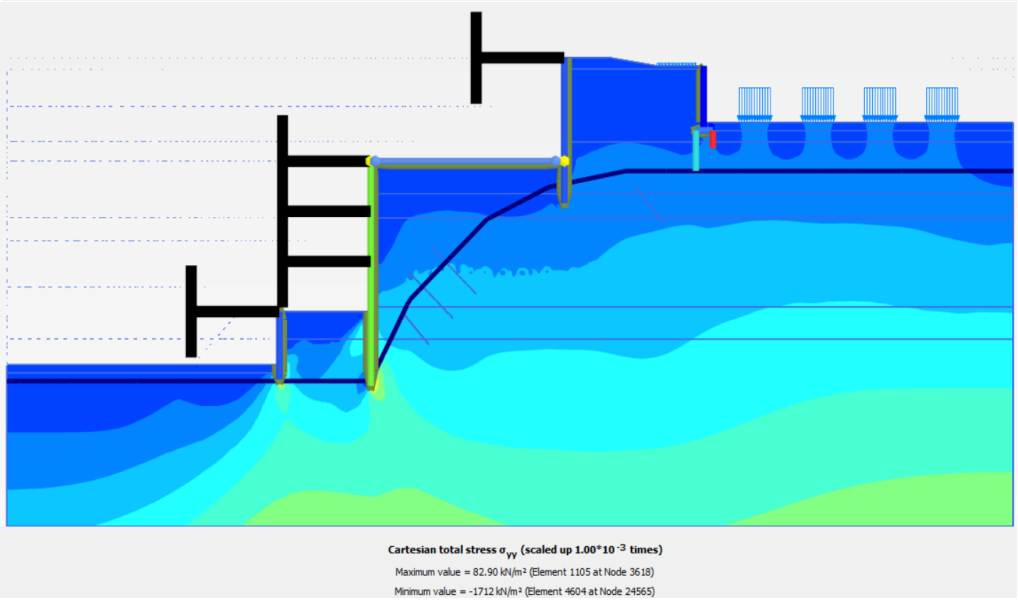
https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 1





Impact of proposed works (end of excavation)



Impact of proposed works (removal of last level of anchors)

File Name: #

CLIENT	PROJECT
BB Wilson	849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

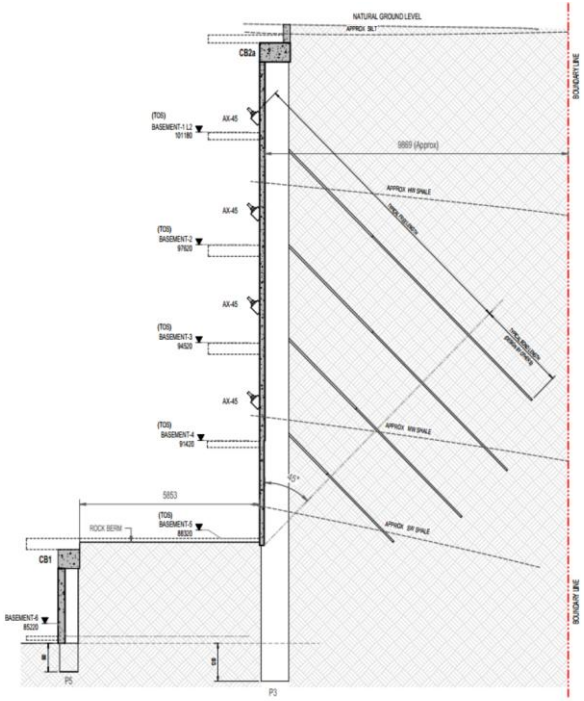
DATE	00/01/1900
PREPARED	0
DESIGN	0
REVIEW	0
APPROVED	00/01/1900

TITLE
PLAXIS 2D - Stress field YY 2/2

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	S1-15

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

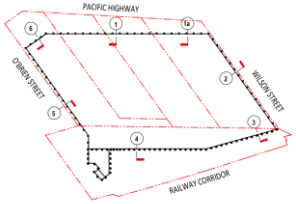
DESIGN SECTION 2



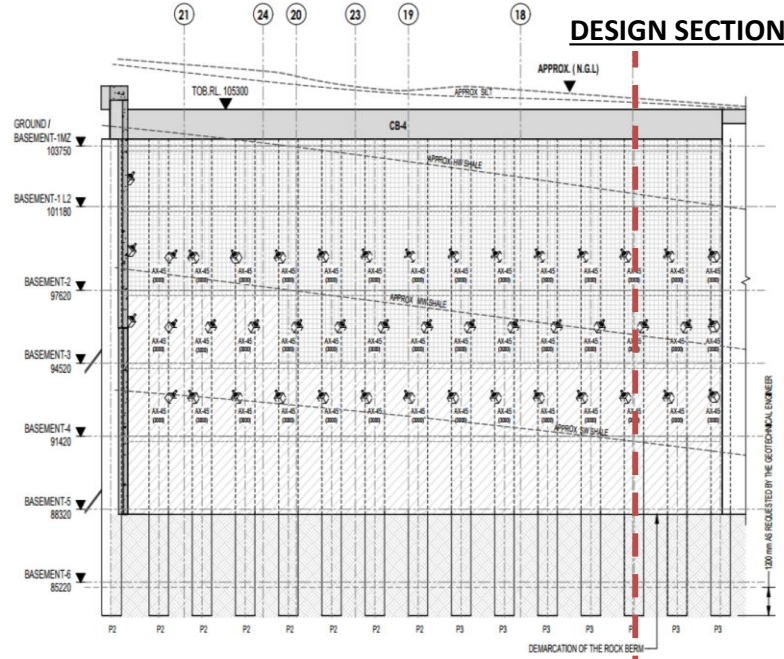
04 SECTION-4
SCALE @ 1:50

Typical cross-section view

(extract of Cardigal Group Drawing S 10017 Rev H, dated 09/05/25, Project Ref. 01-100084)

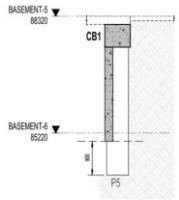


KEY PLAN



03 SHORING WALL ELEVATION -SW3
SCALE @ 1:100

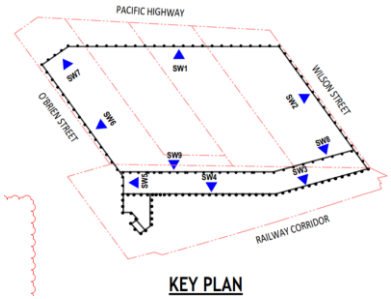
Location of design cross



07 SECTION -7
SCALE @ 1:50

Rock berm cross-section view

(extract of Cardigal Group Drawing S 10020 Rev H, dated 09/05/25, Project Ref. 01-100084)



KEY PLAN

Elevation view showing indicative location of design cross-section

(extract of Cardigal Group Drawing S 10011 Rev H, dated 09/05/25, Project Ref. 01-100084)

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**Proposed shoring system - structural input 1/2**

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS2-1

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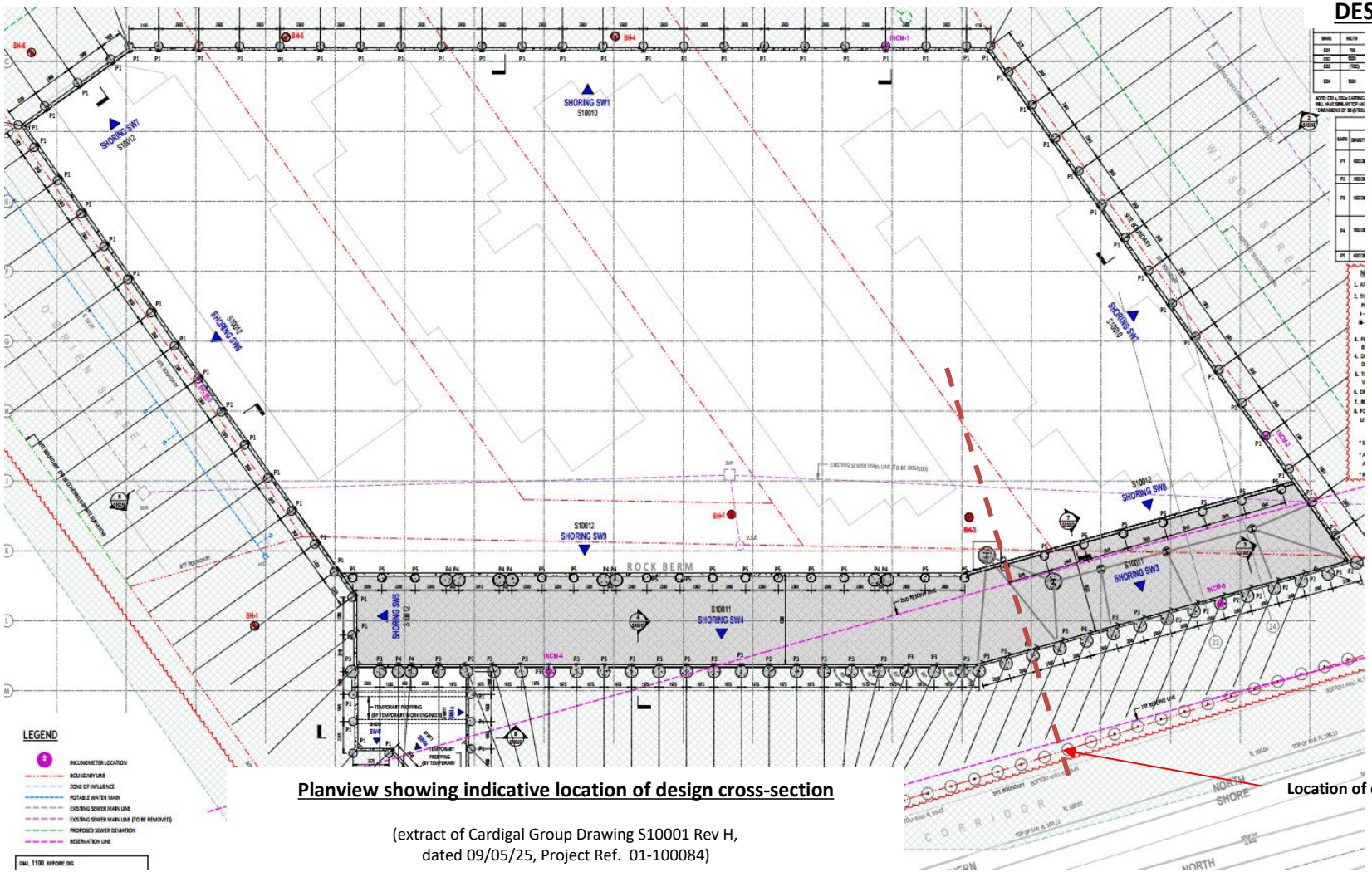
DESIGN SECTION 2



Planview showing indicative location of design cross-section

(extract of Cardigal Group Drawing S10001 Rev H,
dated 09/05/25, Project Ref. 01-100084)

Location of design cross section

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**Proposed shoring system - structural input 2/2**

FORTIFY GEOTECH

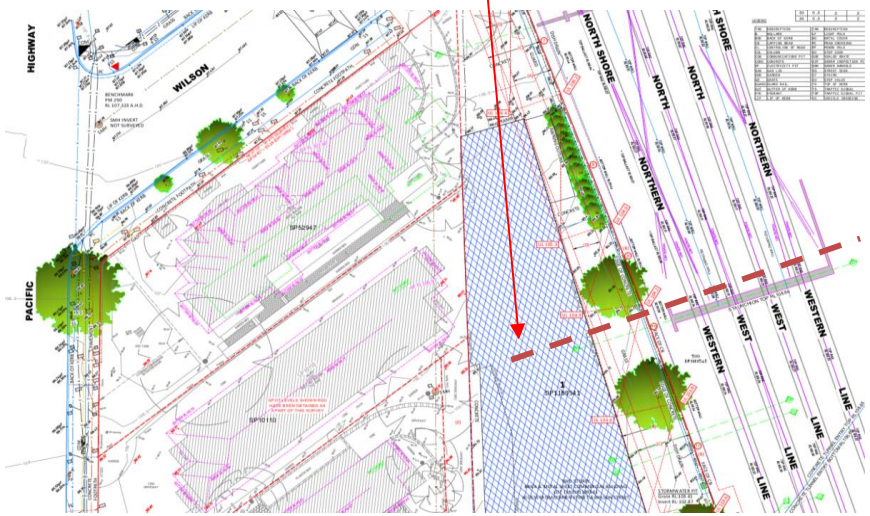
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS2-2

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

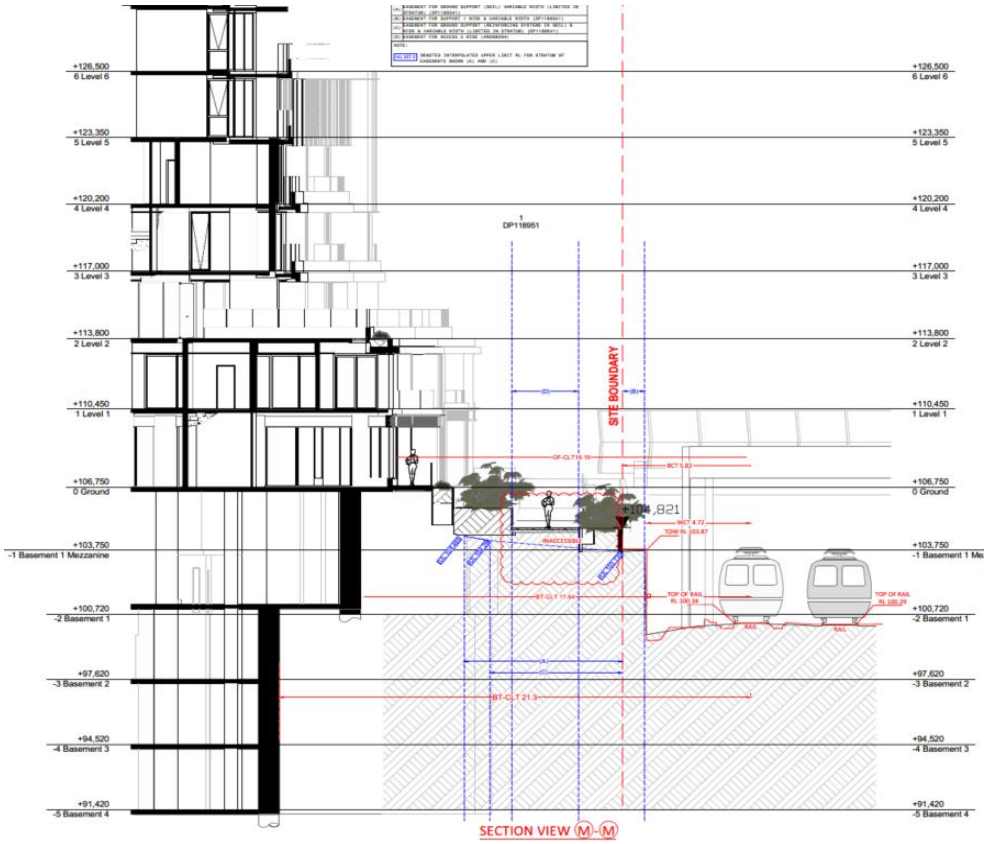
DESIGN SECTION 2

Location of design cross section



Survey plan of the site and surroudings, showing location of design cross-section

(extract of SDS Pty Ltd Drawing 6 of 9, REF: 9062 Rev C, dated 20/03/24)



Cross-section M-M showing proposed development in relation to railway assets

(extract of SDS Pty Ltd Drawing 6 of 9, REF: 9062 Rev C, dated 20/03/24)

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

TITLE
Survey/architectural drawings - geometric input

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS2-3

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DESIGN SECTION 2

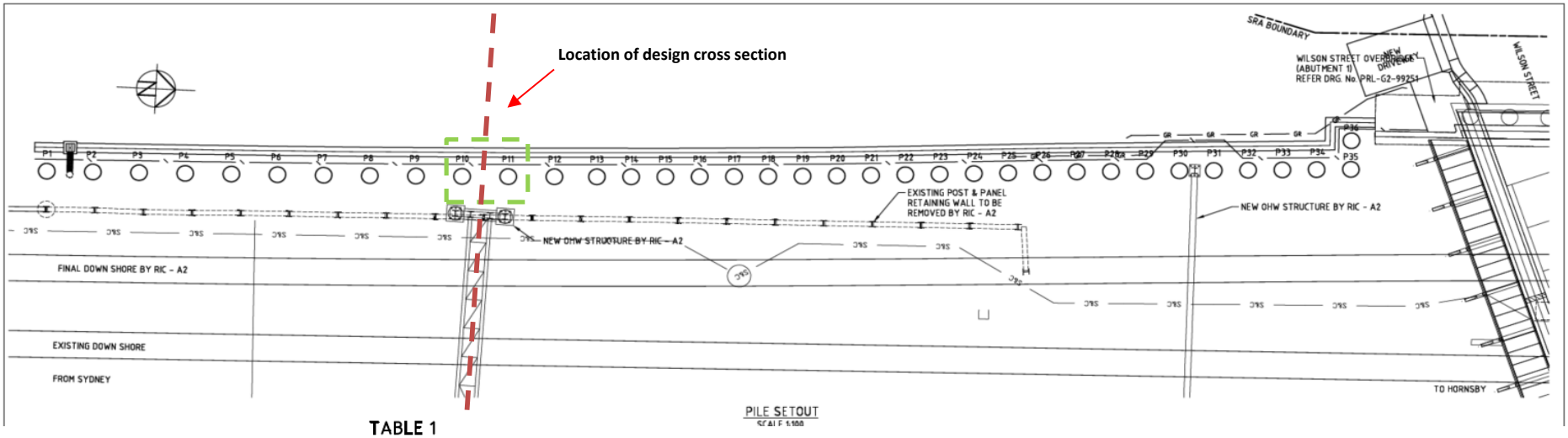

TABLE 1

PILE No	EASTING	NORTHING	DIAMETER	CUT OFF LEVEL	CONTRACT LEVEL	× ACTUAL FOUNDING LEVEL
P1	331 577.167	6 259 284.036	850	102.920	94.50	94.50
P2	331 577.085	6 259 286.405	850	102.995	94.50	94.50
P3	331 577.002	6 259 288.773	850	103.070	94.50	94.50
P4	331 576.917	6 259 291.142	850	103.145	94.50	94.50
P5	331 576.830	6 259 293.510	850	103.225	94.50	94.50
P6	331 576.739	6 259 295.879	850	103.300	94.50	94.50
P7	331 576.645	6 259 298.247	850	103.375	94.50	94.50
P8	331 576.548	6 259 300.615	850	103.450	94.50	94.50
P9	331 576.446	6 259 302.982	850	103.525	94.50	94.50
P10	331 576.339	6 259 305.350	850	103.600	94.50	94.50
P11	331 576.228	6 259 307.717	850	103.675	94.50	94.50
P12	331 576.112	6 259 310.085	850	103.750	94.50	94.50
P13	331 576.002	6 259 312.262	850	103.820	93.50	93.50
P14	331 575.910	6 259 314.020	850	103.875	93.50	93.50
P15	331 575.816	6 259 315.777	850	103.930	93.50	93.50
P16	331 575.719	6 259 317.535	850	103.990	93.50	93.50
P17	331 575.620	6 259 319.292	850	104.060	93.50	93.50
P18	331 575.519	6 259 321.049	850	104.185	93.50	93.50
P19	331 575.416	6 259 322.806	850	104.310	93.50	93.50

As-built pile setout plan & Pile shedule

(extracts of Down Side Outer Pile Retaining Wall GC-3 Works Drawing set, Contract SDS Pty Ltd Drawing 6 of 9, REF: 9062 Rev C, dated 20/03/24)

CLIENT
BB Wilson

PROJECT
849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

TITLE
Existing railway assets as-builts

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS2-4

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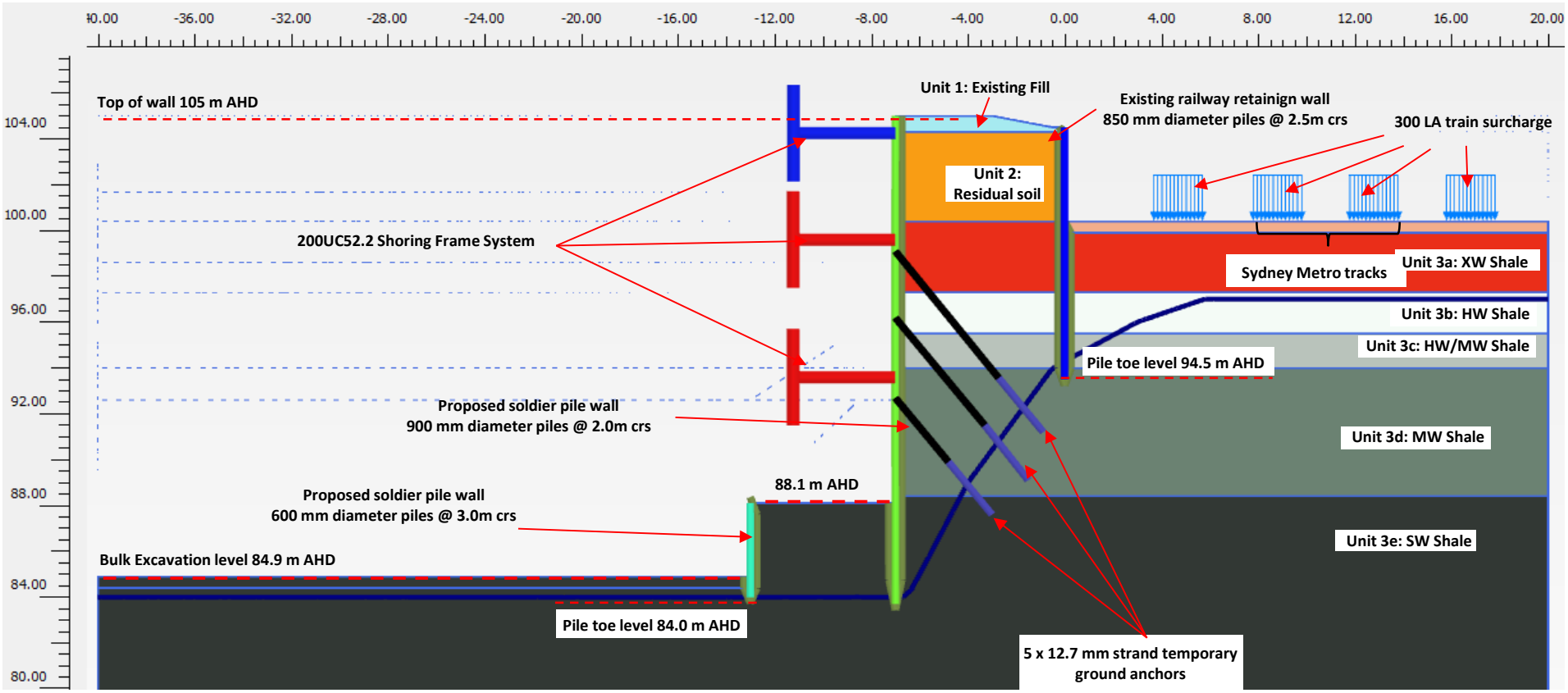
DESIGN SECTION 2



CLIENT	PROJECT
BB Wilson	849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

TITLE
PLAXIS 2D - Model overview

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS2-5

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 2

Stage no:		Construction stage	Surcharge/Loading	Structural EI stiffness of new piled wall
1		Establish initial conditions	/	N/A
2		Current housing development	Dwelling (20 kPa) & pedestrian (5 kPa) surcharge	
3		Railway trench excavation	As above	
4		Railway operation	Dwelling (20 kPa), pedestrian (5 kPa) surcharges & LA300 train surcharge	
5		Demolition of current housing development	LA300 train surcharge	
6		Install soldier pile wall	As above	0.9 EI
7		1st level of excavation	As above	
8		Installation of 1st level of shoring frame	As above	
9		2nd level of excavation	As above	
10		3rd level of excavation	As above	
11		Installation of 1st level of ground anchors and 2nd level of shoring frame	As above	
12		4th level of excavation	As above	
13		Installation of 2nd level of ground anchors and 3rd level of shoring frame	As above	
14		5th level of excavation	As above	
15		Installation of 3rd level of ground anchors	As above	
16		6th level of excavation	As above	
17		Install rock berm shoring wall		
18		Excavation to bulk excavation level	As above	
	18.1	Over-excavation scenario	As above	
19		Change to long-term structural properties	As above	0.6 EI
20		Install Basement -4 slab	As above	
21		Install Basement -3 slab	As above	
22		Deactivate 4th level of ground anchors and 3rd level of shoring frame	As above	
23		Install Basement -2 slab	As above	
24		Deactivate 3rd level of ground anchors	As above	
25		Install Basemend -1 L2	As above	
26		Deactivate 2nd level of ground anchors and 2nd level of shoring frame	As above	
27		Install Basement -1MZ slab	As above	
28		Deactivate 1st level of ground anchors and 1st level of shoring frame	As above	
29		Application of 20kPa surcharge for future railway operations	Railway (20 kPa) surcharge & LA300 train surcharge	

CLIENT
BB Wilson

PROJECT
849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

TITLE
PLAXIS 2D - Construction staging

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS2-6

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 2

Existing railway asset

Plate - Rail retaining wall

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	7.445E6
EA_2	kN/m	7.445E6
E_1	kN/m²	13.05E6
E_2	kN/m²	13.05E6
EI	kN m²/m	202.0E3
ν (nu)		0.2000
d	m	0.5706

Proposed shoring frame

Anchor - Mid / Bottom

General | Mechanical | Thermal

Property	Unit	Value
Properties		
$L_{spacing}$	m	4.800
Stiffness		
EA	kN	120.0E3

Anchor - Top

General | Mechanical | Thermal

Property	Unit	Value
Properties		
$L_{spacing}$	m	4.800
Stiffness		
EA	kN	30.00E3

Proposed shoring wall

Plate - 900mm @ 2.0m ST

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	10.43E6
EA_2	kN/m	10.43E6
E_1	kN/m²	14.12E6
E_2	kN/m²	14.12E6
EI	kN m²/m	475.0E3
ν (nu)		0.2000
d	m	0.7391

Plate - 900mm @ 2.0m LT

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	10.43E6
EA_2	kN/m	10.43E6
E_1	kN/m²	17.28E6
E_2	kN/m²	17.28E6
EI	kN m²/m	317.0E3
ν (nu)		0.2000
d	m	0.6038

Proposed rock berm shoring wall

Plate - 600mm @3m ST

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	3.091E6
EA_2	kN/m	3.091E6
E_1	kN/m²	6.271E6
E_2	kN/m²	6.271E6
EI	kN m²/m	62.60E3
ν (nu)		0.2000
d	m	0.4930

Plate - 600mm @3m LT

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	3.091E6
EA_2	kN/m	3.091E6
E_1	kN/m²	7.683E6
E_2	kN/m²	7.683E6
EI	kN m²/m	41.70E3
ν (nu)		0.2000
d	m	0.4023

CLIENT
BB Wilson

PROJECT
849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

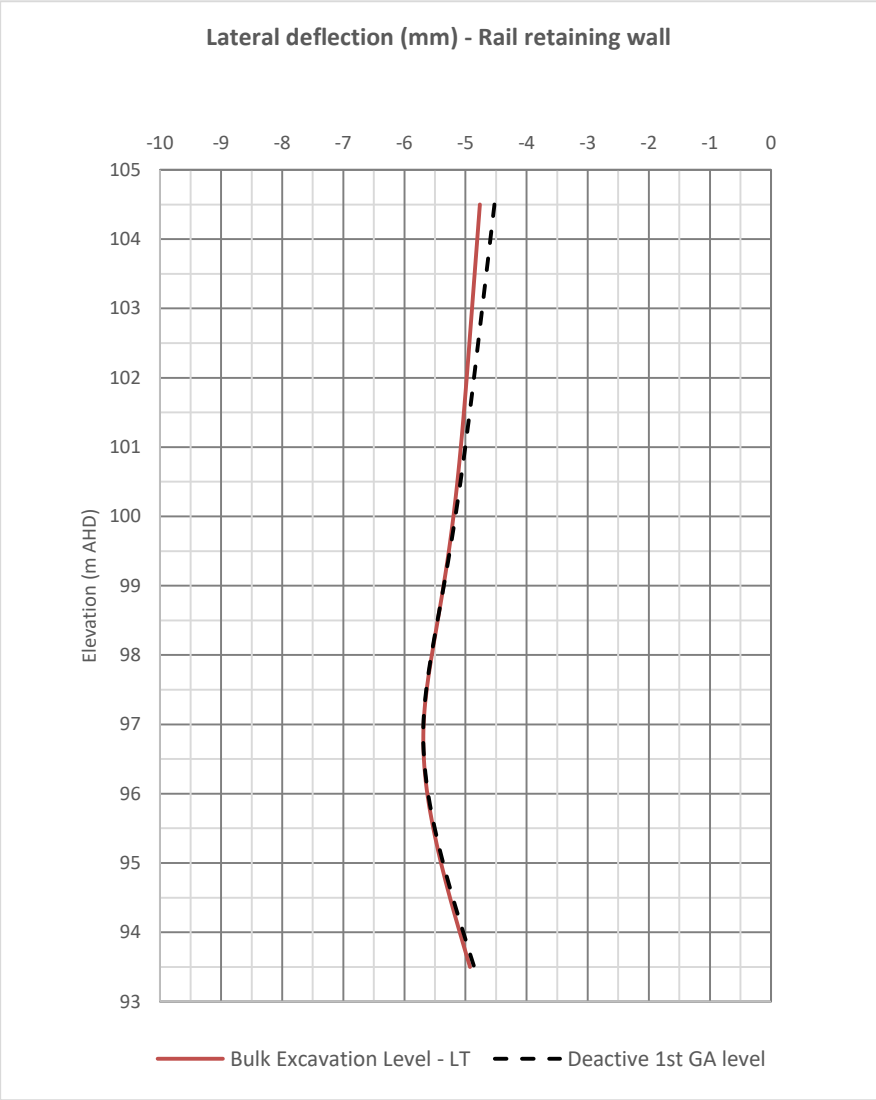
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

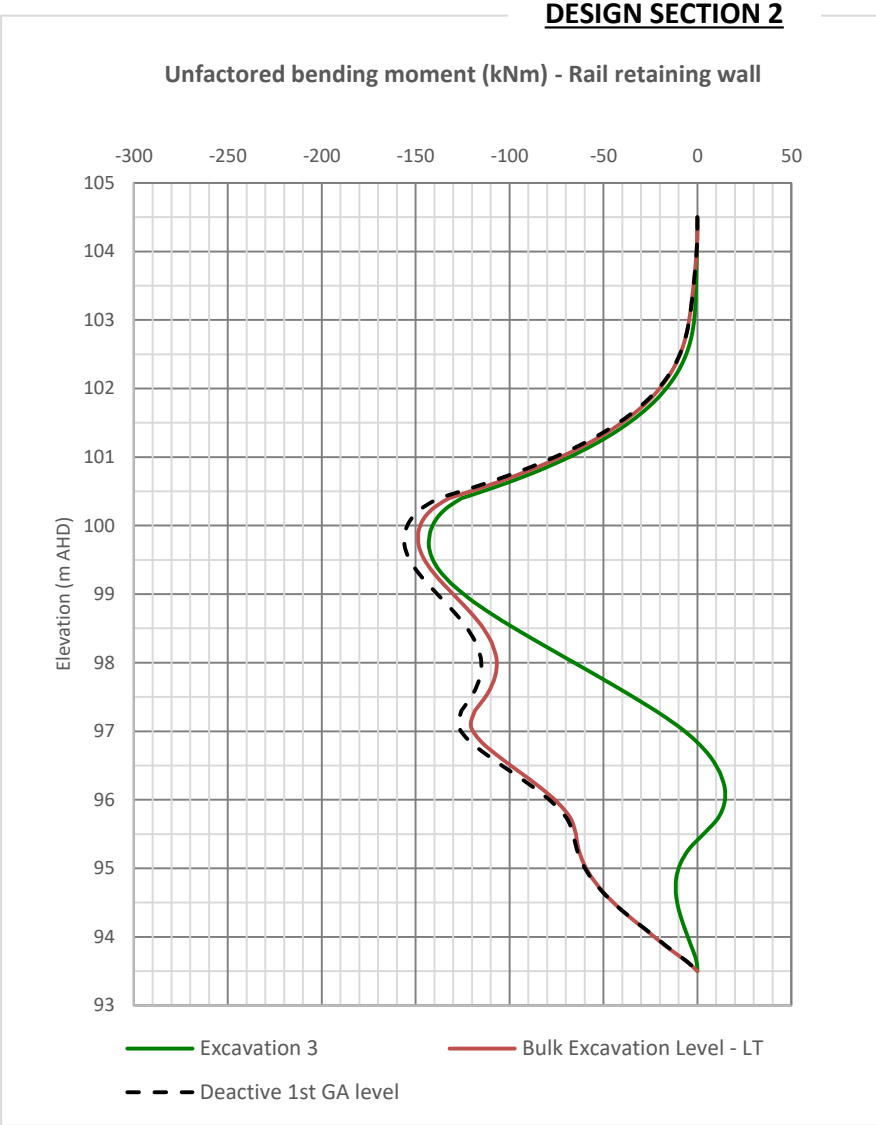
TITLE
PLAXIS 2D - Structural elements properties

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS2-7

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 2





Notes:
1. Structural actions are per pile and unfactored

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**PLAXIS 2D - Existing railway wall outputs**

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS2-8

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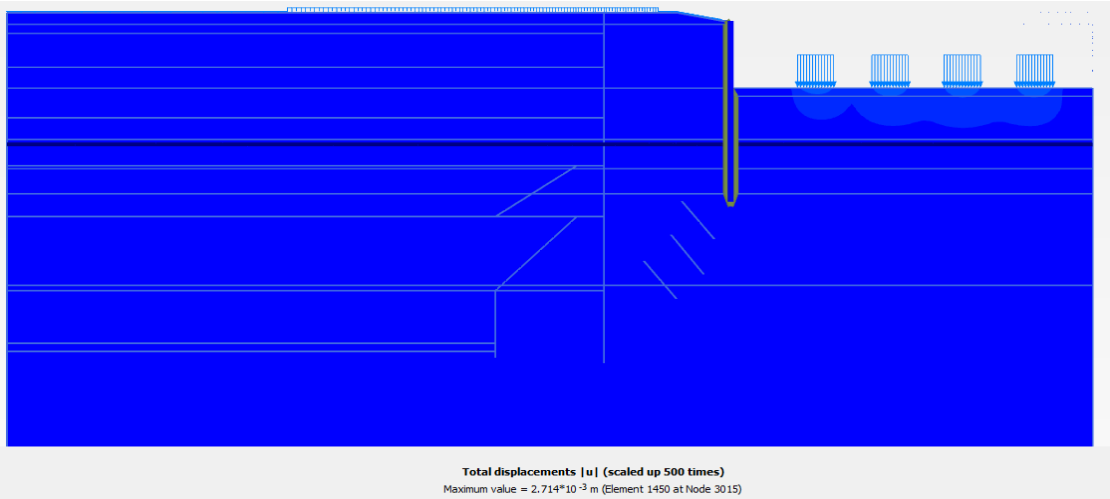
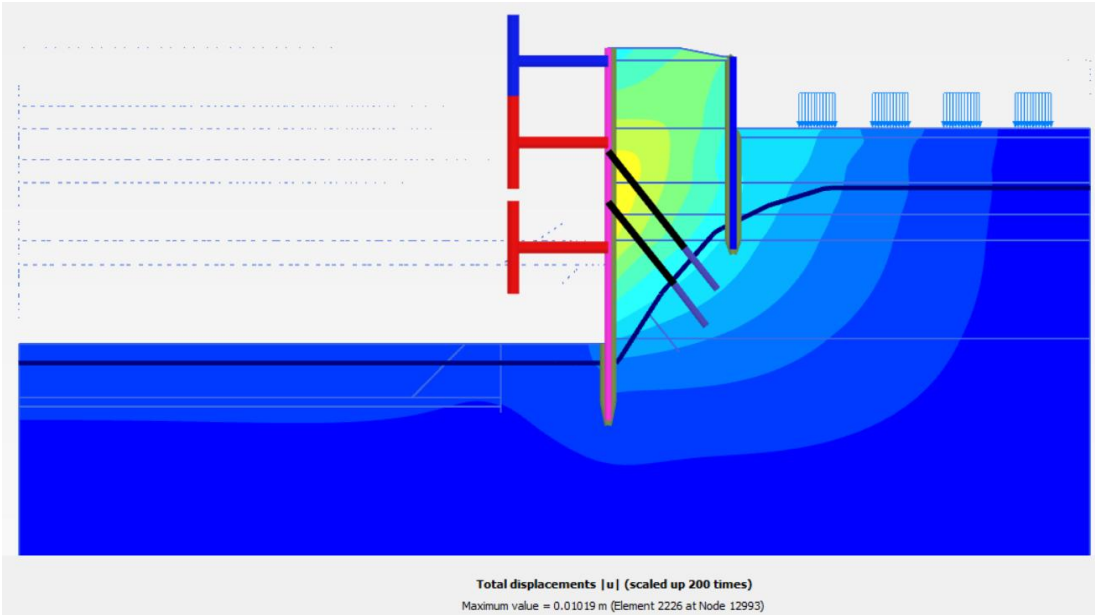
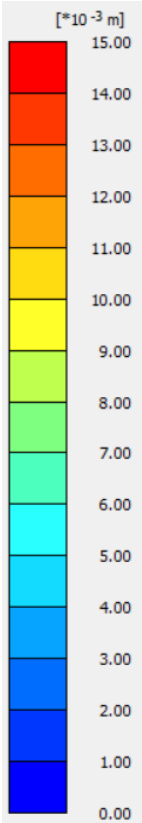
DESIGN SECTION 2







Railway operation stage (current)

Impact of proposed works (6th level of excavation)

File Name: #

CLIENT	PROJECT
BB Wilson	849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

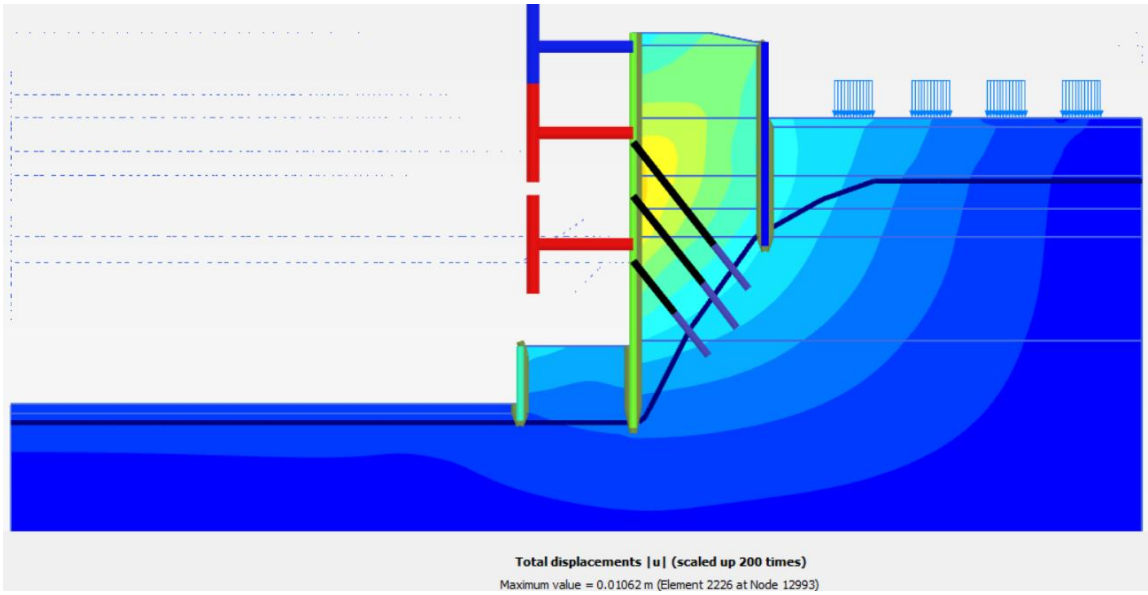
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

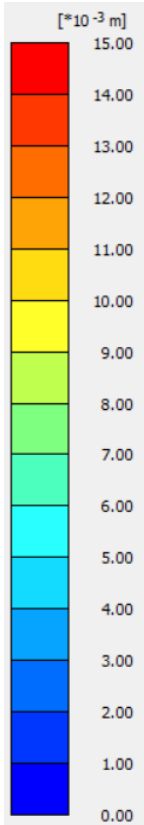
TITLE
PLAXIS 2D - Displacement field XY 1/2

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS2-9

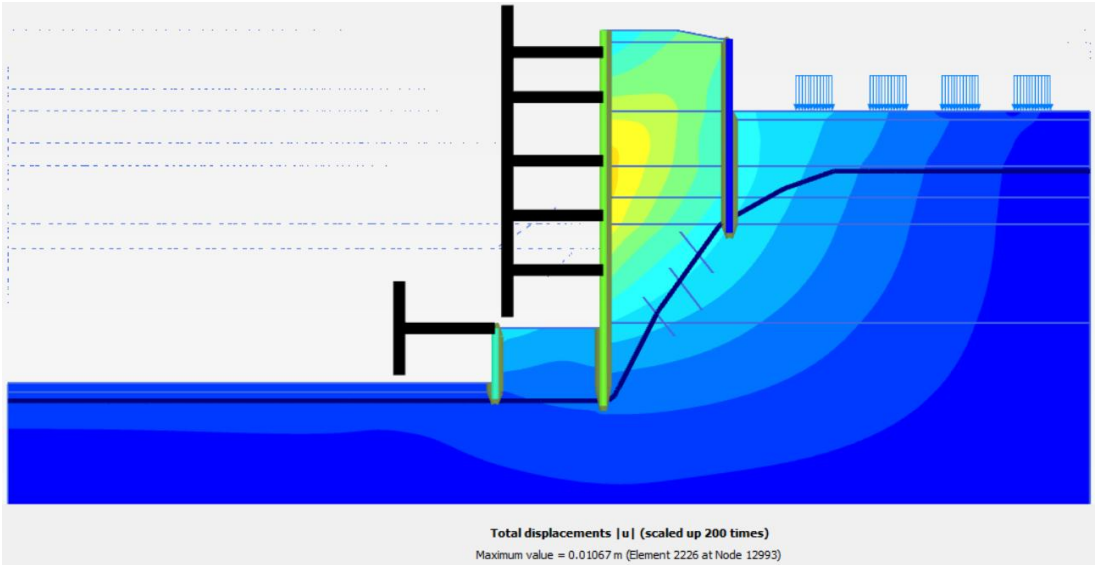
https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 2





Impact of proposed works (end of excavation)



Impact of proposed works (removal of last ground anchor level)

File Name: #

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	PLAXIS 2D - Displacement field XY 2/2

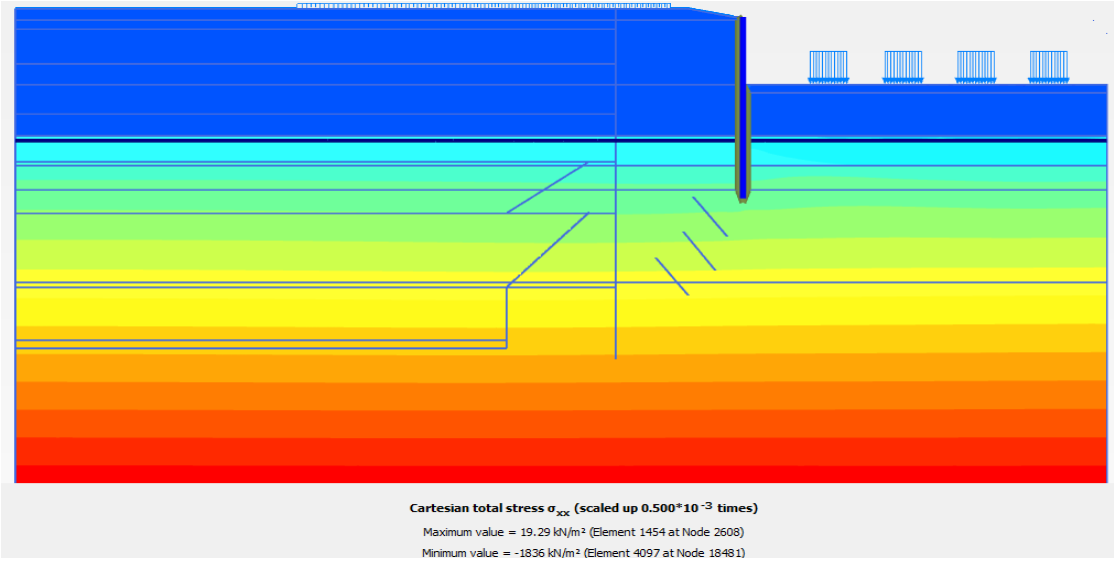
FORTIFY GEOTECH

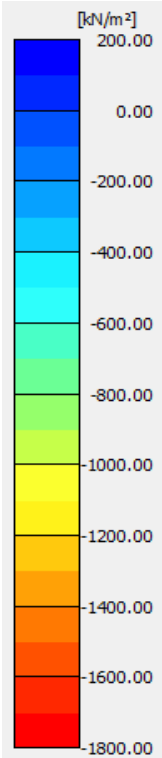
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	S2-10

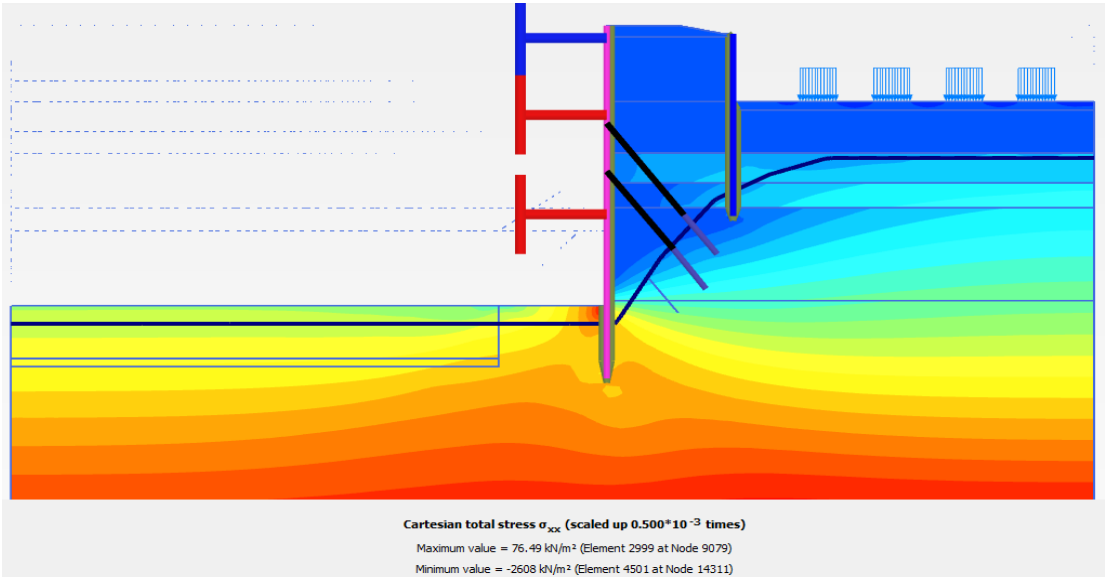
https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 2





Railway operation stage (current)



Impact of proposed works (6th of excavation)

File Name: #

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	PLAXIS 2D - Stress field XX 1/2

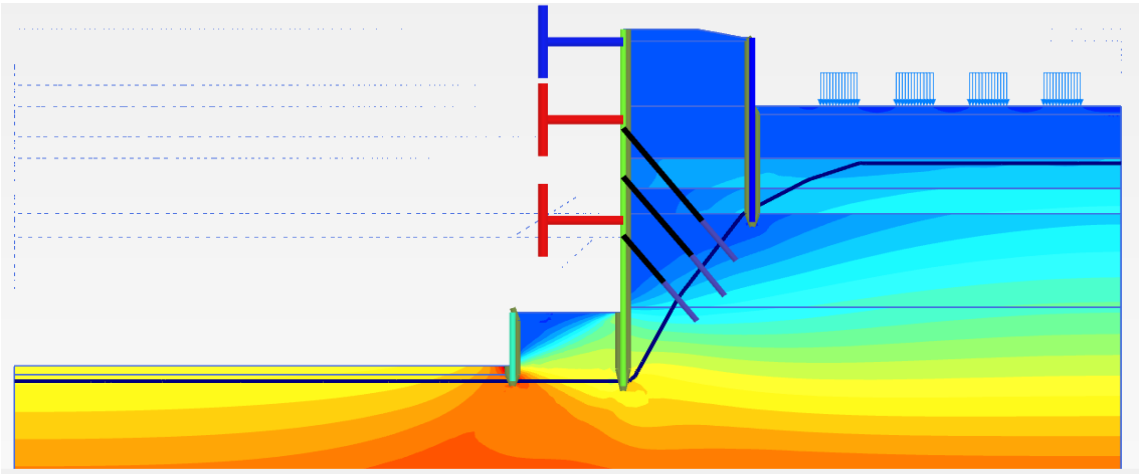
FORTIFY GEOTECH

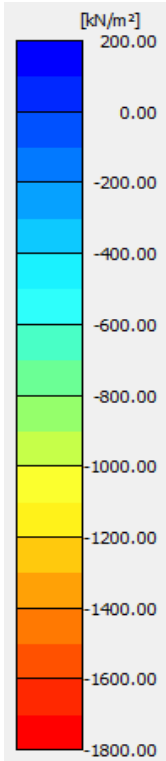
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	S2-11

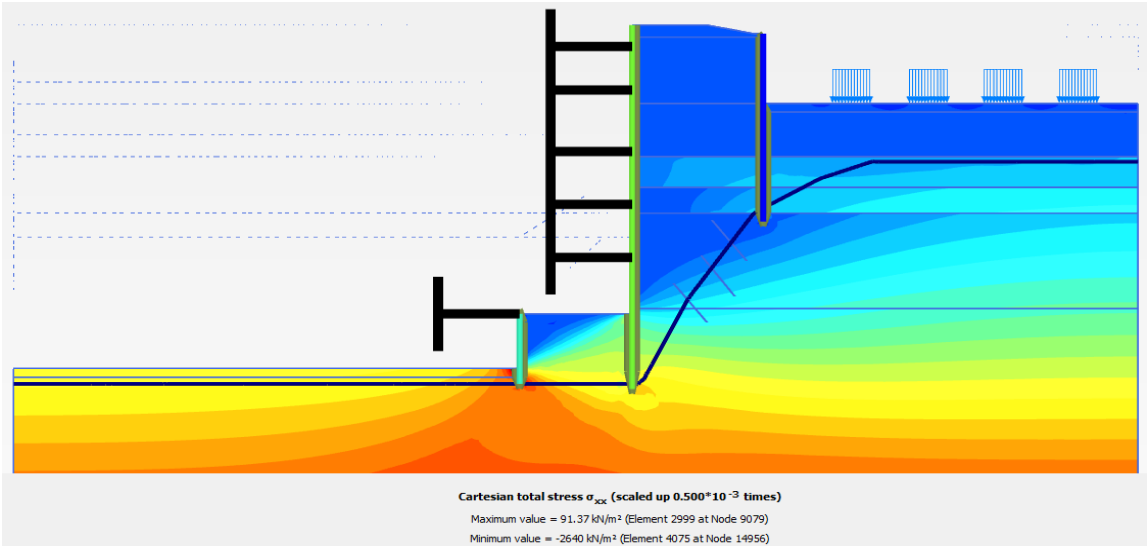
https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 2





Impact of proposed works (end of excavation)



Impact of proposed works (removal of last level of anchors)

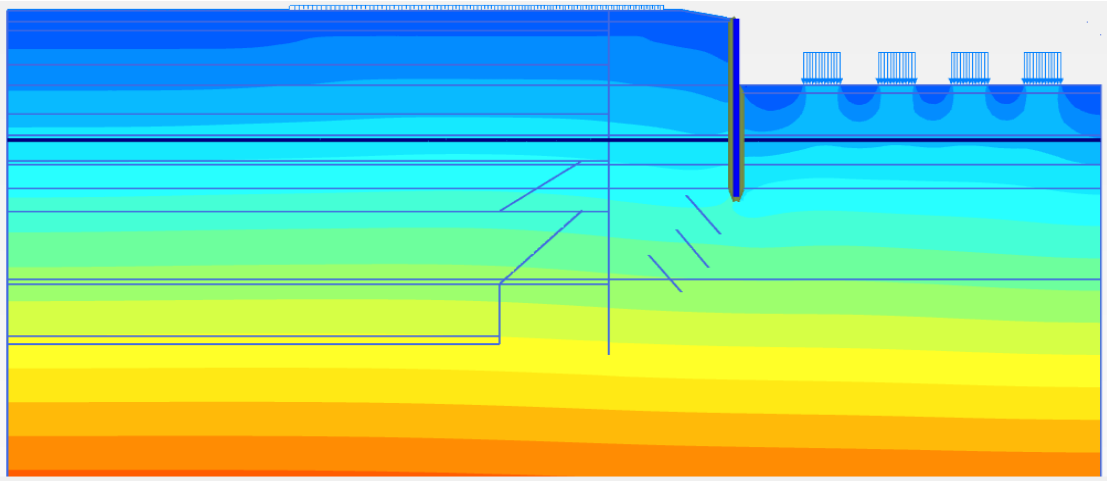
File Name: #

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	PLAXIS 2D - Stress field XX 2/2
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

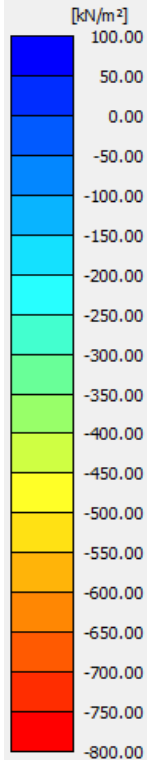
PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	S2-12

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

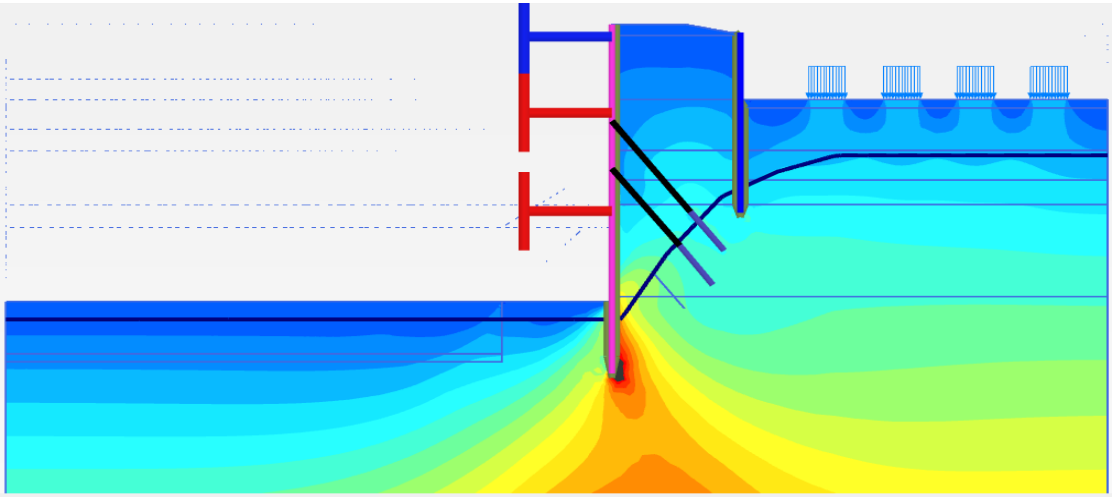
DESIGN SECTION 2



Cartesian total stress σ_{YY} (scaled up $2.00*10^{-3}$ times)
Maximum value = 30.90 kN/m² (Element 1458 at Node 6466)
Minimum value = -688.8 kN/m² (Element 4096 at Node 17635)



Railway operation stage (current)



Cartesian total stress σ_{YY} (scaled up $2.00*10^{-3}$ times)
Maximum value = 35.16 kN/m² (Element 4501 at Node 14306)
Minimum value = -1443 kN/m² (Element 4347 at Node 11092)

Impact of proposed works (6th of excavation)

File Name: #

CLIENT	PROJECT
BB Wilson	849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

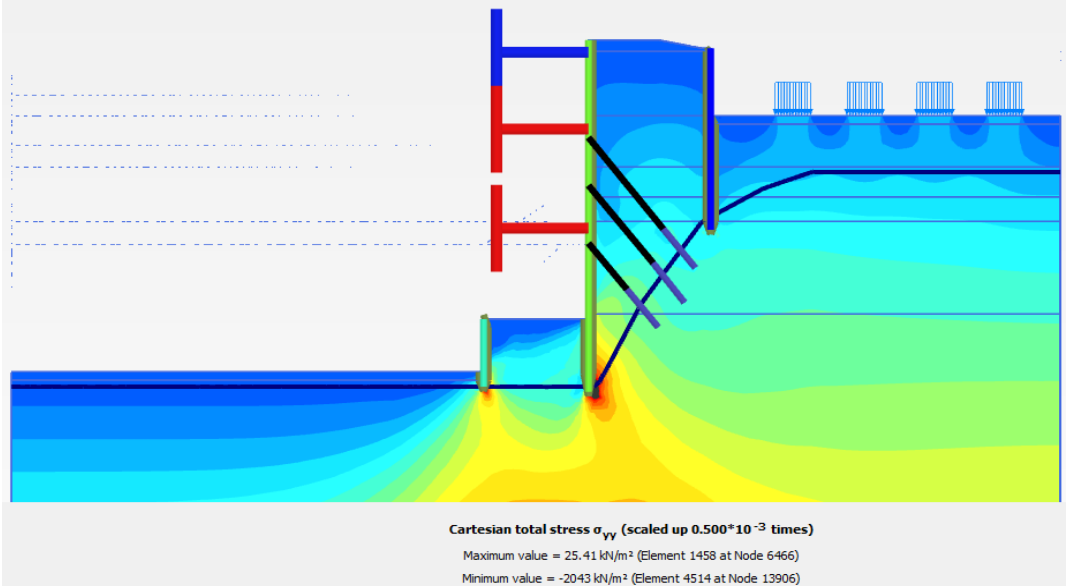
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

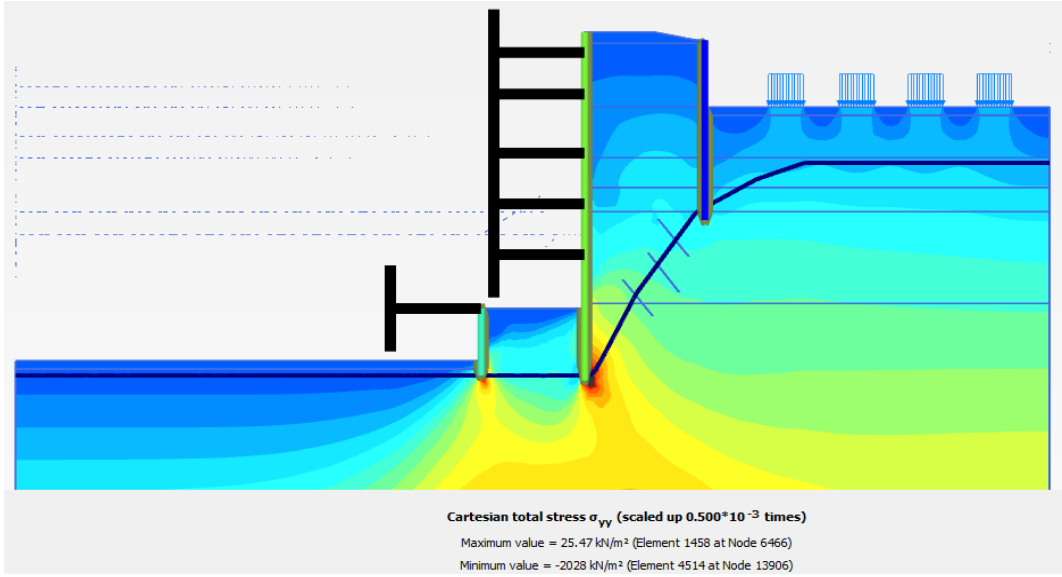
TITLE
PLAXIS 2D - Stress field YY 1/2

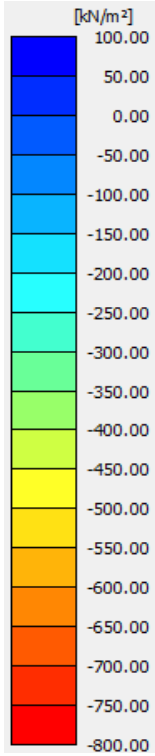
PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	S2-13

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 2







Impact of proposed works (end of excavation)

Impact of proposed works (removal of last level of anchors)

File Name: #

CLIENT	PROJECT
BB Wilson	849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

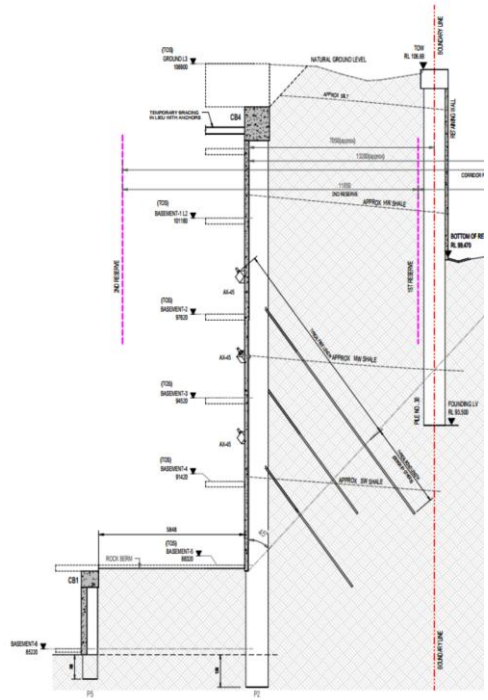
DATE	30/05/2025
PREPARED	MN
DESIGN	MN
REVIEW	JM
APPROVED	JM

TITLE
PLAXIS 2D - Stress field YY 2/2

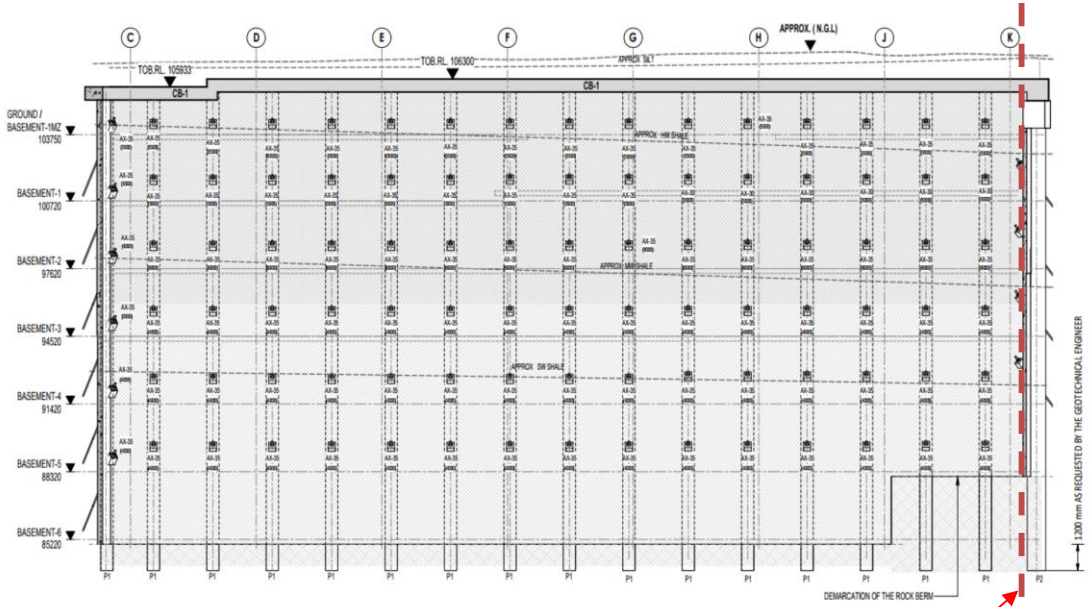
PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	(S2-14

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 3

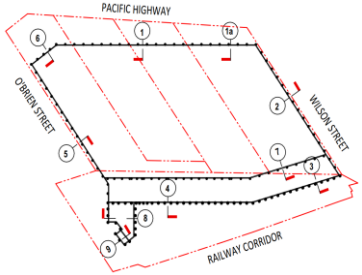


03 SECTION -3
SCALE @ 1:50



02 SHORING WALL ELEVATION -SW2
SCALE @ 1:100

Location of design cross section

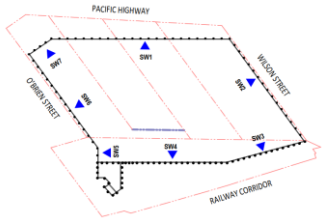


Typical cross-section view

(extract of Cardigal Group Drawing S 10020 Rev H, dated 09/05/25, Project Ref. 01-100084)

Elevation view showing indicative location of design cross-section

(extract of Cardigal Group Drawing S 10010 Rev H, dated 09/05/25, Project Ref. 01-100084)



KEY PLAN

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**Proposed shoring system - structural input 1/2**

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	JOE
DESIGN	JOE
REVIEW	MN
APPROVED	MN

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS3-1

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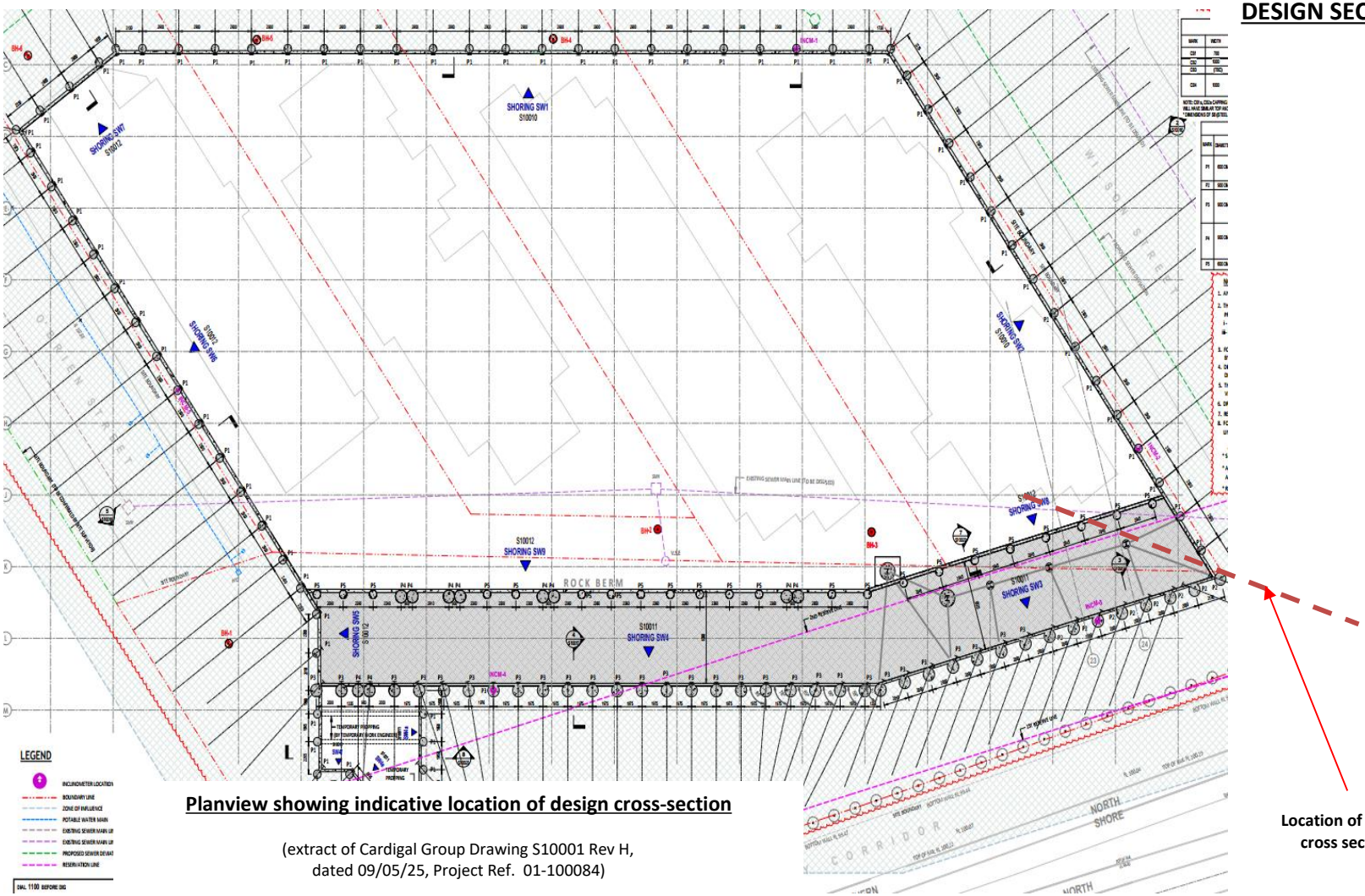
DESIGN SECTION 3



Planview showing indicative location of design cross-section

(extract of Cardigal Group Drawing S10001 Rev H, dated 09/05/25, Project Ref. 01-100084)

Location of design cross section

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**Proposed shoring system - structural input 2/2**

FORTIFY GEOTECH

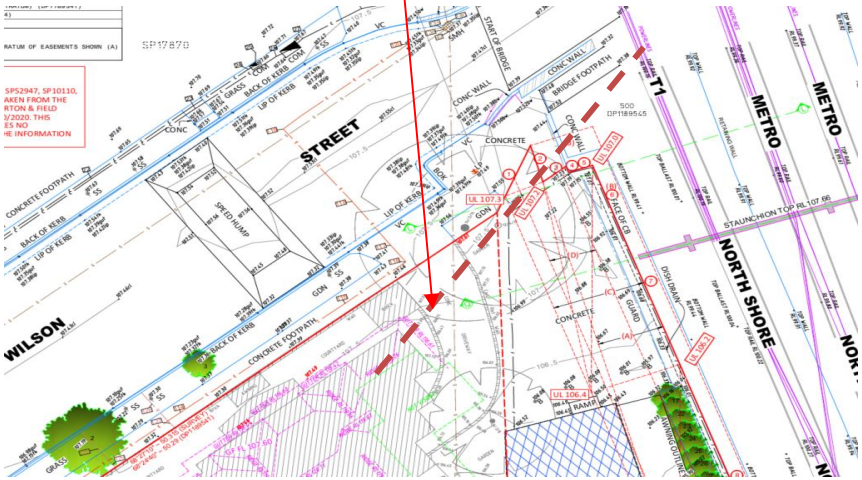
DATE	30/05/2025
PREPARED	JOE
DESIGN	JOE
REVIEW	MN
APPROVED	MN

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS3-2

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

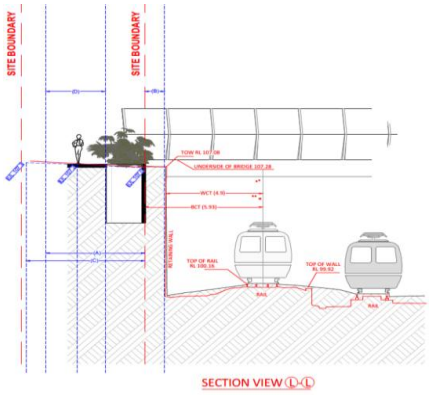
DESIGN SECTION 3

Location of design cross section



Survey plan of the site and surroudings, showing location of design cross-section

(extract of SDS Pty Ltd Drawing 6 of 9, REF: 9062 Rev C, dated 20/03/24)



Cross-section L-L showing proposed development in relation to railway assets

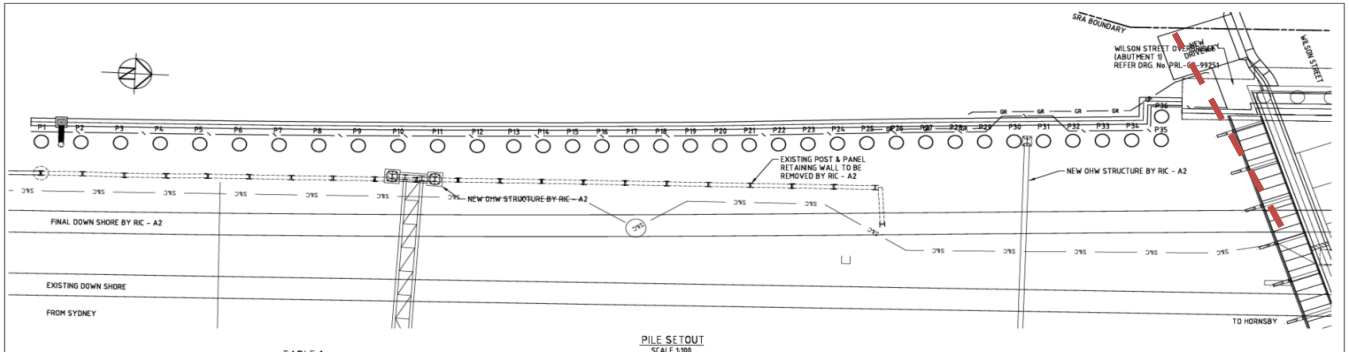
(extract of SDS Pty Ltd Drawing 5 of 9, REF: 9062 Rev C, dated 20/03/24)

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
DATE	30/05/2025
PREPARED	JOE
DESIGN	JOE
REVIEW	MN
APPROVED	MN
TITLE	**Survey/architectural drawings - geometric input**

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS3-3

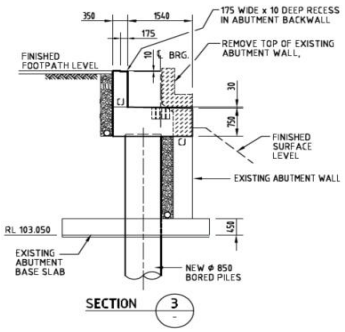
https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

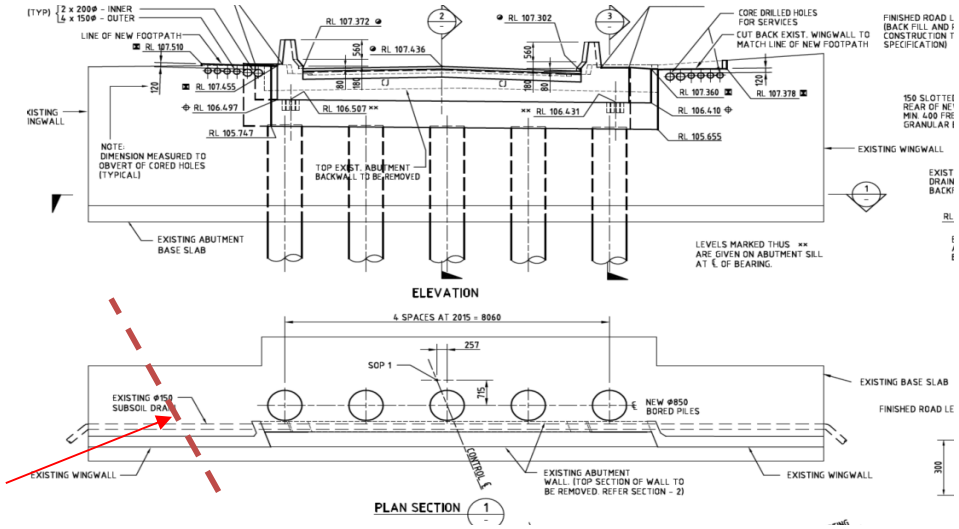
DESIGN SECTION 3



As-built pile setout plan & Pile shedule

(extract of Down Side Outer Pile Retaining Wall GC-3 Works Drawing set, Contract SDS Pty Ltd Drawing 6 of 9, REF: 9062 Rev C, dated 20/03/24)





Location of design cross section

As-built pile setout plan & Pile shedule

(extract of Will Street Overbirgde GC-3 Works Contract Drawing set, unknown date)

CLIENT	PROJECT
BB Wilson	849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

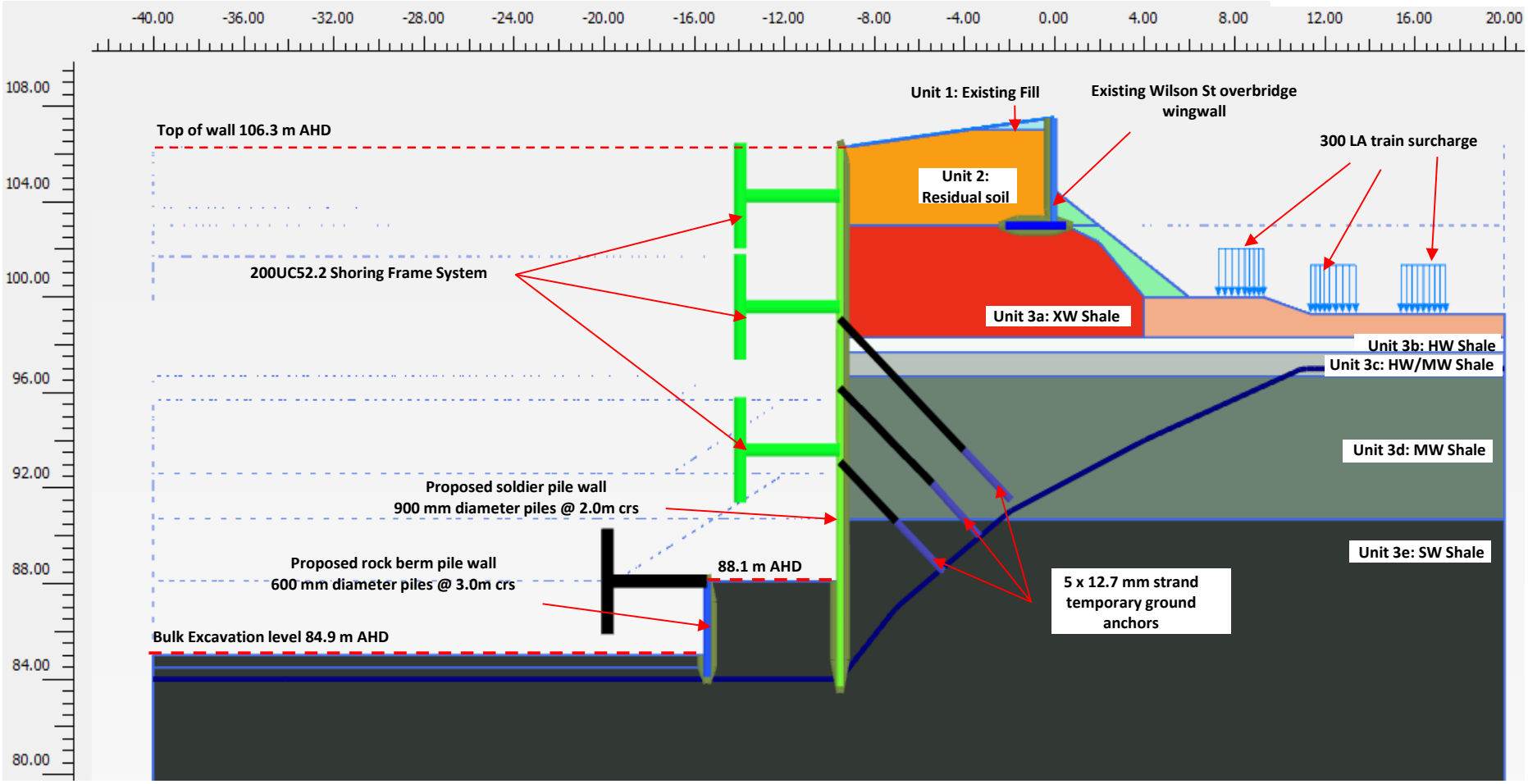
DATE	30/05/2025
PREPARED	JOE
DESIGN	JOE
REVIEW	MN
APPROVED	MN

TITLE
Existing railway assets as-builts

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS3-4

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 3



CLIENT	PROJECT
BB Wilson	849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	JOE
DESIGN	JOE
REVIEW	MN
APPROVED	MN

TITLE
PLAXIS 2D - Model overview

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS3-5

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 3

Stage no:		Construction stage	Surcharge/Loading	Structural EI stiffness of new piled wall
1		Establish initial conditions	/	N/A
2		Current housing development	Dwelling (20 kPa) & pedestrian (5 kPa) surcharge	
3		Railway trench excavation	As above	
4		Railway operation	Dwelling (20 kPa), pedestrian (5 kPa) surcharges & LA300 train surcharge	
5		Demolition of current housing development	LA300 train surcharge	
6		Install soldier pile wall	As above	0.9 EI
7		1st level of excavation	As above	
8		Installation of 1st level of shoring frame	As above	
9		2nd level of excavation	As above	
10		3rd level of excavation	As above	
11		Installation of 1st level of ground anchors and 2nd level of shoring frame	As above	
12		4th level of excavation	As above	
13		Installation of 2nd level of ground anchors and 3rd level of shoring frame	As above	
14		5th level of excavation	As above	
15		Installation of 3rd level of ground anchors	As above	
16		6th level of excavation	As above	
17		Installation of rock berm retaining wall	As above	
18		Excavation to bulk excavation level	As above	
	18.1	Over-excavation scenario	As above	
19		Change to long-term structural properties	As above	0.6 EI
20		Install Basement -5 slab		
21		Install Basement -4 slab	As above	
22		Install Basement -3 slab	As above	
23		Deactivate 4th level of ground anchors and 3rd level of shoring frame	As above	
24		Install Basement -2 slab	As above	
25		Deactivate 3rd level of ground anchors	As above	
26		Install Basemend -1 L2	As above	
27		Deactivate 2nd level of ground anchors and 2nd level of shoring frame	As above	
28		Install Basement -1MZ slab	As above	
29		Deactivate 1st level of ground anchors and 1st level of shoring frame	As above	
30		Application of 20kPa surcharge for future railway operations	Railway (20 kPa) surcharge & LA300 train surcharge	

CLIENT
BB Wilson

PROJECT
849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	JOE
DESIGN	JOE
REVIEW	MN
APPROVED	MN

TITLE
PLAXIS 2D - Construction staging

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS3-6

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 3

Existing railway asset

Plate - Stem (300 mm)

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	9.000E6
EA_2	kN/m	9.000E6
E_1	kN/m²	38.73E6
E_2	kN/m²	38.73E6
EI	kN m²/m	40.50E3
ν (nu)		0.2000
d	m	0.2324

Plate - Base (450 mm)

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	13.50E6
EA_2	kN/m	13.50E6
E_1	kN/m²	38.73E6
E_2	kN/m²	38.73E6
EI	kN m²/m	136.7E3
ν (nu)		0.2000
d	m	0.3486

Proposed shoring frame

Anchor - Mid / Bottom

General | Mechanical | Thermal

Property	Unit	Value
Properties		
$L_{spacing}$	m	4.800
Stiffness		
EA	kN	120.0E3

Anchor - Top

General | Mechanical | Thermal

Property	Unit	Value
Properties		
$L_{spacing}$	m	4.800
Stiffness		
EA	kN	30.00E3

Proposed shoring wall

Plate - 900mm @ 2.0m ST

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	10.43E6
EA_2	kN/m	10.43E6
E_1	kN/m²	14.12E6
E_2	kN/m²	14.12E6
EI	kN m²/m	475.0E3
ν (nu)		0.2000
d	m	0.7391

Plate - 900mm @ 2.0m LT

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	10.43E6
EA_2	kN/m	10.43E6
E_1	kN/m²	17.28E6
E_2	kN/m²	17.28E6
EI	kN m²/m	317.0E3
ν (nu)		0.2000
d	m	0.6038

Proposed rock berm shoring wall

Plate - 600mm @ 2.4m ST

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	3.864E6
EA_2	kN/m	3.864E6
E_1	kN/m²	7.841E6
E_2	kN/m²	7.841E6
EI	kN m²/m	78.20E3
ν (nu)		0.2000
d	m	0.4928

Plate - 600mm @ 2.4m LT

General | Mechanical | Thermal

Property	Unit	Value
Properties		
Isotropic		☑
Stiffness		
EA_1	kN/m	3.864E6
EA_2	kN/m	3.864E6
E_1	kN/m²	9.597E6
E_2	kN/m²	9.597E6
EI	kN m²/m	52.20E3
ν (nu)		0.2000
d	m	0.4026

CLIENT
BB Wilson

PROJECT
849, 853 & 859 Pacific Highway, Chatswood

FORTIFY GEOTECH

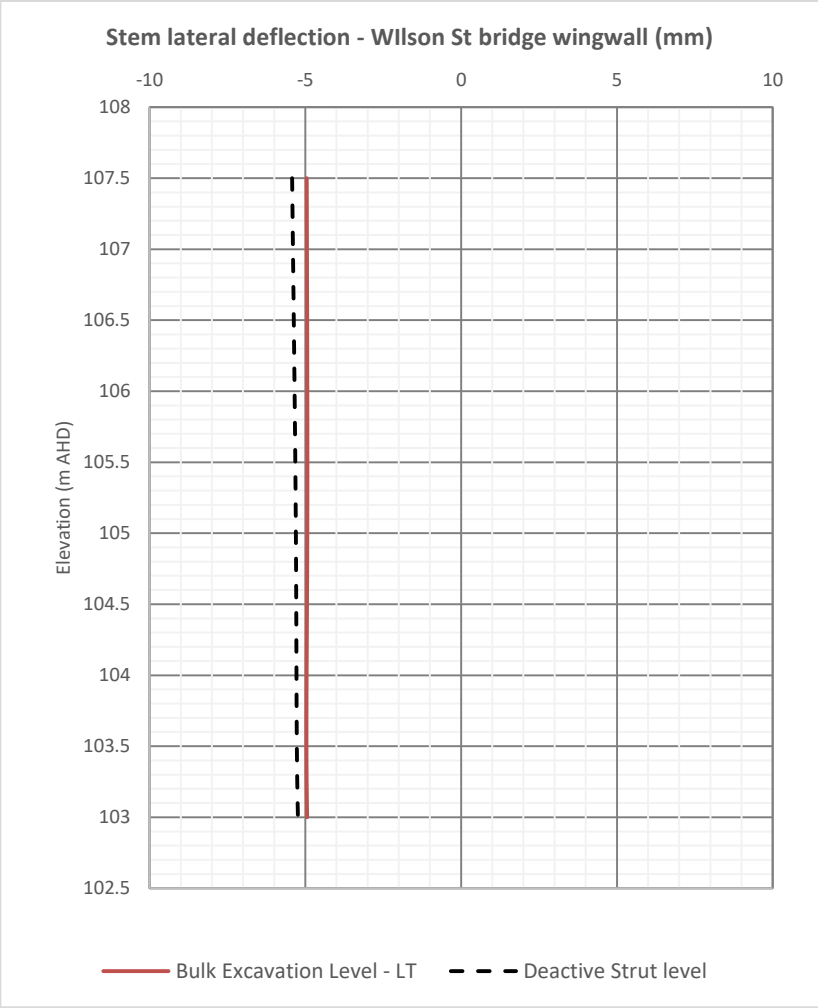
DATE	30/05/2025
PREPARED	JOE
DESIGN	JOE
REVIEW	MN
APPROVED	MN

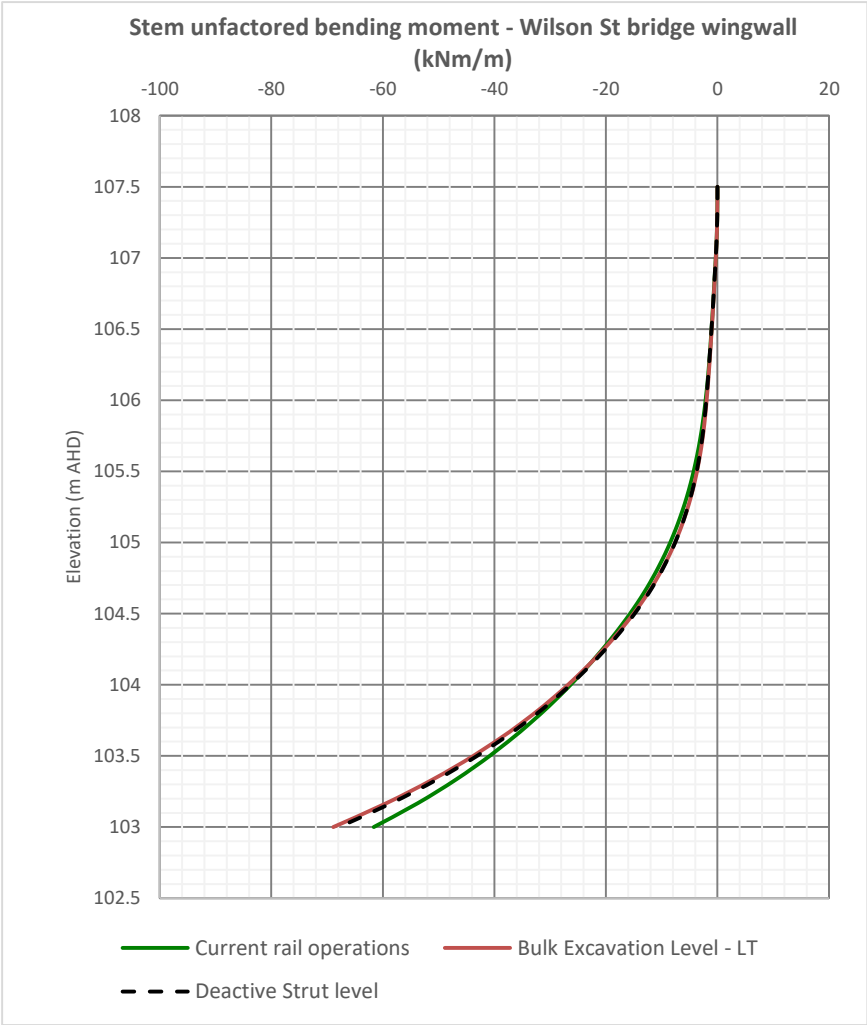
TITLE
PLAXIS 2D - Structural elements properties

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS3-7

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 3





Notes:
1. Structural actions are per pile and unfactored

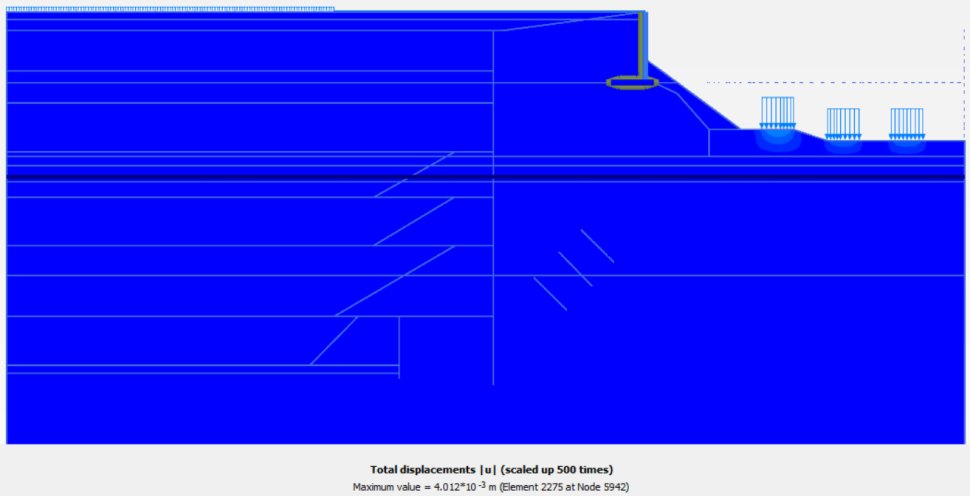
CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**PLAXIS 2D - Existing railway wall outputs**
DATE	30/05/2025
PREPARED	JOE
DESIGN	JOE
REVIEW	MN
APPROVED	MN

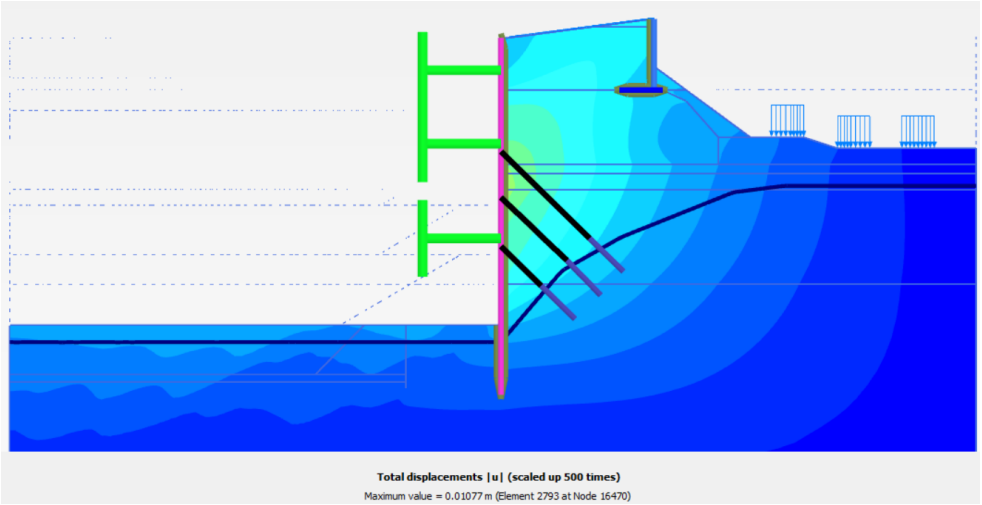
FORTIFY GEOTECH

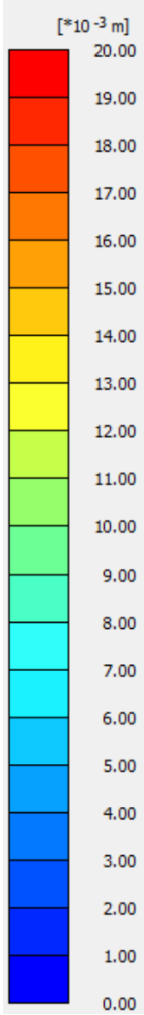
PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS3-8

https://fortifygeotech.sharepoint.com/sites/FortifyGeotech2/Shared Documents/01. Jobs/S2207 - 849, 853 & 859 Pacific Highway, Chatsw

DESIGN SECTION 3







Railway operation stage (current)

Impact of proposed works (6th level of excavation)

File Name: #

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**PLAXIS 2D - Displacement field XY 1/2**

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	JOE
DESIGN	JOE
REVIEW	MN
APPROVED	MN

PROJECT No.	DOC. No	Rev.	FIG. No
S2207	S2207_GIA_01	1	XS3-9

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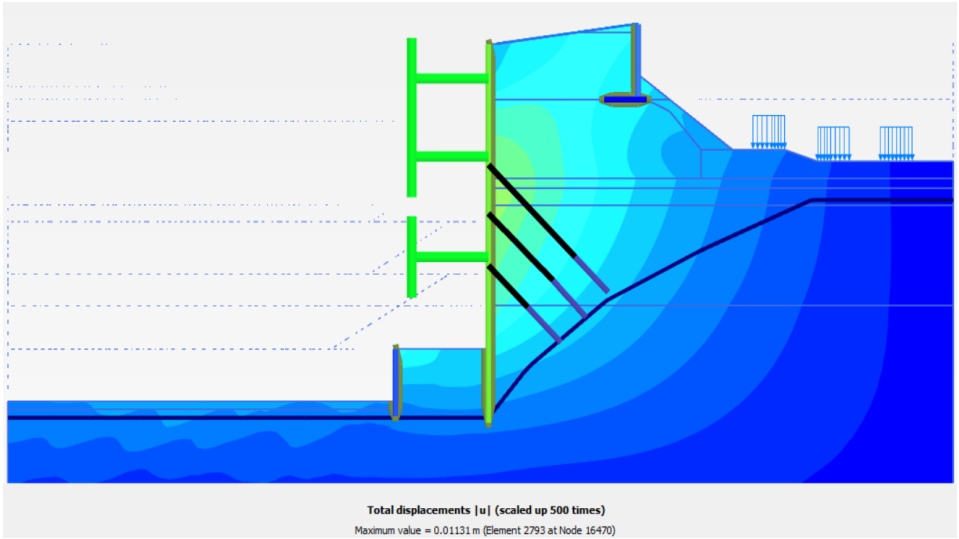

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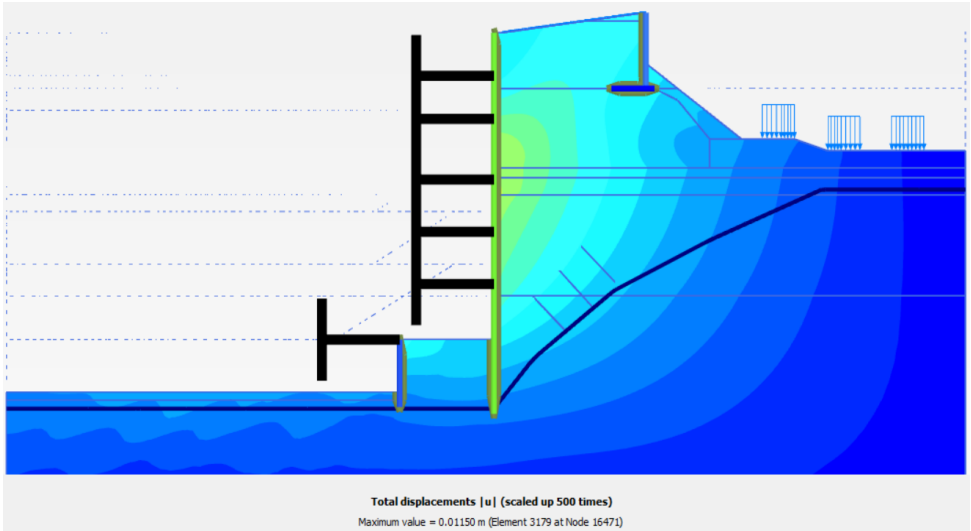

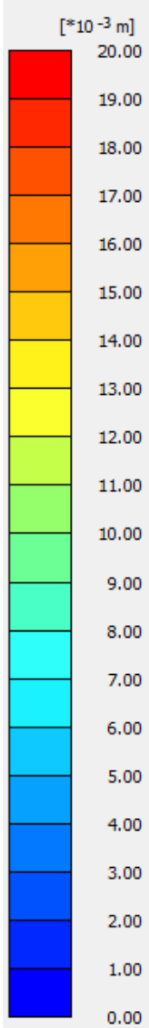

Impact of proposed works
(removal of last ground anchor level)

File Name: #

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**PLAXIS 2D - Displacement field XY 2/2**

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	JOE
DESIGN	JOE
REVIEW	MN
APPROVED	MN

PROJECT No.	DOC. No	Rev.	FIG. No
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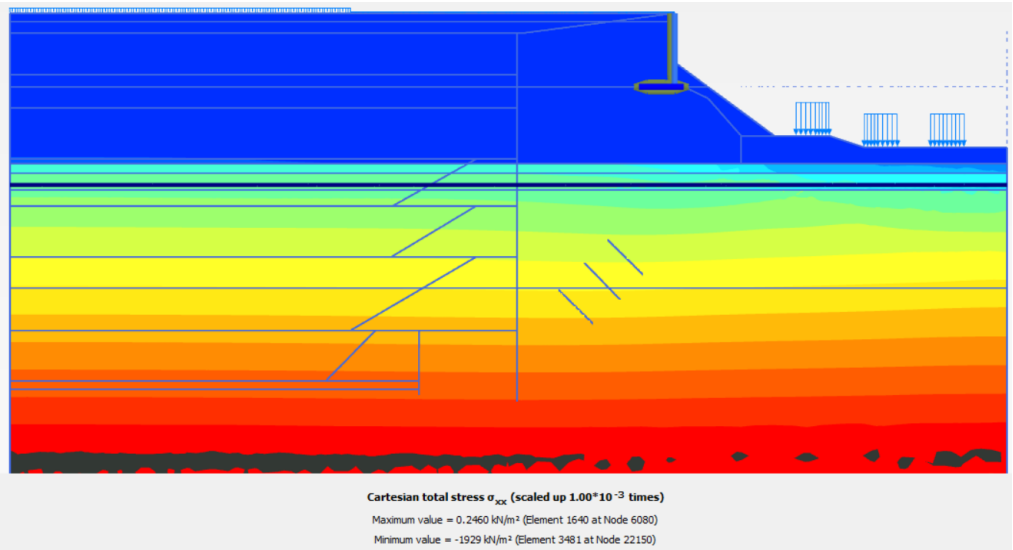

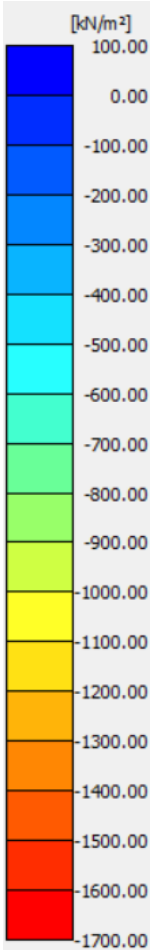

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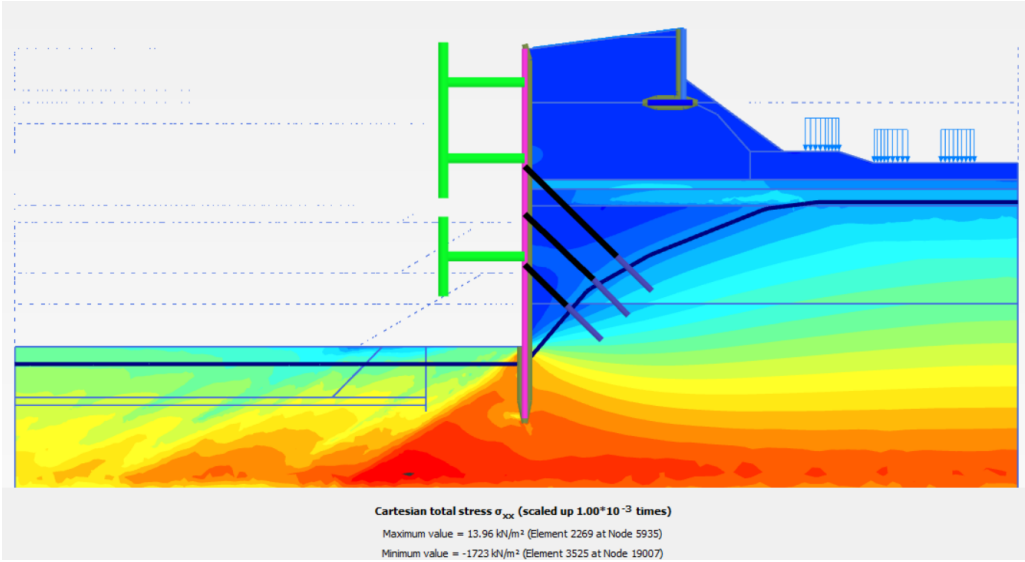

Impact of proposed works (6th of excavation)

File Name: #

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PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	PLAXIS 2D - Stress field XX 1/2

FORTIFY GEOTECH

DATE	30/05/2025
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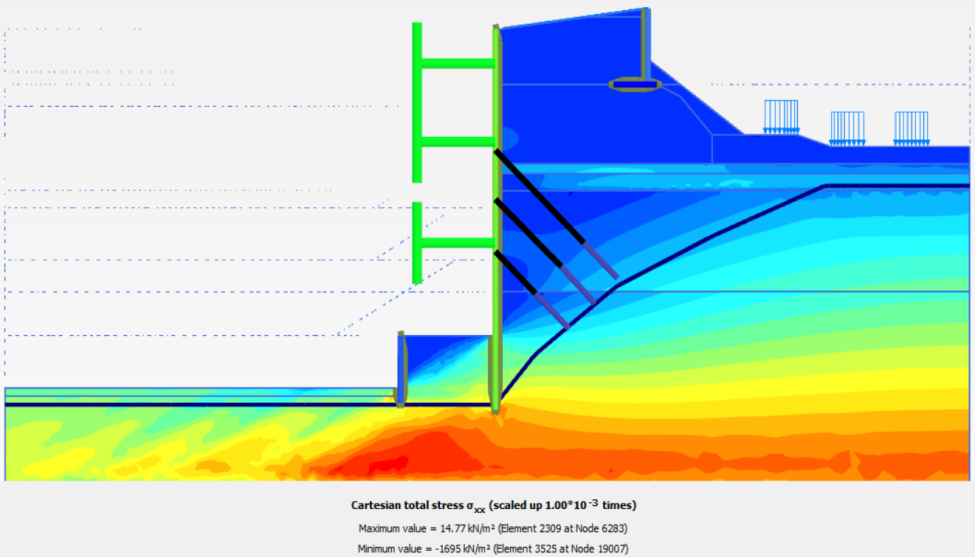

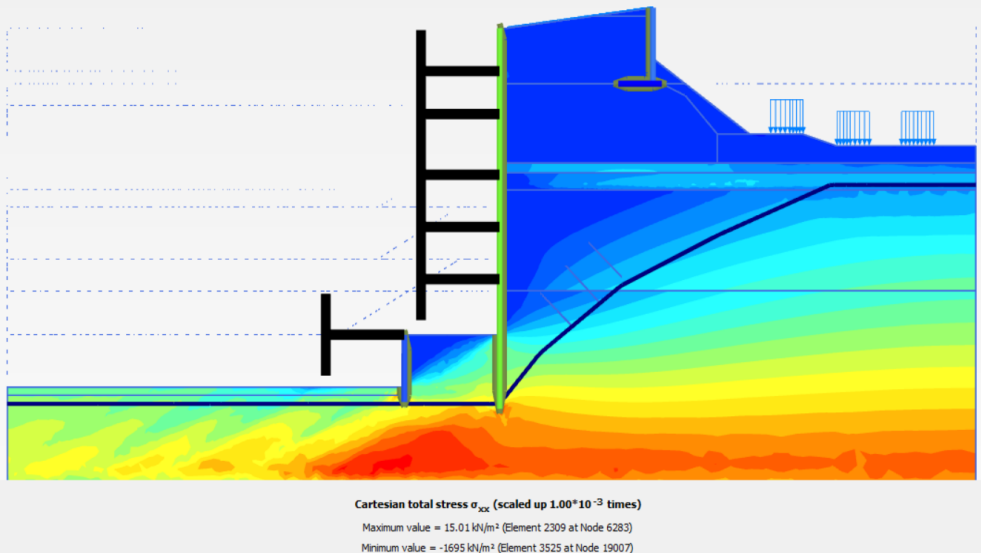

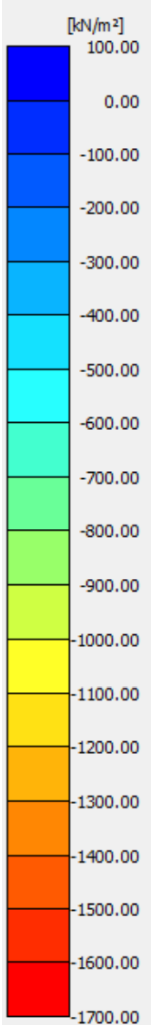

Impact of proposed works (end of excavation)

Impact of proposed works (removal of last level of anchors)

File Name: #

CLIENT	PROJECT
BB Wilson	849, 853 & 859 Pacific Highway, Chatswood

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TITLE
PLAXIS 2D - Stress field XX 2/2

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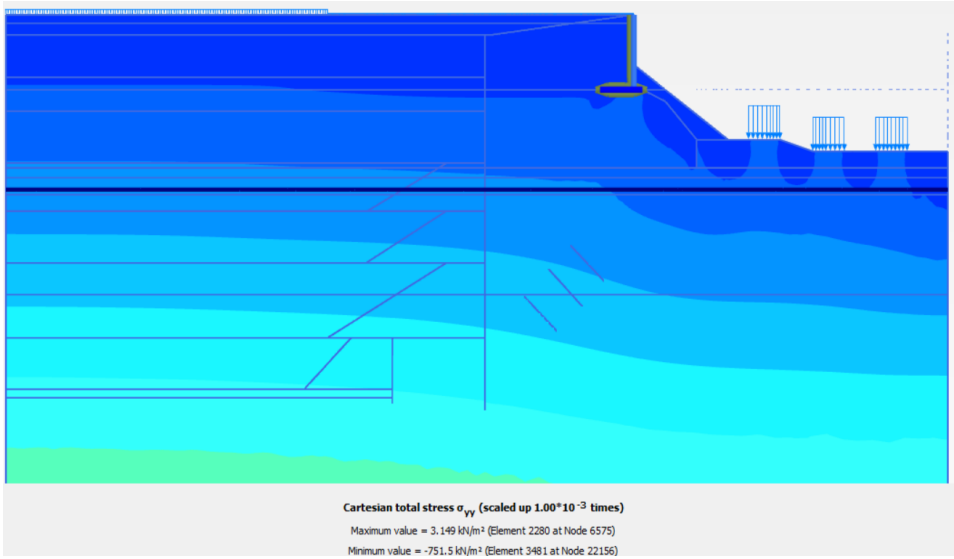

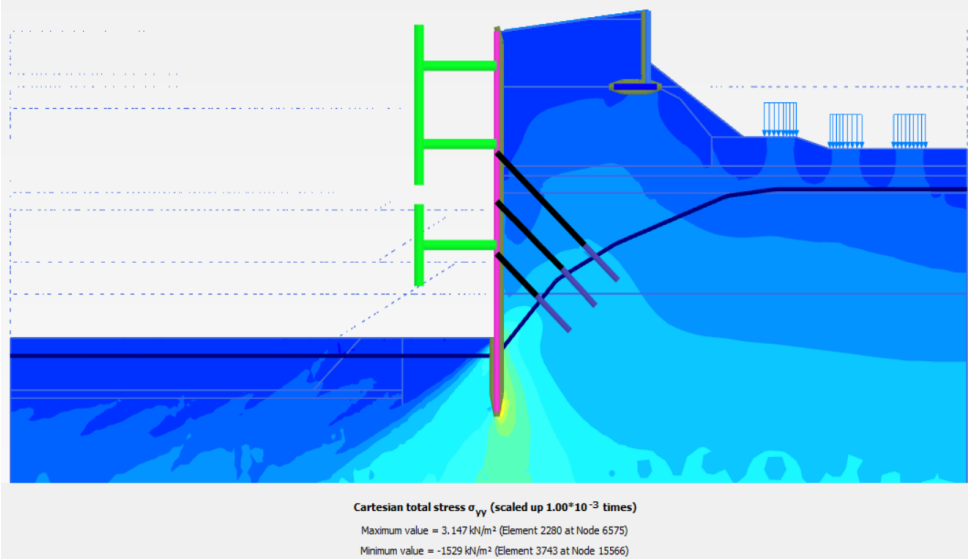

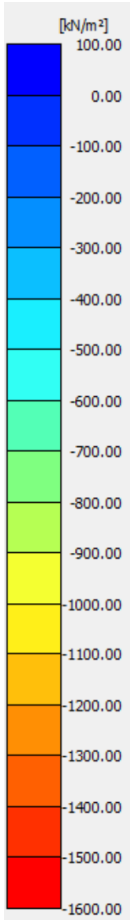

Railway operation stage (current)

Impact of proposed works (6th of excavation)

File Name: #

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**PLAXIS 2D - Stress field YY 1/2**

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DATE	30/05/2025
PREPARED	JOE
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PROJECT No.	DOC. No	Rev.	FIG. No
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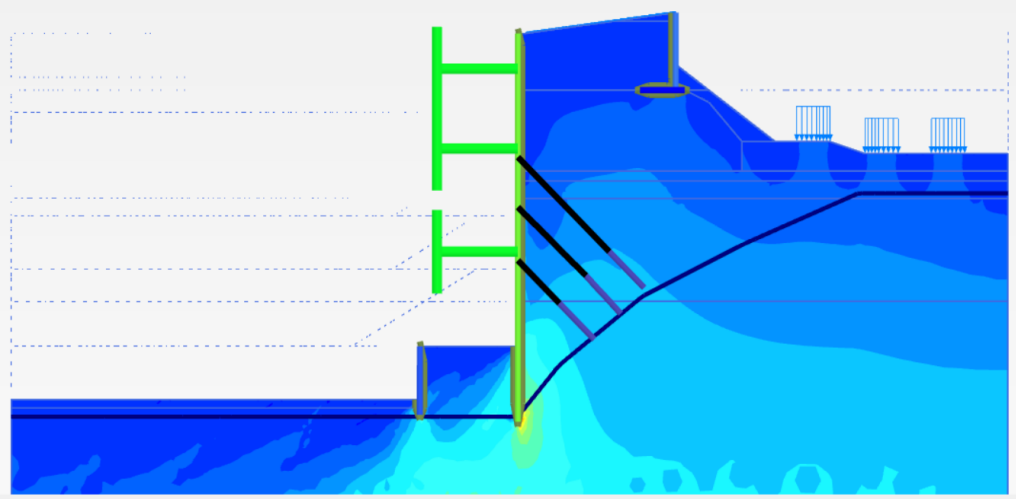
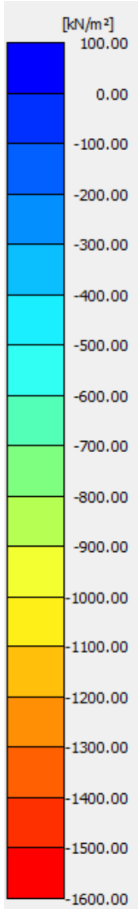


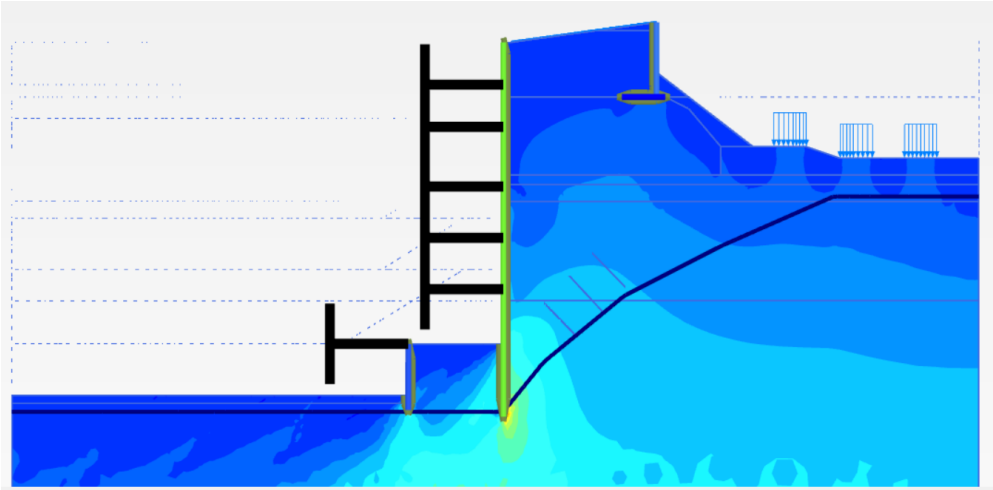
Cartesian total stress σ_{yy} (scaled up $1.00*10^{-3}$ times)

Maximum value = 7.616 kN/m² (Element 3401 at Node 21594)

Minimum value = -1688 kN/m² (Element 3743 at Node 15566)



Impact of proposed works (end of excavation)



Cartesian total stress σ_{yy} (scaled up $1.00*10^{-3}$ times)

Maximum value = 9.999 kN/m² (Element 3401 at Node 21594)

Minimum value = -1690 kN/m² (Element 3743 at Node 15566)

Impact of proposed works (removal of last level of anchors)

File Name: #

CLIENT	BB Wilson
PROJECT	849, 853 & 859 Pacific Highway, Chatswood
TITLE	**PLAXIS 2D - Stress field YY 2/2**

FORTIFY GEOTECH

DATE	30/05/2025
PREPARED	JOE
DESIGN	JOE
REVIEW	MN
APPROVED	MN

PROJECT No.	DOC. No	Rev.	FIG. No
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Appendix D

TAO/AEO review certificate

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Our ref: PS214804-JP-SYD-GEO-LTR-00007 RevA

Your ref: PS214804

By email
manuel@fortifygeotech.com.au

2 June 2025

Public

Manuel Neves
Operations Manager
Fortify Geotech
39 Sydenham Road
Marrickville NSW 2204

Dear Manuel,

849, 853 & 859 Pacific Highway, Chatswood, NSW - Review of Rail Impact Assessment (Sydney Trains & Sydney Metro)

I, Jiping Pan, certify that I have undertaken a TAO review in relation to the geotechnical impact assessment report reference S2207_GIA_01_ Rev1, dated on 2 June 2025, provided by Fortify Geotech in line with Clause 14.3.2 "Impact Assessment Report" (Geotechnical) of Transport for NSW standard "TS 02404– Airspace and External Developments (previous T HR CI 12090 ST)", issue date 01 June 2021 and in line with the requirements of Sydney Metro At Grade and Elevated Sections Corridor Protection Guidelines, in particular geotechnical requirements of Clauses 5.2 and 6.

In performing the function of reviewer, I have used due skill, care and diligence and from my review and in my opinion as a professional engineer I consider that all relevant requirements within Clause 14.3.2 of TS 02404 and the geotechnical requirements of Sydney Metro At Grade and Elevated Sections Corridor Protection Guidelines (Clauses 5.2 and 6) have been addressed by this geotechnical impact assessment report.

Yours sincerely,

Dr. Jiping Pan
Technical Director
CPEng, IntPE, APEC Engineer, RPEV, FIEAust, NER

WSP | Calibre acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Appendix E

Limitations in the use and interpretation of this geotechnical report

Limitations in the Use and Interpretation of this Geotechnical Report

Our Professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

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In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Fortify Geotech's opinions are based upon information that existed at the time of the production of the Document. It is understood that the Services provided allowed Fortify Geotech to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

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By date, or revision, the Report supersedes any prior report or other document issued by Fortify Geotech in dealing with any matter that is in the Report.

Any uncertainty as to the extent to which this Report can be used or relied upon in any respect should be referred to Fortify Geotech for clarification.

Annexure D: Rail Corridor Interface - Preliminary Engineering Advice Report by KBR

Rail Corridor Interface - Preliminary Engineering Advice Report

Development Application - 8 Wilson Street, Chatswood

Rail Corridor Interface - Preliminary Engineering Advice Report

Development Application - 8 Wilson Street, Chatswood

Prepared for:
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Prepared by:
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13 December 2023

SET376-01-TD-PE-REP-0001 Rev A

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Acknowledgments

KBR acknowledges the Traditional Custodians throughout Australia and their continuing connection to land, water, culture, and community, and pays respect to their Elders past and present.

Limitations Statement

The sole purpose of this report and the associated services performed by Kellogg Brown & Root Pty Ltd (KBR) is to provide advisory services in accordance with the scope of services set out in the contract between KBR and BB Wilson Property Pty Ltd ('the Client'). That scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

This report has been prepared on behalf of and for the exclusive use of the Client and is subject to and issued in connection with the provisions of the agreement between KBR and the Client. KBR accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

Revision History

Revision	Date	Comment	Signatures			
			Originated by	Checked by	Technical Approval	Project Approval
A	13/12/23	Issued for Review	N Patel	R Murray	N Patel	R Turp

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Abbreviations

AMB	Asset Management Branch
BWA	Balance Weight Anchor
DA	Development Application
DTRS	Digital Train Radio System
ECRL	Epping to Chatswood Rail Line
E&B	Earthing and Bonding
KBR	Kellog Brown & Root
MEN	Multiple Earthed Neutral
OHWS	Overhead Wiring Structure
OLB	Overline Bridge
RES	Rail Enclosure Structure
RRU	Remote Radio Unit
TAO	Technically Assured Organisation
VPR	Virtual Planroom

Executive Summary

Kellogg Brown & Root Pty Ltd ('KBR') were appointed by BB Wilson Property Pty Ltd (the 'Proponent') to provide engineering advice in relation to the Development Application (DA) submission for a new planned development at 8 Wilson Street, Chatswood ('the Site'). The site is approximately 4,705 m^2 and is comprised of five properties to support redevelopment into a 27-storey mixed use development delivering an activated commercial and retail podium, and residential towers above that maximise amenity, view corridors and efficient design. The eastern side of the property, 1/DP1189541, shares the boundary with the NSW rail corridor, namely the Sydney Trains North Shore Line and the Sydney Metro converted Epping to Chatswood Rail Line (ECRL).

The purpose of the report is to provide engineering advice in relation to the adjacent NSW railway network and associated assets from a Structural, Civil, Permanent Way and Electrical discipline perspective and is based on the supplied preliminary development proposal and survey information. The assessment is to also provide advice on the throw risk, derailment risk, electrolysis and conductor blow-out risks associated with the railway assets and interaction with the proposed development.

The assessment has further identified that the detailed design for the proposed development will require to consider the impacts to the adjacent railway assets; the Wilson Street Overline Bridge (OLB), Down Shore Outer Pile Retaining Wall and associated Overhead Wiring (OHW) fixtures, Chatswood Rail Enclosure Structure (RES) and the Metronet Hut, Digital Train Radio System (DTRS) and Remote Radio Unit (RRU) cabinets.

A summary of the key discipline specific findings are detailed below:

- Structural
  - The as-built documentation for the piled retaining wall along the eastern site boundary indicates:
    - The retaining wall does not contain any ground anchors.
    - A detailed analysis is required to determine the impact to the wall caused by the proposed raised walkway, planter boxes and retaining wall.
  - 3D analysis is recommended to assess the impact onto the Wilston St OLB and RES, with a 2D analysis for the retaining wall.
- Civil
  - In the next phase of the project, the proponent will need to consider strategies to fully enclose rail corridor facing balconies and terraces as well as limit window openings to 80 mm to address throw risks as required by Section 5.4 of T HR CI 12090 ST *Airspace and External Developments*.
  - The existing corridor fencing and access gate will need to be replaced with a high security fence or similar as approved by Sydney Trains.
  - Safe maintenance access to the existing Metronet Hut and DTRS cabinets is improved by the proponents' preliminary architectural design with direct access provided via O'Brien Street.
  - The Proponent is to consider the existing retaining wall catch drains and demonstrate maintaining the existing drainage performance.
- Electrical

  - A detailed blowout assessment is not required as there is no overhead transmission line in the rail corridor adjacent to the development site.
  - The design of the building structure shall consider the potential impacts of stray current and electrolysis.
  - The existing earthing installation at the Metronet, DTRS and RRU site shall not be impacted by the works at the development site.
  - There are no High Voltage installations nearby that may impact the development site.
  - Any Multiple Earthed Neutral's (MEN) must be isolated from any Sydney Trains or Sydney Metro infrastructure.
  - Any Low Voltage infrastructure located alongside the rail corridor boundary must be double insulated.
- Permanent Way
  - In the event of derailment, the guard rails on the down shore track provide mitigation against trains impacting onto the existing piled retaining wall which will prevent the train from colliding with the proposed development.
  - It is considered that the likelihood of a train derailment occurring adjacent to the site location is very unlikely.
  - The integrity of the existing pile wall is to be evaluated against AS 5100 and if deemed inadequate, additional deflection resistance may be required with the design of the proposed development. A risk assessment is anticipated to be undertaken to determine any additional deflection resistance requirements.
  - The proposed development is not expected to infringe onto the existing transit space.
  - The provision of a Safe Place does not need to be considered as part of this project.

Based on the findings of the preliminary assessment, it is recommended that the detail designers of the proposed development demonstrate that the temporary and permanent works are not affected by or cause impact to the existing railway infrastructure.

In support of obtaining concurrence from the relevant railway authority, Sydney Trains and Sydney Metro, it is recommended to comply with relevant details stipulated in AMD-EMI-GUI-*001 Guide to Working in Sydney Trains*, T HR CI 12090 *ST Airspace and External Developments*, SM-20-00081444 *Sydney Metro Underground Corridor Protection Technical Guideline* and NSW Government Department of Planning *Development Near Rail Corridors and Busy Roads – Interim Guideline*. Further details are provided in Section 8.

1 Introduction

Kellogg Brown & Root Pty Ltd (KBR) were appointed by the Proponent to provide engineering advice in relation to the Development Application (DA) submission for a new planned development at 8 Wilson Street, Chatswood ('the Site'). The engineering advice is in relation to the adjacent NSW railway network and associated assets from a Structural, Civil, Permanent Way and Electrical discipline perspective and is based on the supplied preliminary architectural plans.

KBR possess the requisite Technically Assured Organisation (TAO) authorisations in accordance with Asset Management Branch (AMB) standard TS 06197.2 to undertake design and engineering work on NSW rail assets and apply standards published by the Transport for NSW AMB.

1.1 BACKGROUND

The site is approximately 4,705 m^2 with an applicable site area of 4,294 m^2 for the development due to future road widening zone to the front of the site. The development is comprised of five properties to support redevelopment into a 27-storey mixed use development which includes:

- A two-storey podium with a mix of commercial uses
- Two split residential towers with communal open space and 251 apartments
- 4 level basement parking and basement loading dock

The properties associated with the development are identified in Table 1.1.

Table 1.1 - Proposed Development Properties

Property ID	Address	Lot Area (m^2)
SP52947	2 Wilson Street Chatswood NSW 2067	908
SP10110	859 Pacific Highway Chatswood NSW 2067	753
SP60178	853 Pacific Highway Chatswood NSW 2067	734
SP1496	849 Pacific Highway Chatswood NSW 2067	713
1/DP1189541	8 Wilson Street Chatswood NSW 2067	1,597

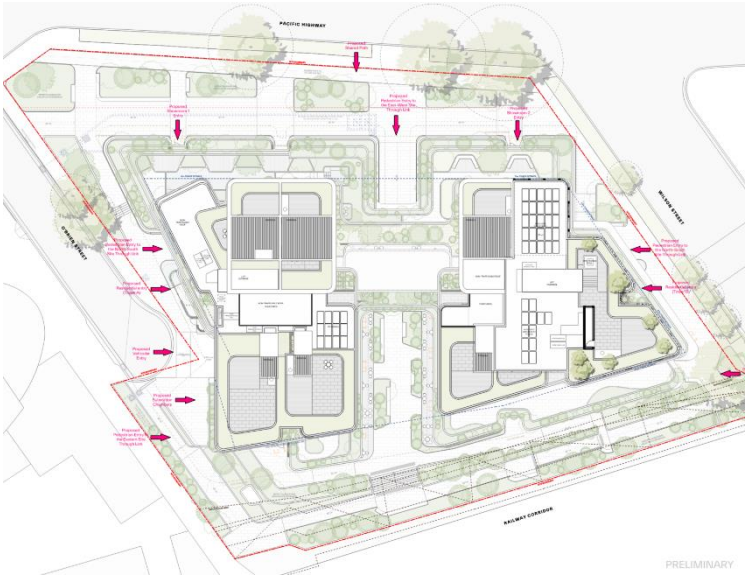

Figure 1.1 - Site plan of ground floor including railway corridor and nearby streets

1.2 RAIL CORRIDOR ASSET INTERFACE

The eastern side of the property 1/DP1189541 shares the boundary with the NSW rail corridor, namely the Sydney Trains North Shoreline and the Sydney Metro converted Epping to Chatswood Rail Line (ECRL). The following key existing assets are identified to have an interface with the proposed development:

- Wilston Street Overline Bridge (OLB)
- DN Shore Outer Pile Retaining Wall
- Chatswood Rail Enclosure Structure (RES)
- Metronet Hut and Digital Train Radio System (DTRS) cabinets

The proposed development site and adjacent railway assets are identified in Figure 1.2.

Figure 1.2 - Proposed development site and adjacent railway assets

The proposed development has a five floor basement structure that is approximately 6,281 mm from the rail corridor boundary. The set-back of the basement has been elected to mitigate negatively impacting onto the rail corridor retaining wall. Both the ground and first floor are approximately 6,960 mm from the rail corridor boundary and increases to 11,650 mm for the remaining building to the twenty seventh floor. The preliminary cross section identifying the clearances to the railway corridor and the proposed development is shown in Figure 1.3.

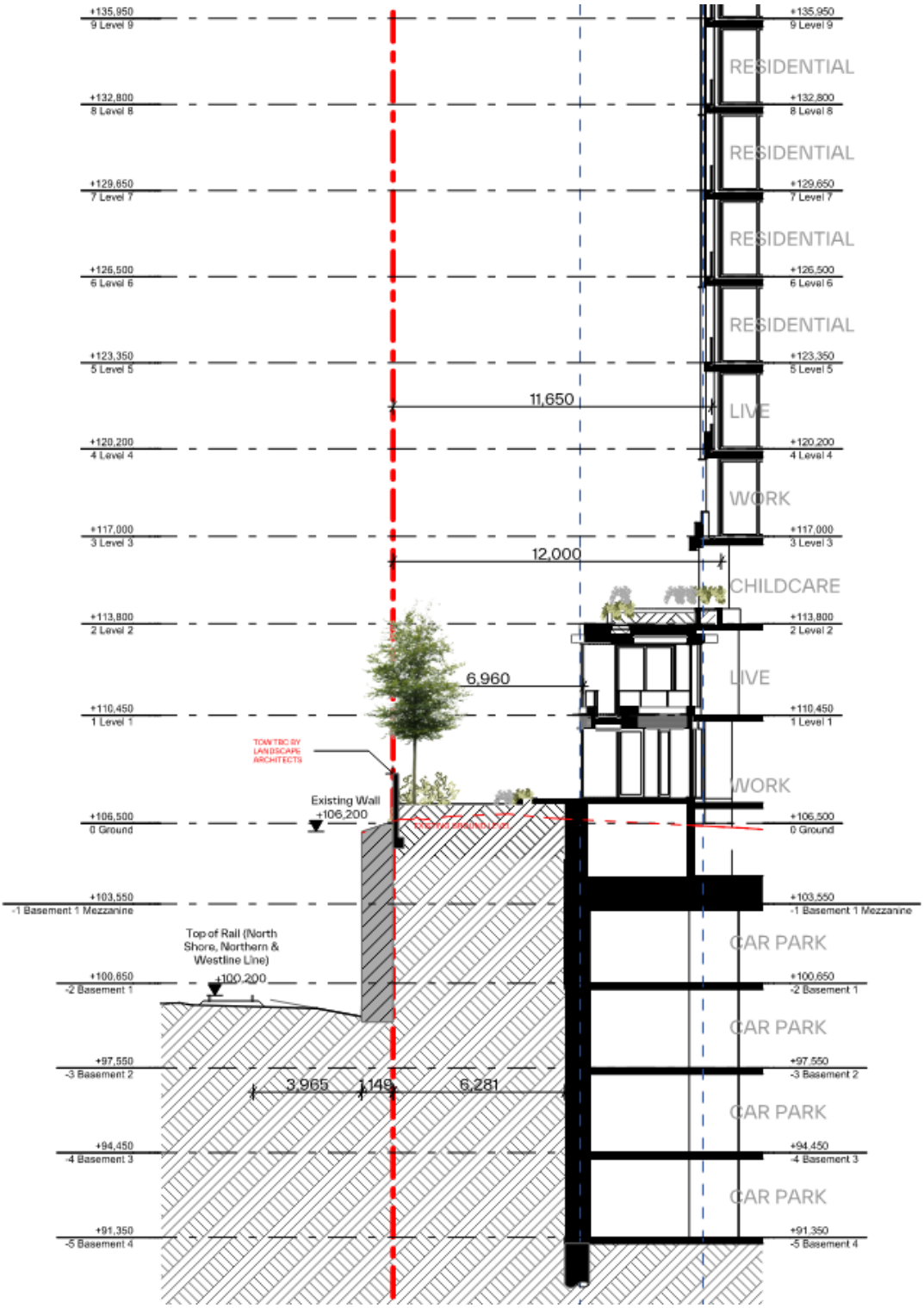

Figure 1.3 - Proposed Development Cross Section at Corridor Boundary

2 Project Brief

2.1 OBJECTIVE

The objective of this engineering advice report is to:

- Identify existing railway assets that may be impacted by the redevelopment of the Site during both the temporary and permanent works stages.
- Provide advice on design considerations to be made during the detailed design phase to reduce impacting onto the identified existing railway assets.
- Identify the relevant Transport for NSW standards applicable for compliance when interfacing with the railway corridor.

2.2 SCOPE OF SERVICES

The scope of works is based on the request to obtain quotation email dated 13th July 2023 and the project kick-off meeting dated 17th November 2023. The following scope of services has been undertaken by KBR to achieve the abovementioned objectives.

- Development of a desktop assessment report to support the Proponents DA submission that provides TAO advice on the railway corridor interface from the following disciplines:
  - Structural
  - Civil
  - Electrical
  - Permanent Way
- Specific advice relevant to the above technical disciplines on the following risk items:
  - Throw Risk
  - Derailment Risk
  - Electrolysis
  - Conductor blowout
- On going services:
  - Provide engineering support and advice during the CC Submission / 70% Design submission through responding to RFI's and queries.

3 Processes & Criteria

3.1 TAO COMPETENCY

KBR possess the requisite Technically Assured Organisation (TAO) authorisations in accordance with Asset Management Branch (AMB) standard TS 06197.2 to undertake design and engineering work on NSW rail assets and apply standards published by the Transport for NSW AMB. As part of this authorisation, KBR can carry out the services required by the Proponent under the agreed scope of works.

Table 3.1 - TAO Status

Company Name	TAO	Certificate No.	Responsible Project Services
Kellogg Brown & Root Pty Ltd	Yes	045	Engineering – Design Advice

3.2 KBR COMPETENCY

The personnel engaged in the service of works are listed in the below table. All KBR Engineers are considered competent in the discipline and role for which they are nominated.

Table 3.2 - KBR Competency and Report Contribution

Name	Role	Report Contribution
Nilesh Patel	Project Manager	All
Richard Wilson	Structural – Subject Matter Expert	Section 4
Joel Abbot	Civil – Subject Matter Expert	Section 5
Jonathan Fabella	Electrical & E&B – Subject Matter Expert	Section 6
Robert Beedham	Permanent Way – Subject Matter Expert	Section 7
Tasneem Fatima	Project Coordinator	All

3.3 STANDARDS, CODES AND GUIDELINES

The following outlines the applicable standards and guidelines that are required to be adopted when seeking approval from the relevant railway authority, Sydney Trains and Sydney Metro. Further specific Transport for NSW standards specific to the Site are identified within the discipline specific sections.

Table 3.3 - Applicable Transport for NSW Standards

Ref. No	Document Title	Organisation	Revision
ISBN 978-0-7347-5504-9	Development near Rail Corridors and Busy Roads – Interim Guideline	NSW Department of Planning	December 2008
AMD-EMI-GUI-001	Guide to Working in Sydney Trains	Sydney Trains	Version 1.5
T HR CI 12090 ST	Airspace and External Developments	AMB	Version 1.0
SM-20-00081444	Sydney Metro Underground Corridor Protection Technical Guideline	Sydney Metro	Version 2
657578	Sydney Metro At Grade and Elevated Sections Corridor Protection Guidelines	Sydney Metro	Revision 0

No assessment has been made on the compliance to legislation, code or Australian Standards.

3.4 ASSESSMENT REPORT INPUTS

The following inputs have been received by the client for assessment to consider the potential interface impacts with the existing railway corridor and associated infrastructure.

Table 3.4 - Report Inputs

Description	Revision	Date Received
Detail and Level Survey of LOT 1 in DP1189541, SP1496, SP60178, SP10110 and part of SP52947	A	16/11/2023
Service Location Report - On Point Utility Locating	-	16/11/2023
Southern Basement Shoring Wall Options – Cadigal	1	16/11/2023
Preliminary Layout & Elevations - PBD Architects	P3	6/12/2023
Preliminary Site Plan – PBD Architects	P1	13/12/2023
Environmental Detailed Site Investigation - Reditus	1	6/12/2023
Services Infrastructure Report - Neuron	2	6/12/2023

As-built engineering drawings have also been sourced from the Sydney Trains Virtual Planroom (VPR) to support assessing the corridor infrastructure impacted by the development as identified in Section 1.2. Table 3.5 identifies the relevant project name and engineering drawing index sheet (where available).

Table 3.5 - As-built Railway Engineering Drawings

Description	EDMS Number	Date
Parramatta Rail Link – Down Side Outer Pile Retaining Wall	CV0214761	3/10/2003
Parramatta Rail Link – Wilson Street Overbridge	CV0214639	3/10/2003
Pacific Place – Chatswood Railway Enclosure Structure	CV0014045	October 2001
Chatswood Digital Train Radio System – Location 2	CV0539029	8/07/2015

3.5 CLIENT ENGAGEMENT

Table 3.6 - Client Engagement

Date	Description	Parties
17/11/2023	Project Kick-off	KBR and Billbergia
21/11/2023	Site Visit – 8 Wilson Street, Chatswood	KBR – Electrical & E&B, Billbergia
30/11/2023	Basement Structure Discussion	KBR – Structural, Billbergia and Cadigal

4 Structural

4.1 DESIGN ADVICE BASIS

Commentary on the requirements in the standards for which the proposed development is to observe including those that are not specifically mentioned but which Transport for NSW and Sydney Trains (ST) would show concern. The purpose is to demonstrate to Transport for NSW and Sydney Trains that all interfaces with structures have been identified and presented for easy transparent discussions to reduce prolongation with approvals and associated conditions or commentary.

4.2 SITE ANALYSIS

The existing structures in the rail corridor that are to be considered in the proposed development are identified in the subsequent sections. The relevant data of these existing structures are shown as extracts of as-built documentation for which future consultation with relevant railway authority will be required to provide full details.

4.2.1 Existing Downside Outer Pile Retaining Wall

There is an existing retaining wall adjacent the down shore track from approximate chainage 12.170 to 12.240 km. Based on the sourced Parramatta Rail Link as-built drawings, the retaining wall consists of a cantilever piled wall with shotcrete infill. The piles are noted as 850 mm diameter reinforced concrete pile with a spacing that varies from 1760 to 2370 mm and toe levels RL 93.5 to RL 94.5.

The down leg of overhead wiring structure (OHWS) number MH 12+295 (at 12.230 km) is directly fixed to the retaining wall capping beam. In addition, the combined frame structure and cable bridge OWHS MH 12+258 (12.192km) has a guy anchor directly fixed to the retaining wall capping beam. This guy anchor appears to be associated with the installed balance weight anchors (BWA) used to tension the Sydney Metro down line.

Relevant extracts from the design are presented below.

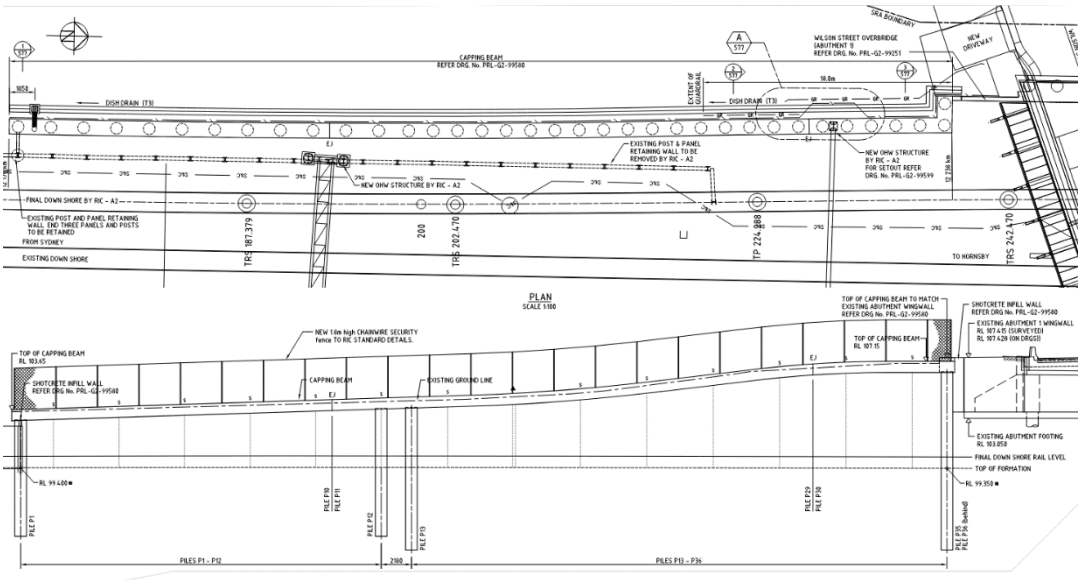

Figure 4.1 - Retaining wall along eastern edge of the Site (extract from CV0214762)

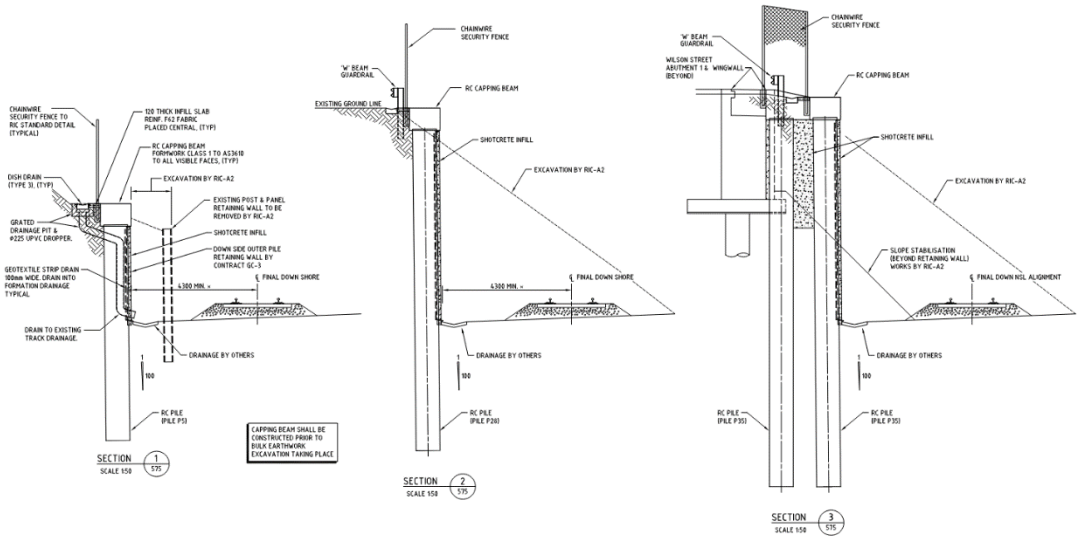

Figure 4.2 - Retaining wall typical sections (extract from CV0214763)

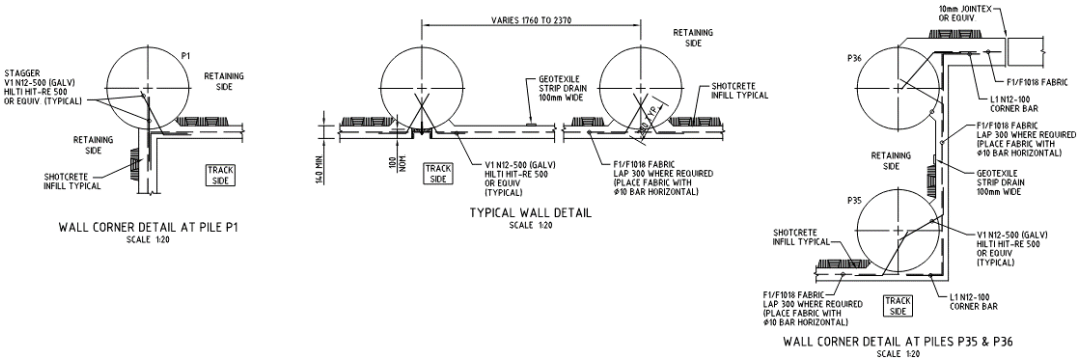

Figure 4.3 - Retaining wall pile details (extract from CV0214765)

NOTES

GENERAL

1. DIMENSIONS ARE NOT BE SCALED FROM THIS DRAWING.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE CHAINAGES & REDUCED LEVELS ARE IN METRES
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING THE LOCATION OF ALL SERVICES AFFECTED BY THE WORKS PRIOR TO COMMENCEMENT OF ANY EXCAVATION.
4. LOCATION OF SERVICES SHOWN ON DRAWINGS IS INDICATIVE AND SHALL BE VERIFIED BY THE CONTRACTOR.
5. TOP OF FORMATION LEVEL AT BASE OF RETAINING WALL TO BE NOT LOWER THAN THE RL SHOWN ■ ON ELEVATION.
6. EXCAVATION IN FRONT OF PILE WALL NOT TO EXCEED 500mm BELOW FORMATION LEVELS.
7. SAFETY SCREENS TO FUTURE DETAIL

DESIGN

1. DESIGN CODE : AUSTRALIAN BRIDGE DESIGN CODE.
2. DESIGN LOADING : T44 TRUCK LOADING
3. CONSTRUCTION SURCHARGE 20 kPa

SURVEY

1. ALL LEVELS ARE TO AUSTRALIAN HEIGHT DATUM (AHD)
2. ALL CO-ORDINATES ARE TO MAP GRID OF AUSTRALIA (MGA).
3. WHERE KILOMETRAGE IS USED TO INDICATE A START OR END POINT IT IS MEASURED PERPENDICULAR TO THE FINAL DOWN SHORE

SECURITY FENCE

1. NEW 1.8m HIGH SECURITY FENCE TO BE CONSTRUCTED IN ACCORDANCE WITH RIC STANDARDS AP6841 & C4501 AND RIC DRAWINGS 207-1353, SHEET 1; 207-1353, SHEET 2 AND 207-1353, SHEET 4.

REFERENCES

TYPICAL WALL SECTIONS.....DRG No PRL-G2-99577
PILE SETOUT.....DRG No PRL-G2-99578
PILE DETAILS.....DRG No PRL-G2-99579
CAPPING BEAM - CONCRETE.....DRG No PRL-G2-99580
CAPPING BEAM - REINFORCEMENT.....DRG No PRL-G2-99581
OHW STRUCTURES HOLDING DOWN BOLT DETAILS.....DRG No PRL-G2-99599

NOTE:
EXCAVATION & SHOTCRETE INFILL NOT COMPLETED AT TIME OF ISSUE

WORK AS EXECUTED
THIS DRAWING SHOWS WORK AS EXECUTED. ANY DEPARTURES FROM THE ORIGINAL DESIGN DETAILS ARE BASED SOLELY ON INFORMATION PROVIDED BY JOHN HALLAND PTY LTD.

Figure 4.4 - Retaining wall general specifications (extract from CV0214762)

As this design was carried out in 2003 it may not comply with the current requirements of AS5100.2, AS5100.3 and THR CI 12060 ST *Retaining Walls*.

Furthermore, the retaining wall has been designed to the Australian Bridge Design Code (ABDC) which was replaced in 2004 with AS 5100. The drawings indicate the transient loadings and surcharges at the retained surface level that the retaining wall has been design for. There is no mention of additional permanent loads on top of the retained surface level.

The proposed development includes for a new mixed use walkway, planter boxes and retaining wall above the existing ground level along the corridor boundary. The impact onto the residual design life of the existing piled retaining wall by the proposed additional loading during both the construction and service state is to be considered with the development of the detailed design.

4.2.2 Existing Wilson Street Overbridge

The overbridge is a Transport for NSW asset which has a piled abutment close to the northeast corner of the proposed development. Below are extracts from the as-built drawings.

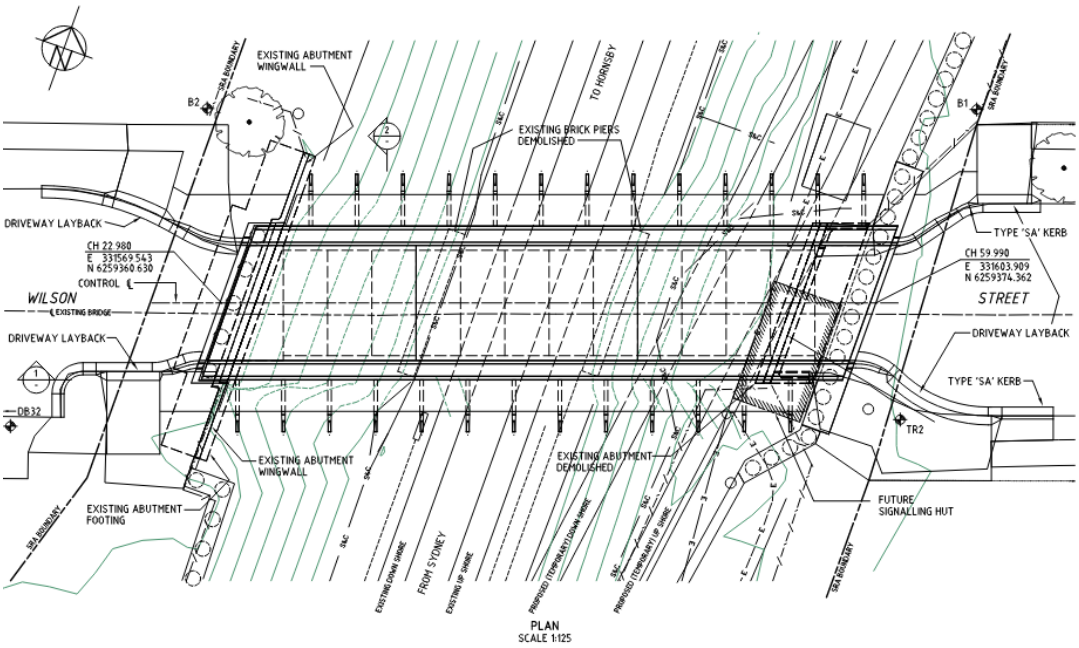

Figure 4.5 - Wilson Street Overbridge Plan (extract from CV0214640)

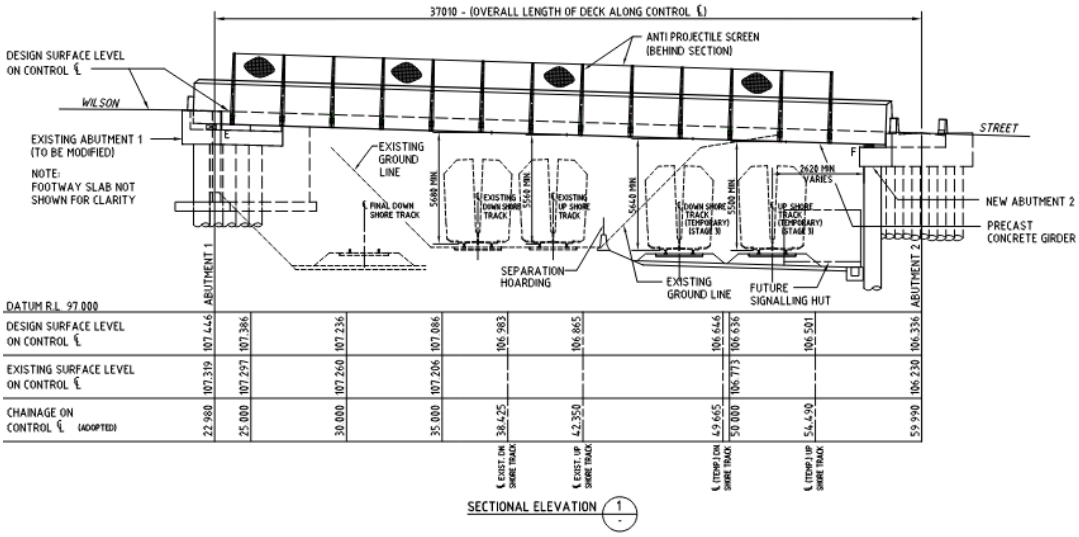

Figure 4.6 - Wilson Street Overbridge Elevation (extract from CV0214640)

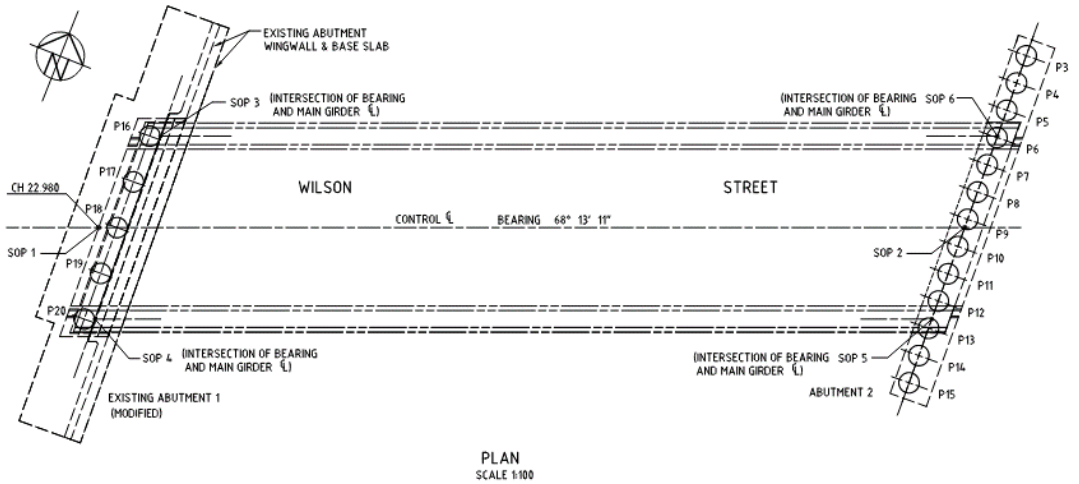

Figure 4.7 - Wilson Street Overbridge Pile Setout (extract from CV0214641)

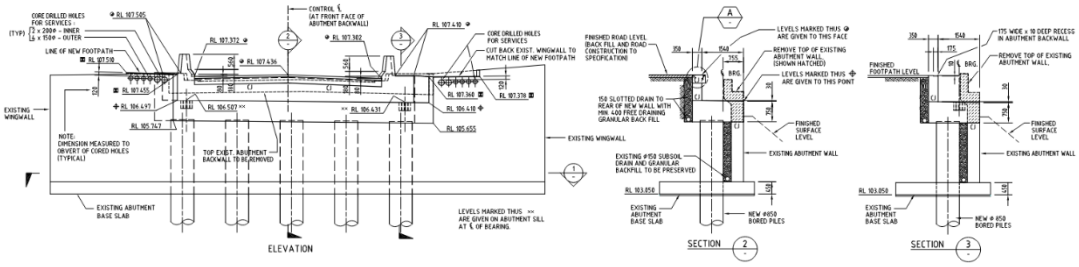

Figure 4.8 - Wilson Street Overbridge Abutment Elevation and Section (extract from CV0214642)

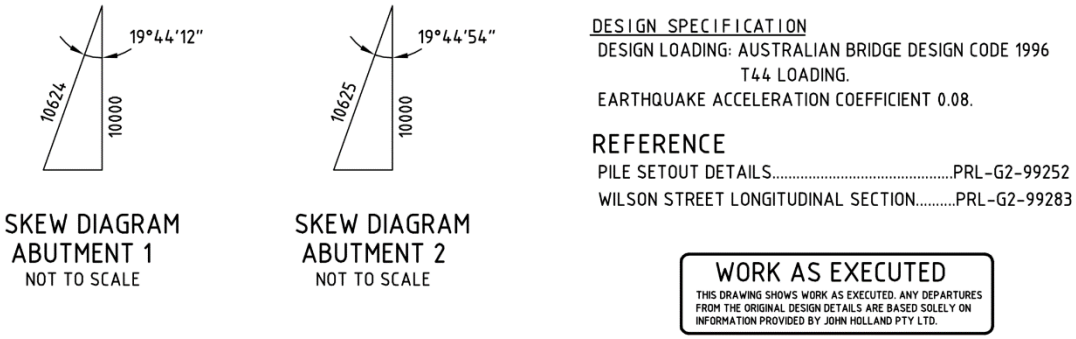

Figure 4.9 - Wilson Street Overbridge General Specification (extract from CV0214640)

4.2.3 Existing Chatswood Rail Enclosure Structure (RES)

This air space development is a Transport for NSW asset and is close to the southeast corner of the proposed development. Below are some extracts from the as-built drawings.

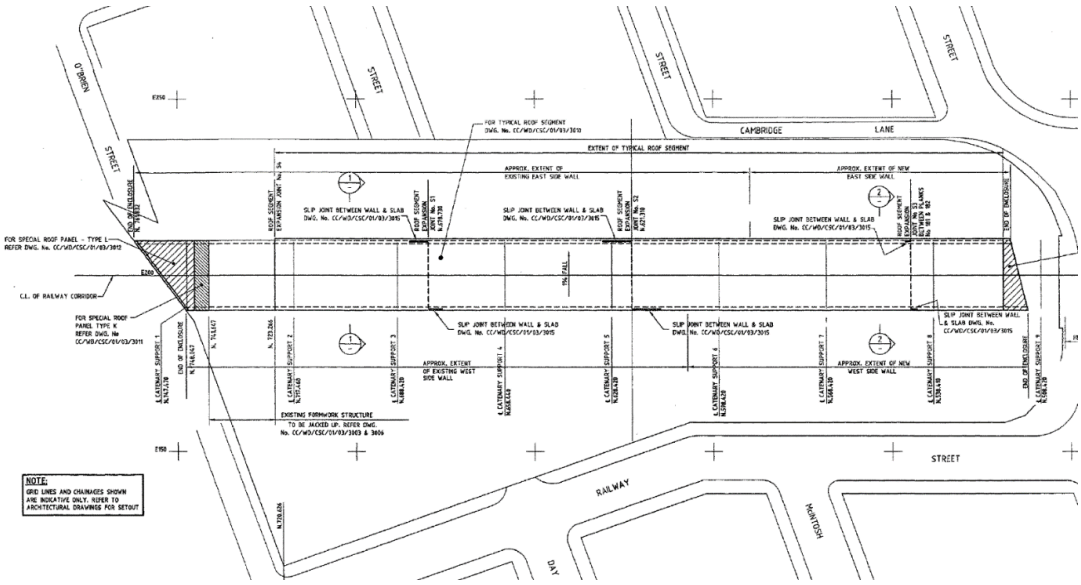

Figure 4.10 - Cambridge Lane to Railway Street Plan Drawing (extract from CV0278720)

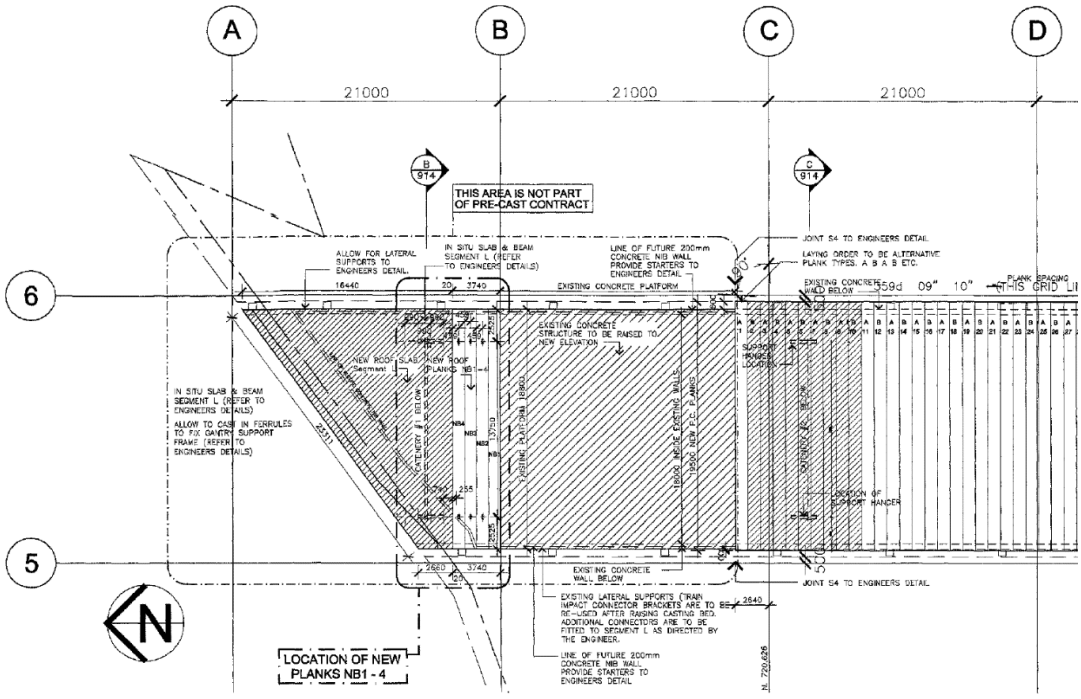

Figure 4.11 - Northern End Precast Plank Layout (extract from CV0014049)

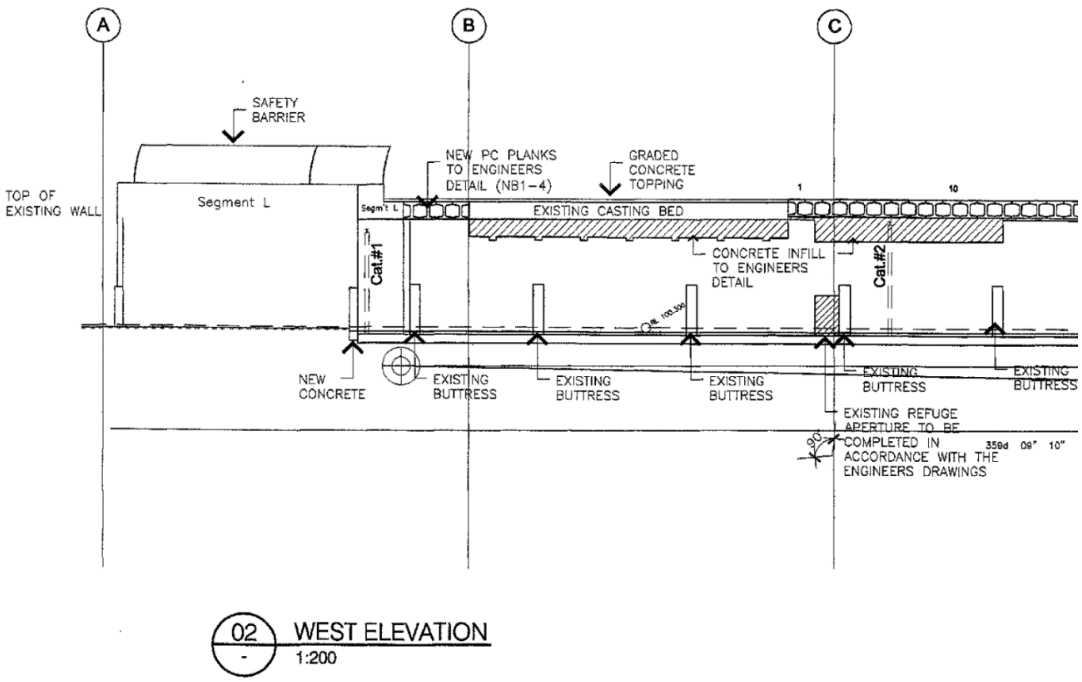

Figure 4.12 - Northern End Buttress Elevation (extract from CV0014050)

4.3 REGULATORY COMPLIANCE

4.3.1 Railway Assets Affected By Adjacent Proposed Development

The main structural rail infrastructure along the rail boundary within the defined zones of assessment for the proposed development include:

- Wilston Street Overline Bridge (OLB)
- DN Shore Outer Pile Retaining Wall
- Chatswood Rail Enclosure Structure (RES)

4.3.2 General Suggestions

To assist Sydney Trains in their assessment of the proposed development, the proponent will prepare simple detailed sections at each adjacent interface clearly showing the RL's and distance of all structures. Corresponding plans with these items and all boundaries should also be provided with a generous amount of dimensions. Any zones of influence or required exclusion zones/clearances, should also be indicated as well as simple geological strata and RL's.

On these sections and plans important structural information regarding the proposed development should be given including simple structural framing, proposed temporary works, where forces are transmitted into the surrounding ground and how these are resolved with respect to adjacent structures. This allows the reviewers confidence that the developers designers have considered all aspects of the design with respect to the railway assets and assist in timely reviews.

4.4 STRUCTURAL DESIGN CONSIDERATIONS

4.4.1 List of Requirements and Engineering Effects

This section identifies specific Transport for NSW standard requirements relevant to the proposed redevelopment based on the engineering concerns and assessments that KBR deems appropriate.

THR CI 12090 ST *Airspace and External Developments* Version 1.0 June 2021

Section 14, *Geotechnical*, requires under Section 14.2 that where the ground penetration in greater than 2 m within 25 m of the rail corridor, unless otherwise directed by Transport for NSW, the developer shall carry out engineering analysis and impact assessment to demonstrate that the effects of the proposed development on the existing rail infrastructure will not cause any adverse effect. This assessment shall be presented in an engineering report. Refer to this standard for the requirements of the reports.

As is mentioned in this section of the standard, significant design modelling will be required by a TAO qualified consultant.

The proposed development is well inside the 25 m zone where analysis is required for the impact on the retaining wall, Wilson St Overbridge, and the RES. Given that the overbridge and RES are on the corners of the site it is recommended that a 3D analysis be undertaken, while the retaining wall is more suited to a 2D analysis in accordance with the requirements of the standard.

The depth of the excavation and the size of the structure for the proposed development require consideration with respect to the adjacent infrastructure. Item that should be assessed included:

- The transmission of horizontal earthquake forces from the lower levels of the proposed building into the ground where they are above the toe level of the retaining wall. This interaction may apply passive pressure from the proposed building exterior basement walls into the section of ground between the cantilever wall and the basement walls. The passive pressure may then and additional horizontal loading the retaining wall, especially if the two structures are in phase.
- Basement structures and floors that form rigid diaphragms between each side of the site, where constructed against Sydney sandstone each side without a gap, will be subject to the existing in-situ stress field changes from a large excavation and may cause significant axial forces in these diaphragms.
- In following, the release of some of the in-situ stress in ground may change the stress field in the influence zone of the embedment area of the cantilever piles and should be review by a TAO geotechnical consultant to confirm the wall capacity is not affected.

Although the existing retaining wall design appears not to have considered any train collision, especially as it has a definite snagging point at the return, it is advised to consider the requirements for collision loads for deflection/abutment walls in AS 5100.1 and AS 5100.2. The resulting pressure that would be transmitted to the proposed building exterior walls, from the 1500kN perpendicular component of the collision load, is unlikely to cause concern but should be include in any analysis.

As the nearest railway line is within a piled wall cutting, a risk assessment shall be undertaken by the proponent in the next stage of the project to determine the need for additional derailment protection with consideration to:

- Site condition, including the cutting and piled retaining wall
- Track geometry, line speed and derailment risk (refer Section 7 for further information)
- Derailment history within the site boundary

- Design assessment on existing protecting structure (piled retaining wall) to AS 5100.1, AS 5100.2, THR CI 12090 ST and T HR CI 12030 ST.

THR CI 12090 ST *Airspace and External Developments* Version 1.0 June 2021

Section 15, *Footings and Basements*, specifically Section 15.2, as also discussed in the *Geotechnical* section, requires that basements that are within 25 m of the rail corridor, or within the zone of influence from the rail corridor using a 45-degree angle measured from the ground level at the rail boundary to the basement excavation level, shall not have any adverse effect on existing or proposed rail infrastructure facilities.

Additional requirements for permanent retention systems for basements including floors, exterior walls, and columns up to ground level, that provides support to the rail corridor and the adjacent assets that have been identified, are as follows:

- Shall be designed for the earthquake AEP in Section 13.5 for the ATW
- Surcharge from rail traffic shall be in accordance with AS 5100.2:2017
- The durability requirements for basements shall be in accordance with Section 13.2
- The design life for basements shall be in accordance with Section 13.3

The use of temporary anchors for the proposed developed shoring may be allowed if the requirements of point A and D are carried out and they are included in the detailed design report as part of the development. This report would require approval from a TAO and subsequently Sydney Trains.

A risk assessment shall be undertaken for each adjacent asset with respect to the new development and included within the detailed design report for the proposed development.

5 Civil

5.1 DESIGN ADVICE BASIS

The purpose is to demonstrate to Transport for NSW and Sydney Trains that all interfaces with the interfacing civil elements have been identified and presented for easy transparent discussions to reduce prolongation with approvals and associated conditions or commentary. Based on the supplied preliminary information and desktop assessment, advice is provided in relation to:

- Access to existing Sydney Trains assets
- Corridor security fence requirements
- Throw risk from the development
- Stormwater runoff

5.2 SITE ANALYSIS

Right of way access easement exists as is defined as 3 m wide starting at the corridor boundary. This easement is assumed to provide maintenance access to the existing Metronet Hut, Digital Train Radio System (DTRS) cabinets and remote radio unit's (RRU) located on the south-eastern corner of the property. There is also an earth grid within the vicinity associated with the rail signalling equipment. The existing right of way access is fully fenced and gated off from public access.

Figure 5.1 - Metronet Hut and DTRS cabinets

The proposed redevelopment is located approximately 7 m from the rail corridor boundary. The boundary is delineated by chain-link fencing located along the top of the existing retaining wall. The rail signalling equipment is accessed through the Site via a pedestrian single swing access gate.

There is an existing catch drain located along the top of the corridor retaining wall which discharges to the rail corridor.

5.3 REGULATORY COMPLIANCE

Table 5.1 - Civil Regulatory Compliance

Standard	Section	Clause	Impact
TMC 511	5	C5-3 Fence Type Matrix	Security fencing
T HR CI 12090 ST	5	5.4 Protection to the rail corridor	Thrown protection
Guideline for the Management of Activities within Electricity Easements and Close to Electricity Infrastructure	9	9. Padmount/kiosk distribution substations	Permitted activities within a right of way easement

5.4 ACCESSIBILITY

Rights of way has been acquired for Sydney Trains to gain access to their asset located on the south-eastern corner of the property. The width of the right of way is defined as 3 m which allows vehicles and plant to travel through from public roads to access the railway assets. The current access from Wilson Street and should be retained and the locking arrangement on gates shall be such that authorised rail personnel including are able to gain access to the equipment. The easement is fully fenced and gated to prevent public access and the proposed development would need to provide fencing to minimise change to the security risk profile.

require upgrading for consistency with the appropriate security fencing type used along the rail corridor boundary.

The proposed development includes for a new mixed-use walkway connecting O'Brien Street and Wilson Street via the eastern edge of the property. This mixed-use walkway includes planter boxes and social spaces along the corridor boundary. Based on the preliminary architectural plans, there is a proposed 2 m wide pathway from O'Brien Street to the south-east corner of the property that can support for an alternative right of way access to the access gate and signalling equipment. This proposal will require further analysis during the detailed design stage, consultation and acceptance by Sydney Trains and AMB. It is possible that modifications to the existing easements associated with property 1/DP1189541 will also be required.

It is therefore considered that the safe maintenance access to the existing Metronet Hut and DTRS cabinets is improved by the proponents' preliminary architectural design with direct access provided via O'Brien Street.

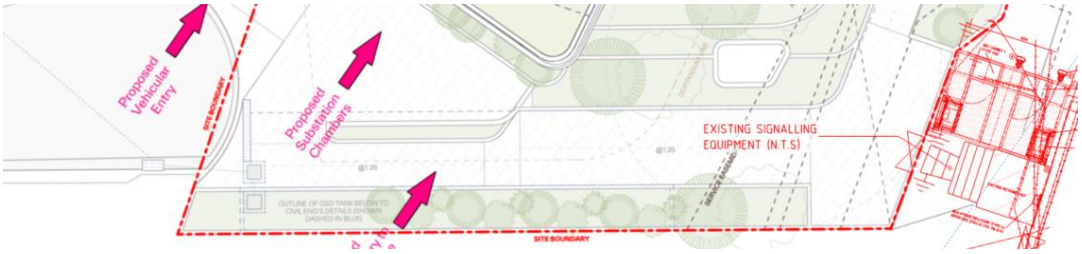

Figure 5.2 – Proposed Alternative Access to Existing Signalling Equipment

5.5 FENCING

The development site is located along an urban corridor and fencing will be provided by the Proponent to enclose the existing signal equipment. Transport for NSW standards require boundary fencing along the corridor to security fencing consistent with TMC 511.

The approved configurations for the security fence are as follows:

- 2400 mm / 2700 mm high close spaced welded mesh fence

- 2400 mm / 2700 mm high palisade fence

Fencing shall comply with CL9 of SPC 511 and tamper resistant, security-type fasteners shall be used.

Other types of fencing may be used subject to the approval of the Chief Engineer Civil. The alternative fence shall provide at least equivalent performance to the close space welded mesh fence.

It is advised not to connect any fencing to railway infrastructure or any installation that would result in load transfer to railway infrastructure.

Electrical Isolation panels shall be installed on fencing, isolation shall be consistent with Section 8.9 of T HR CI 12160 ST *Boundary Fences* and the advice provided in Section 6 of this report. The existing insulated fencing adjacent to OHWS MH 12+295 (at 12.230 km) is to be assessed and replaced as determined through the detailed design phase.

The proposed development plans nominate trees along the corridor boundary. Only low maintenance plant species with non-invasive root systems shall be planted on areas adjacent to rail infrastructure. There shall be no climbing aids within 2m of the fence such as planter boxes or trees that could create a climbing aid. Vegetation must be managed to mitigate the risk of climbing aids in the future.

5.6 THROW RISK

In the next phase of the project, the proponent will need to consider strategies to fully enclose rail corridor facing balconies and terraces as well as limit window openings to 80 mm to address throw risks as required by Section 5.4 of T HR CI 12090 ST Airspace and External Developments. This is applicable to all proposed balconies, roof top terraces and windows on the eastern side of the property that are within 20 m of the rail corridor boundary.

Roof top terraces and openings facing the railway corridor shall not facilitate the throwing of any objects into the rail corridor and shall be fitted with protection screens in accordance with AS 5100.

5.7 STORMWATER RUNOFF

The catch drains along the top of the retaining wall, shown on the retaining wall as-built drawings would require capacity to convey a 2% AEP safely to the track drainage at the bottom of the retaining wall. The proponents preliminary stormwater management plans do not direct any stormwater runoff towards the rail corridor.

It is noted that the plans do propose to remove the existing retaining wall catch drains (drawing C300). It is recommended to retain this as part of the wall structure with further assessment required during the next phase of the project. If it is not possible, the design must demonstrate no impacts to the rail corridors drainage performance for up to a 1% AEP and obtain approval from AMB and Sydney trains.

6 Electrical

6.1 DESIGN ADVICE BASIS

The purpose is to demonstrate to Transport for NSW and Sydney Trains that all interfaces with the interfacing electrical elements have been identified and presented for easy transparent discussions to reduce prolongation with approvals and associated conditions or commentary. Based on the supplied preliminary information and desktop assessment, advice is provided in relation to:

- Earthing and Bonding - Electrolysis
- High Voltage
- Low Voltage
- Assessment of the overhead aerial line span blowout against AS700

6.2 SITE ANALYSIS

The proposed development at 849-859 Pacific Highway, Chatswood, is located parallel to the tracks, and the building is separated approximately 10m from the tracks.

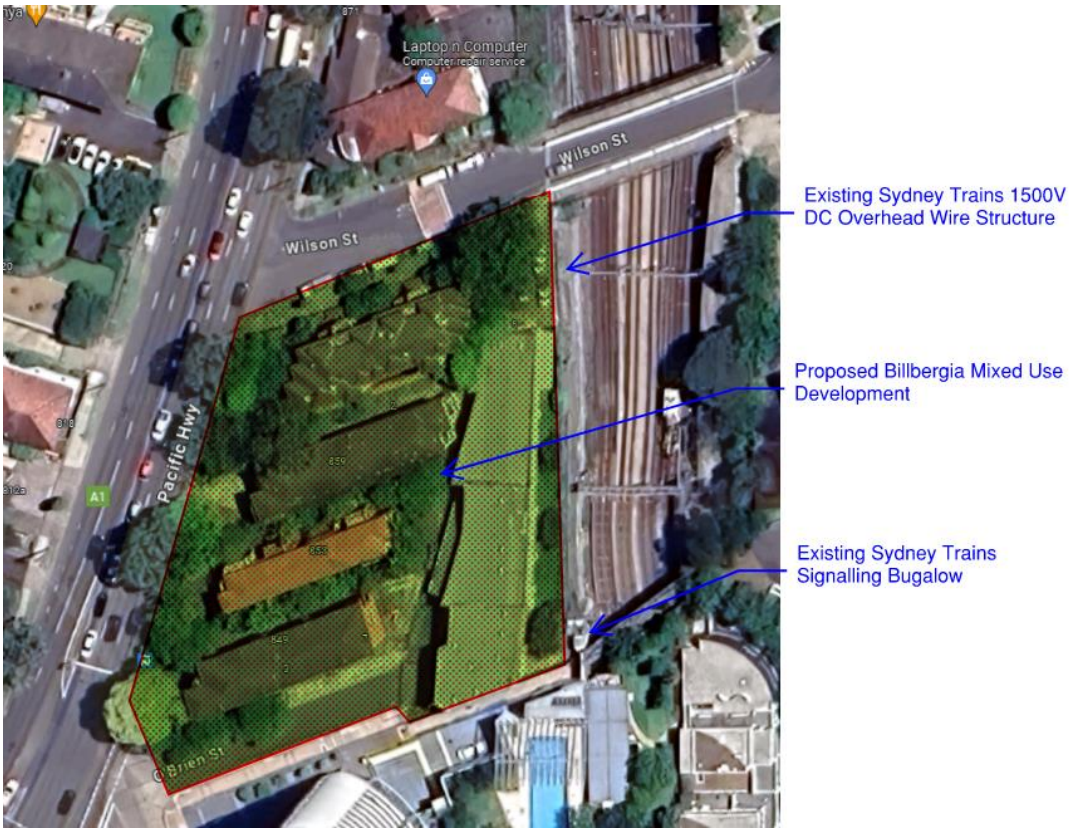

Figure 6.1 - Site Location

Figure 6.2 - Corridor Fence and 1500V DC Overhead Wire Structure mounted on top of the retaining wall capping beam

Figure 6.3 - Signalling cabinets located within the boundary at the South-East side corner

Figure 6.4 - Existing insulated fence at the 1500V DC OHWS MH 12+295

Figure 6.5 - Existing 1500V DC OHWS MH 12+258 with HV and Possible Signalling Cables

The nominal 80 m property boundary line of 849-859 Pacific Highway, Chatswood, is approximately 10 m from the nearest track rail and approximately 6 m from the nearest OHWS mounted on the top of the retaining wall.

An analysis of the site indicates that a Metronet Hut, Digital Train Radio System (DTRS) cabinets and remote radio unit's (RRU) are located on the south-eastern corner of the property. There is also an earth grid within the vicinity of the cabinets associated with the Metronet, DTRS and RRU equipment.

Along the rail corridor, on top of the retaining wall is an existing steel mesh fence with insulated sections at the OHWS locations. This runs the length of the property development, from O'Brien Street to Wilson Street.

The bridge at Wilson street is close to the property buildings however no OHWS equipment is attached and thus may be deemed to be isolated from the rail corridor infrastructure, although it is sitting on top of the existing retaining wall and may be bonded to the steel reinforcement of the retaining wall. As the existing OHWS is also connected to the Retaining Wall there may exist a pathway for stray current.

At O'Brien Street, OHWS equipment is connected to the Chatswood Rail Enclosure Structure (RES) and may be a path for stray current, although the Site is some way from this infrastructure and the likelihood is low.

There are two OHW portals within the section of rail corridor opposite the proposed development, one is connected directly to the retaining wall on the boundary whilst the second portal is a free standing structure. This portal also serves as a cable route for HV and possibly for signalling services.

Attached to the retaining wall is an existing GST run of three troughs. At least one HV service has been identified, the others may contain Signalling and Communications services.

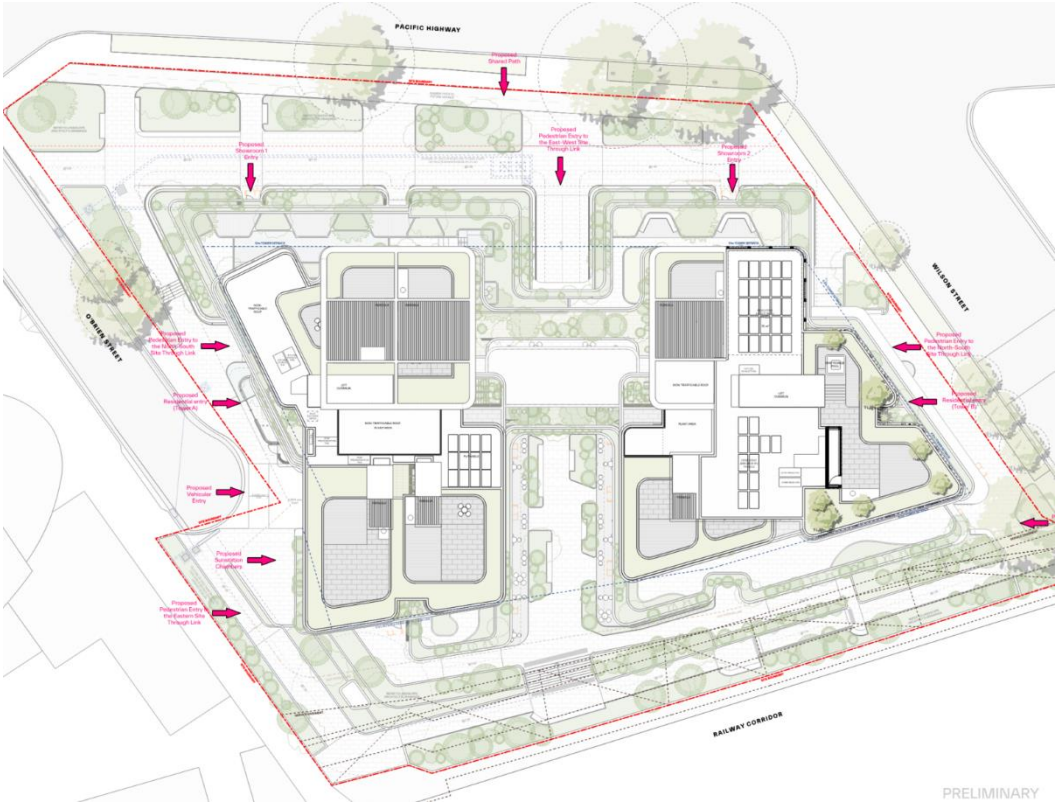

Figure 6.6 - Site Plan

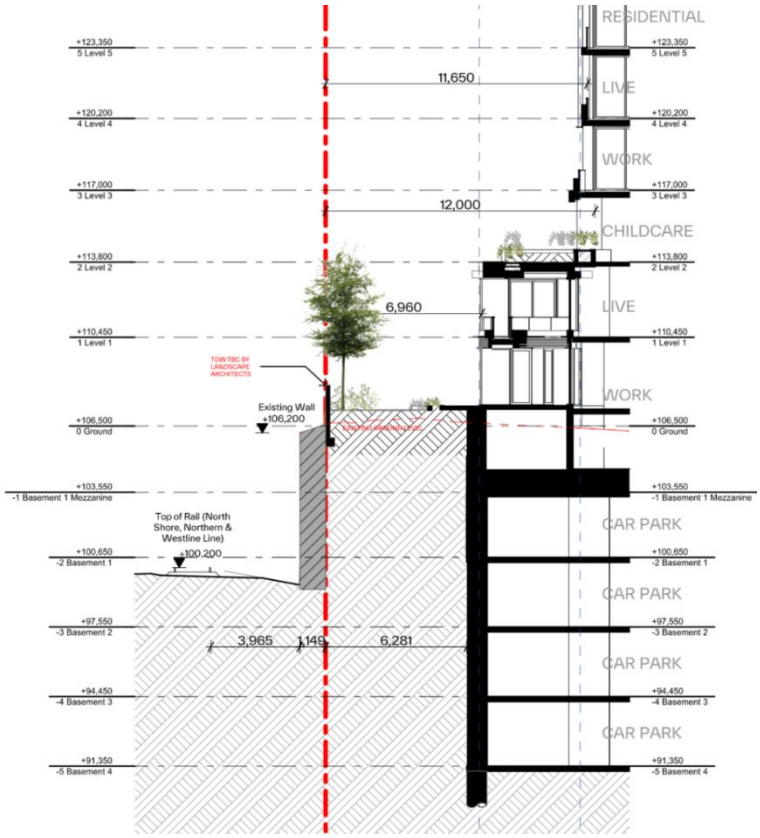

Figure 6.7 - Site Elevation

6.3 REGULATORY COMPLIANCE

Table 6.1 - Electrical Regulatory Compliance

Standard	Section	Clause	Impact
T HR EL 12002 GU	4.1	Continuous Structure	Continuous structures such as metallic fences and troughs provide conductive paths for stray
T HR EL 12002 GU	5.3	Isolation	Provide isolating joint for underground incoming services
T HR EL 12002 GU	5.4	Breaking Continuity	Install insulating panels every 500 m of metallic fences and metallic troughs along the tracks
AS/NZS 7000:2016	3.11.2.1	Structures and Buildings	Minimum clearance from electrical conductors to any non-electrical infrastructure and buildings.

6.4 EARTHING & BONDING

The scope of this section is to evaluate the possibility of steel within the proposed building foundations being subjected to electrolysis damage caused by proximity to sources of stray DC current originating from the adjacent to 1500V DC electrified Sydney Trains services; the T1 North Shore & Western Line and the T9 Northern Line, and the Sydney Metro's Northwest Line.

6.4.1 Review Methodology

Potential hazardous environments can arise as different electrical and utility systems share common areas within, or adjacent to the rail corridor.

Effective earthing, bonding and isolation methods are essential for mitigation of possible inherent electrolysis hazards associated with stray DC current originating from the 1500V DC network and transferred to adjacent infrastructure and Touch Voltage.

The earthing, bonding and isolation design must be in accordance with:

- Relevant standards applicable to each electrical system to mitigate possible stray DC current hazards, and
- Regulatory isolation requirements from rail infrastructure.

Electrolysis

Electrolytic corrosion is due to the ionic flow of DC current exiting a metallic object. Stray DC current requires a voltage source, a conductive electrolytic medium (moist soil), subject metallic object and a current exiting conductive medium (moist soil).

The power source for railway rolling stock drive motors is 1500V DC supplied via a network of overhead contact wires (OHW) and train pantographs with the load current returning via the rail track system to the supply substation. The return current develops a rail voltage of 10-70V DC.

Ideally, all current should return through the rails, but since they are in close contact with the ground through the sleepers and ballast, some current will 'leak' from the rails and return to the substation through the ground. This is called 'stray current' or 'leakage current'.

OHW support structures are directly buried in the soil; hence, stray currents may also originate from leakage across the OHW supporting insulators.

Stray current risk mitigation involves separation (isolation) and insulation of related components.

Isolation of Network Earths

The local Electricity Distributors low voltage supply has a multiple earthed neutral (MEN) system of earthing. The neutral conductor is reticulated throughout the areas through which the rail network operates and provides an accessible method for the transfer of stray DC current.

A MEN supply to the proposed building complex is only permissible if the installation and its earthing electrode are at reasonable distance from the electrified rail or any metal which may be connected to it.

Separation and/or isolation between respective earths must be adequate to mitigate any possible HV supply fault generated Touch Voltage hazards.

6.4.2 Hazard Evaluation

Stray DC Current Hazard Source

Locations of possible sources of stray DC current include:

- The T1 North Shore & Western Line, the T9 Northern Line, and the Sydney Metro's Northwest rail tracks are separated by a nominal 10m from the proposed complex foundations.

Possible sources of stray DC current include:

- Rail track DC voltage created by the return current, and
- Leakage current from OHW structure insulators.

Components completing a possible return path for stray DC current resulting in possible electrolytic corrosion at the proposed development are:

- Mass of general soil adjacent to the rail track.
- Concrete retaining wall consisting of piles and capping beams along the corridor boundary fence.
- GST along the retaining wall with 1500V DC, 11kV and 33kV networks.
- Building substructure support (e.g. steel reinforced concrete, metallic fence).
- Mass of soil surrounding the proposed development and
- A conductive medium returns the current back to the source via an alternate route.

Stray DC Current Hazard Evaluation

The strategy for evaluating satisfactory mitigation of possible stray DC current hazards arising from the existing electrified rail networks into adjacent infrastructure involves an assessment of the following key elements:

- The electrified rail network design ensures a high level of insulation of both rail and OHW from earth for all rail overhead wiring (OHW) and track support systems.
- The electrified rail network design ensures physical separation between rail and overhead wiring structures (OHWS) from other mechanical structures.
- The electrified rail network design ensures periodic physical separation of continuous metallic structures (such as cable trays, reinforcement, and pipes).
- There is adequate separation between adjacent infrastructure (current recipient) and possible current source (OHWS and rail).
- Minimisation of the parallel length of the adjacent infrastructure to the possible stray DC current source.

- The adjacent infrastructure substructure steel/concrete design utilises adequate cover of water-proof high strength concrete and/or water membranes.

Isolation Hazard Evaluation

Structures connected to an MEN earthing system must be isolated from rail track infrastructure, isolation solutions include.

- A minimum 2 m separation between any metallic structure bonded to the MEN earth from any rail infrastructure bonded to rail earth.
- Water, sewerage, and gas service must have an isolating section at, or from, the rail corridor boundary.
- Metallic fence associated with the proposed development shall not be directly connected to Sydney Trains infrastructure.
- Any lighting, control circuits (including support troughs, conduits) located along the side of Sydney Trains fence boundary must be double insulated to ensure isolation between Sydney Trains and the proposed development infrastructures.
- Transfer of a supply faulted EGR from the 33kV cables in GST running along the wall of the retaining wall.

Recommendations

On-Ground Slab

Use of a moisture barrier on the lower floor and basement on-ground slab. The moisture barrier acts as an electrical insulator to the conduction of stray traction current.

Footing

Pad and strip footings will be provided at load-bearing areas. Concrete with a minimum strength of 40 MPa combined with a minimum of 50 mm clear concrete cover is considered to have sufficient electrical resistance to reduce the conduction of a stray traction current and has been confirmed by the Proponent to form part of the developments detailed design.

Piles

Any excavation may need to be supported by reinforced concrete contiguous piles. Similar to footings, the Proponent has confirmed that a concrete strength of 40 MPa with 50 mm of clear concrete cover forms part of the developments detailed design.

Rock and Ground anchors

If anchors are required, it is recommended that from a stray current mitigation point of view that the anchors be isolated to the slab-reinforcing steel. A typical ground tie anchor detail is shown below.

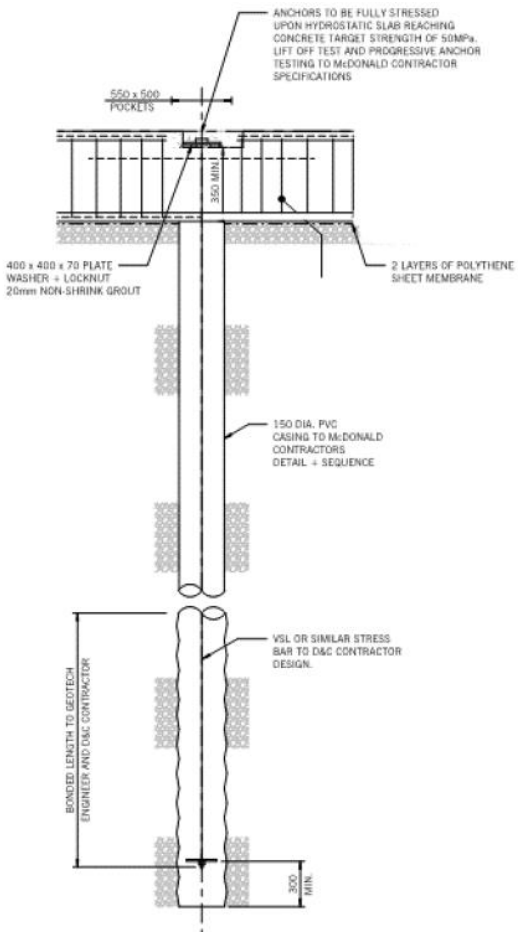

Figure 6.8 - Typical Ground Tie Anchor Details

Incoming Services

Stray traction current can affect metallic water, fire, and gas services. Should stray traction current be picked up by the services, this can result in a corrosion problem on:

- The services, and
- The proposed development of an electrical earth system.

The earth and the water service have a direct interconnection via the MEN system. Current picked up by the water and/or fire services can discharge back to the earth via the earth system, resulting in the earth grid or stake corrosion.

The above corrosion hazard to water, gas and fire services can be eliminated by the installation of an insulating fitting or non-metallic sections in the water and fire services at or close to the boundary of the property as detailed in the Transport for NSW document T HR EL 12002 GU *Electrolysis from Stray DC Current*, Clause 5.3:

- *Water and gas pipes servicing buildings on the Railway Corridor and near 1500 V track to have an isolating joint installed at the boundary.*

Metallic Fences

Section 4.1 Continuous Structures of Standard T HR EL 12002 GU states:

- *Continuous structures such as metallic fences and troughs provide conductive paths for stray dc current because they are close to the tracks for long distance.*

Section 5.4 Breaking Continuity of Standard T HR EL 12002 GU recommends:

– *Install insulating panels every 500 m of metallic fences and metallic troughs along the tracks.*

Noted from the architectural drawings that the building length of approximately 80m is far shorter than the permitted 500m continuous fence length.

Isolated sections will need to be provided opposite OHWS.

Stray Current Hazard Mitigation Summary

Mitigation of possible transfer of stray DC current associated with the proposed development at 849-859 Pacific Highway, Chatswood, from the adjacent electrified T1 North Shore & Western Line, the T9 Northern Line, and the Sydney Metro's Northwest rail tracks is achieved by the following elements:

- The electrical rail network rails are supported on insulating concrete sleepers and ballast.
- The insulation/isolation elements of the proposed electrified rail network must be in accordance with current relevant construction and maintenance Sydney Trains standards.
- The separation distance of the proposed retail building substructure from the adjacent OHWS is approximately 6 m, and the nearest track rail is approximately 10m (compared to station platforms located approximately 1m from the nearest track and may have up to five OHWS located within the platform footprint).
- The parallel length of the proposed building will have a nominal 80m length (compared to the required continuous fence and GST length of 500 m between isolating breaks).
- Wilson Street Overbridge does not support OHW fittings hence, there is no direct stray DC current originating from the bridge structure.
- The steel within the footings are to have 40mm of concrete cover.
- The floor slabs cast against the ground are to be protected by a waterproofing membrane; and
- Incoming underground services are to be installed with insulating or non-metallic sections at the boundary of the property.

6.5 HV AND LV ELECTRICAL SERVICES

6.5.1 High Voltage

The existing GST with the 1500V DC, 11kV and 33kV cables are within the rail corridor and, hence, not accessible from the proposed development site. There is no impact to the GST from the development nor from the GST to the development, although the detailed construction methodology should assess the potential for anything being dropped onto the GST from a height, thus damaging the high voltage cables.

6.5.2 Low Voltage

The earth electrodes of the proposed development shall be designed to be located far away from the corridor. Any lighting and camera poles (including support troughs, conduits) located along the side of Sydney Trains fence boundary must be double insulated.

6.5.3 Signalling cabinets (MetroNet, DTRS and RRU)

The existing Signalling Bungalow is located within the corridor and is currently accessible through the gate at Wilson St. The proposed development appears to improve on the existing access arrangement, though, the final arrangement will require consent from Sydney Trains.

6.6 RAIL CORRIDOR OVERHEAD AND TRANSMISSION LINE

For any overhead line infrastructure a 10 m Power Line Zone clearance shall be applied around structures (i.e. proposed building extents) in accordance with Sydney Trains requirements (refer Figure 6.9 below). This minimum clearance requirement is higher compared with the clearance per Table 3.7 of AS/NZS 7000:2016. Any activities within the Power Line Zone must be undertaken with prior Sydney Trains consent and in accordance with the WorkCover Code of Practice.

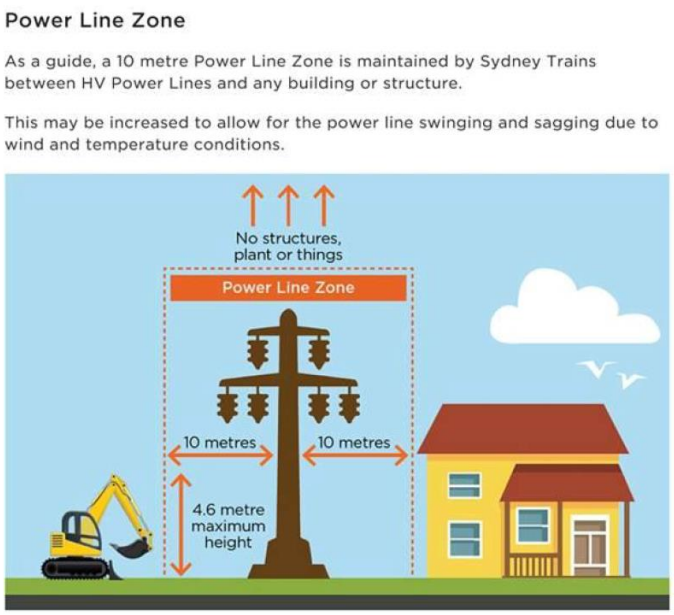

Figure 6.9 - Sydney Trains clearance requirements

Within the section of rail corridor adjacent to the proposed development, there is existing 1500V DC overhead line located more than 10 metres from the Northern edge of all proposed buildings. As this clearance is greater than the Power Line Zone, a detailed blowout assessment on the 1500VDC system is not required. The buildings are compliant to AS/NZS 7000:2016 and Sydney Trains standards with respect to these assets.

There is no overhead transmission line infrastructure within the rail corridor adjacent to the proposed development and hence a detailed blowout assessment is not required.

7 Permanent Way

7.1 DESIGN ADVICE BASIS

The purpose is to demonstrate to Transport for NSW and Sydney Trains that all interfaces with the interfacing permanent way elements have been identified and presented for easy transparent discussions to reduce prolongation with approvals and associated conditions or commentary. Based on the supplied preliminary information and desktop assessment, advice is provided in relation to:

- Transit Space
- Safe Places
- Derailment Potential

7.2 SITE ANALYSIS

7.2.1 Transit Space

As defined in the Engineering Standard ESC 215, Transit Space is '*a clearance envelope that provides for the safe passage of defined rolling stock and for infrastructure service requirements.*' This envelope is typically referred to as the Structure Gauge, within which no structures are permitted to be located.

The location of the development site at 8 Wilson Street, is wholly outside of the existing railway boundary and positioned to the west side of the 4-track railway corridor, which is itself within a retained cutting that varies in depth between approximately 4 to 5 m (Figure 7.1). As such the proposed building is not in close proximity to the adjacent rail tracks, and therefore clearances to the structure gauge do not need to be considered in this instance.

Figure 7.1 - Retained cutting adjacent to site

7.2.2 Safe Places

A Safe Place is an area within or outside the danger zone where authorised staff can stand safely during the passage of rail traffic. They are a requirement within the Transport for NSW Metropolitan Heavy Rail network.

The provision of a Safe Place does not need to be considered as part of this project as the works are to take place outside of, and without adverse impact to, the existing rail boundary. As such, there will be no changes required to the current access and maintenance procedures within the rail corridor.

7.2.3 Potential for Derailment

Factors to consider in reviewing the risk of a potential train derailment include the track geometry, the presence of track components, the existing trackform, and the nature, speed and frequency of trains using the section of track.

At this location there are 4 tracks, as operated by Sydney Trains (outer two tracks) and Sydney Metro (inner two tracks), with the Down Shore track of the Sydney Trains T1 line being the closest track to the site at 8 Wilson Street. The line speed through this section is 80 km/h, with passenger trains operating at a high frequency. The track comprises of a relatively straight horizontal geometry with no turnouts or special trackwork components present in the vicinity, i.e., no sharp horizontal curves or rail discontinuities that could be potential triggers for a train derailment, in association with overspeed or track failure events.

It is noted that there is a change in the track structure from concrete slab track to ballasted trackform as the tracks depart the northern end of the Chatswood Rail Enclosure Structure (RES) (Figure 7.2). These changes introduce a change in the track stiffness, which are commonly addressed through the application of a transition / approach slab beneath the ballasted track to ensure no abrupt change in stiffness occurs. Thereby, limiting the induced stresses that could lead to a rail break, and a potential cause for a derailment.

Figure 7.2 - Down Shore track at north end of RES

The vertical grade between the Sydney Trains and Metro Trains tracks changes at this point, whereby the Metro tracks begin to enter the tunnel dive. It is considered that because of this height difference, the T1 Down Shore track has been provided with guardrails within the 4ft of the track as a mitigation measure against derailed trains falling onto the lower-level Metro tracks.

In the event of a derailment, the guardrails would also provide mitigation against trains impacting the retaining wall of the cutting. But, if this were to occur, then the wall itself and the depth of the cutting would provide a barrier against the trains ability to collide with the development building structure. However, taking into account the above factors, it is considered that the likelihood of a train derailment occurring at this location is very unlikely.

7.3 REGULATORY COMPLIANCE

Table 7.1 – Permanent Way Regulatory Compliance

Standard	Section	Clause	Impact
T HR CI 12090 ST	9.1	Track Clearance	Train collision with building structure or personnel
ESC 215	5	Application	Minimum clearance requirements
T HR CI 12073 ST	10	Clearances	Provisions for Safe Places

8 Conclusion and Recommendation

Based on the findings of the preliminary assessment, it is recommended that the Proponent demonstrate that the temporary and permanent works are not affected by or cause impact to the existing railway infrastructure during the next stage of the project.

The following conclusions can be drawn from this preliminary assessment and will be verified by the Proponent during the next stage of the project:

- Down Shore Outer Pile Retaining Wall
  - It is considered that the likelihood of a train derailment occurring adjacent to the site location is very unlikely. Despite this, the proponent shall undertake a risk assessment be to determine if any additional deflection resistance is required by the development.
  - The proponents preliminary stormwater management plans do not direct any stormwater runoff towards the rail corridor. However, the proponent is to re-assess the retention of the existing retaining wall catch drains.
- Maintenance Access
  - The safe maintenance access to the existing Metronet Hut and DTRS cabinets is improved by the proponents' preliminary architectural design with direct access provided via O'Brien Street.

Given the proponents past experience with developing adjacent to the railway corridor and the supplied preliminary documentation, the proposed development does not currently present as a high-risk project and provided the appropriate design and construction mitigation measures are in place, it is not anticipated to impact onto the safe operations of the Sydney Trains and Sydney Metro railway network.

In support of obtaining concurrence from the relevant railway authority, Sydney Trains and Sydney Metro, it is recommended to comply with relevant details stipulated in AMD-EMI-GUI-001 *Guide to Working in Sydney Trains*, T HR CI 12090 ST *Airspace and External Developments*, SM-20-00081444 *Sydney Metro Underground Corridor Protection Technical Guideline* and NSW Government Department of Planning *Development Near Rail Corridors and Busy Roads – Interim Guideline*.

The detailed design of the proposed development shall produce a dedicated report to detail the works primarily undertaken along the eastern site boundary to demonstrate and address at a minimum:

- Structural and geotechnical design analysis and modelling on the proposed development and interaction with existing railway infrastructure including the Wilson Street OLB, Down Shore Outer Pile Retaining Wall, Chatswood RES and the Metronet Hut and DTRS cabinets.
- Demonstrate sufficient derailment protection of the development to AS 5100. This is anticipated to be achieved through a risk assessment as outlined in Section 4.4.1 due to unlikely event of derailment at the development location.
- Demonstrate no negative impact to the existing corridor drainage system, maintenance access to the Metronet Hut and DTRS cabinets, and protection of the corridor from unauthorised access and thrown objects.
- Confirm no impact to the performance and operation of the OHWS MH 12+295 (at 12.230 km) and OWHS MH 12+258 (12.192km) attachments fixed to the capping beam of the piled retaining wall.

- Detailed sections at each adjacent railway interface clearly showing the levels and distance of all structures. All sections are required at the nearest relationship to each of the identified interfacing railway assets. Further description of content to consider is in Section 4.3.2.
- Safety in Design (SiD) process and hazard mitigation including any potential residual risks proposed to be transferred and accepted by the relevant railway operator. For the proposed development, SiD mitigation measures should address:
  - Electrolysis risk and mitigation measures (refer to Section 6).
  - Vandalism and climbing aids to gain entry into the railway corridor.
  - Derailment protection of proposed development, taking into consideration the existing railway corridor, piled retaining wall and Wilson St OLB abutment.
- Development of a Construction Management Plan (CMP) and relevant Safe Work Method Statements (SMWS) for the proposed works in relation to managing construction activities nearby the railway corridor including but not limited to:
  - Crane, concrete pump and other aerial operations.
  - Scaffolding and other temporary structures.
  - Excavation and shoring methodology.
  - Safe maintenance access to railway assets during construction.
  - Impacts to railway operations and maintenance (track possessions).
  - Clearance to DC overhead wiring and protection measures if within 6 m.
- Development of a Track and Rail Asset Monitoring Plan for monitoring movement in the railway infrastructure associated with the construction of the proposed development.
- Development of a maintenance plan for the portion of the proposed development facing the railway corridor to ensure minimal and acceptable impacts (if any).
- Evidence of railway operator stakeholder consultation.

The detailed design report shall be reviewed and assured by a TAO organisation(s) that hold competency for the relevant design elements interfacing with the railway corridor prior to submission to Sydney Trains and Sydney Metro for the purpose of obtaining concurrence and/or the closure of conditions of consent related to the proposed development.

Annexure E: Detailed Site Investigation Report Prepared by REDITUS

reditus.com.au

REDITUS

Detailed Site Investigation

849, 853 & 859 Pacific Highway and 2 Wilson Street, Chatswood NSW

Project No. 23210
Version 1

30 November 2023

Reditus Consulting Pty Ltd
ABN: 34 631 168 502

Detailed Site Investigation

849, 853 & 859 Pacific Highway and 2 Wilson Street, Chatswood NSW

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This report has been prepared for BBG Management Pty Ltd in accordance with the terms and conditions of appointment for proposal P3210 dated 31 August 2023. Reditus Consulting Pty Ltd (ABN 34 631 168 502) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

DOCUMENT HISTORY

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Date	30 November 2023
Version	Version 1
Description	Original version of report

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Abbreviations

TERM	DEFINITION
° C	Degrees Celsius
ACM	Asbestos Containing Material
AEC	Area of Environmental Concern
AF/FA	Asbestos Fines / Fibrous Asbestos
AFFF	Aqueous Film Forming Foam
AHD	Australian Height Datum
ASC	Assessment of Site Contamination
BGL	Below Ground Level
BTEX	Benzene Toluene Ethylbenzene Xylene
BTOC	Below Top of Casing
C&D	Construction and Demolition
CEC	Cation Exchange Capacity
COC	Chain of Custody
COPC	Contaminants of Potential Concern
CSM	Conceptual Site Model
DO	Dissolved Oxygen
DQO	Data Quality Objective
EI	Environmental Investigation
EIL	Ecological Investigation Level
EPA	Environment Protection Authority
ESG	Environmental Services Group
ESL	Ecological Screening Level
GDE	Groundwater Dependant Ecosystem
HIL	Health Investigation Level
HSL	Health Screening Level
IBC	Intermediate Bulk Container
LGA	Local Government Area
LIR	Land Insight and Resources
LOR	Limit-Of-Reporting
ML	Management Limits
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council

TERM	DEFINITION
NEPM	National Environment Protection Measure (2013)
NPI	National Pollutant Inventory
NSW	New South Wales
PAH	Polycyclic Aromatic Hydrocarbons
OC	Organic Carbon
OCP	Organochloride Pesticides
OPP	Organophosphorus Pesticides
PACM	Potentially Asbestos Containing Material
PCB	Polychlorinated Biphenyls
PD NSW	Property Development New South Wales
PFAS	Per- and polyfluoroalkyl Substances
PID	Photoionisation Detector
PPM	Parts Per Million
PQL	Practical Quantification Limit
QA/QC	Quality Assurance / Quality Control
RAP	Remedial Action Plan
RPD	Relative Percentage Difference
SAC	Soil Assessment Criteria
SD	Standard Deviation
SDS	Safety Data Sheet
SWL	Standing Water Level
TOC	Top-of-Casing
TPH	Total Petroleum hydrocarbons
TRH	Total Recoverable Hydrocarbons
UPSS	Underground Petroleum Storage Systems
USCS	Unified Soil Classification System
UST	Underground Storage Tank
VOC	Volatile Organic Compounds

Executive Summary

Reditus Consulting Pty Ltd (Reditus) was engaged by BB Wilson Property Pty Ltd (Billbergia) to complete a Detailed Site Investigation (DSI) at 849, 853, and 859 Pacific Highway and 2 Wilson Street Chatswood NSW (the site).

The site is approximately 3, 127 m^2 and currently comprises four multi-level residential apartment buildings with two single level underground carparks beneath 2 Wilson Street and 853 Pacific Highway. The site comprises four lots (SP 52947, SP 1496, SP 60178 and SP 10110) and SP2 land fronting the Pacific Highway. The site is proposed to be redeveloped in conjunction with the adjacent lot (8 Wilson Street) into a 27 storey mixed use development including a two storey podium with mixed commercial uses, two split residential towers and 4 level basement parking. A DSI has also been completed at 8 Wilson Street, Chatswood, and is reported under separate cover.

The objectives of the DSI were to:

- Assess whether Contaminants of Potential Concern (CoPCs) (if detected above site assessment criteria) present an unacceptable risk of exposure to human health and/or the environment, in the context of the proposed redevelopment.
- Provide advice on whether the land is suitable or could be made suitable (from a contamination perspective) for the proposed land use.
- Provide recommendations for further investigation, management, or remediation (if required).
- Conform to the requirements of the National Environmental Protection Council (Assessment of Site Contamination) National Environment Protection Measure 1999 (as amended in 2013) ('ASC NEPM, 2013') and the NSW Environmental Protection Authority (NSW EPA 2020) Contaminated Land Guideline for *Consultants Reporting on Contaminated Land*.

The objectives of this investigation were achieved by completing the following:

- A review of historical reports.
- A desktop review of the site history and setting to supplement data provided in historical reports.
- An intrusive soil and groundwater assessment.

Based on a review of the site history, observations made during fieldwork, results of laboratory analysis and the proposed land use scenario, Reditus concludes the following:

- Historical sources of potential contamination included fill material, potentially hazardous building materials, and an offsite service station.
- Fill material was predominantly a silty to clayey SAND topsoil except for BH03 which was a silty clay underlying the concrete slab and extended to a maximum of 0.8 m. Anthropogenic materials were identified within fill material in most of the boreholes and included terracotta, concrete, brick and tile.
- Groundwater was encountered between 99.481 mAHD (11.85 mbTOC) and 103.291 mAHD (11.85 mbTOC) and was observed to be slightly turbid and brown with no odour.
- Concentrations of contaminants of potential concern (CoPC) in soil were reported below the applicable site assessment criteria with the exception of TRH F3 fraction in MW02-0.1 and benzo(a)pyrene in BH05-0.1 which both marginally exceeded the ecological screening level (ESL).
  - These exceedances are within an order of magnitude of the site assessment criteria and as such are unlikely to preclude the proposed development. It is likely that shallow fill material will be removed off site as part of bulk excavation works.
- Concentrations of CoPC in groundwater were reported below the site assessment criteria with the exception of copper (MW02), nickel (MW03) and zinc (MW02 and MW03) which exceeded the site assessment criteria.
  - These exceedances are within an order of magnitude of the site assessment criteria and are considered to be typical concentrations of metals within groundwater in an urban environment.

Based on the findings of the DSI, Reditus considers that the site can be made suitable for the proposed mixed use residential/commercial development, subject to implementation of the following recommendations.

Based on the findings of the investigation, Reditus recommends the following to make the site suitable in the context of the proposed development.

- The shallow fill soils at BH01, BH05 and MW02 are required to be removed or managed due to minor exceedances of the ecological screening criteria for benzo(a)pyrene, TRH and zinc. It is assumed that the soils will be removed as part of the bulk excavation works however, if the soils within this area are to remain onsite, they will require remediation through removal or management of the soils. This will be confirmed after a review of the finalised design of the site is performed.
- Completion of a pre-demolition hazardous materials survey to inform appropriate safety measures for demolition.

Reditus considers that the consent authority may be satisfied that the required considerations of Clause 4.6 of State Environmental Planning Policy (Resilience and Hazards) 2021are satisfied for the following reasons:

- This DSI (Reditus) completed on the development site has adequately assessed the site history to identify potential sources of contamination, and has suitability assessed the potential risk posed by contaminants to health and the environment. As such, Clause 4.6(1)(a) of SEPP (Resilience and Hazards) 2021 has been successfully achieved.
- This DSI has determined that the land can be made suitable in its current state for the purposes for which the development is proposed to be carried out (as a mixed use residential/commercial development). As such, Clause 4.6(1)(c) of SEPP (Resilience and Hazards) 2021 has been successfully achieved.
- The DSI has been completed in accordance with the contaminated land planning guidelines, satisfying Clause 4.6(2) and 4.6(3) of SEPP (Resilience and Hazards) 2021.

1 Introduction

Reditus Consulting Pty Ltd (Reditus) was engaged by BB Wilson Property Pty Ltd (Billbergia) to complete a Detailed Site Investigation (DSI) at 849, 853, and 859 Pacific Highway and 2 Wilson Street Chatswood NSW (the site). The location and layout of the site is presented in **Figure 1**, **Appendix A**.

This DSI was completed to support the intended Development Application (DA) in accordance with State Environmental Planning Policy (Resilience and Hazards) 2021 requirements. The DSI includes assessment to define the nature, extent, and degree of contamination (if any); to assess potential risk posed by contaminants to health and the environment (if any); and to obtain sufficient information to assess environmental risk and inform recommendations to render the site suitable (if required) for the proposed redevelopment.

1.1 Background

The site is approximately 3, 127 m^2 and currently comprises four multi-level residential flat buildings with two single level underground carparks beneath 2 Wilson Street and 853 Pacific Highway. The site is legally described as the following lots:

- SP 52947 (2 Wilson Street)
- SP 1496 (849 Pacific Highway)
- SP 60178 (853 Pacific Highway)
- SP 10110 (859 Pacific Highway)
- SP2 land fronting Pacific Highway.

The site is proposed to be redeveloped (in conjunction with 8 Wilson Street) into a 27-storey mixed use development which includes:

- A two-storey podium with a mix of commercial uses (showroom and live/work shop top units).
- Two split residential towers with communal open space and circa 250 apartments.
- 4 level basement parking and basement loading dock.

A 'Limited Environmental Investigation' was completed on-site by Geotest Services in 2021 (Geotest, 2021) which concluded that based on the limited desktop assessment, site walkover and field-sampling program that the site presented a low-risk of contamination and was considered suitable for continued residential land use.

Reditus notes that this report, including its conclusions and recommendations, must be read in conjunction with the Statement of Limitations provided in **Section 14.**

1.2 Objectives

The objectives of the DSI were to:

- Assess whether Contaminants of Potential Concern (CoPCs) (if detected above site assessment criteria) present an unacceptable risk of exposure to human health and/or the environment, in the context of the proposed redevelopment.
- Provide advice on whether the land is suitable or could be made suitable (from a contamination perspective) for the proposed land use.
- Provide recommendations for further investigation, management, or remediation (if required).
- Conform to the requirements of the National Environmental Protection Council (Assessment of Site Contamination) National Environment Protection Measure 1999 (as amended in 2013) ('ASC NEPM, 2013') and the NSW Environmental Protection Authority (NSW EPA 2020) Contaminated Land Guideline for *Consultants Reporting on Contaminated Land*.

1.3 Scope of Works

The following scope of works was completed by Reditus to achieve the investigation objectives.

1.3.1 DESKTOP ASSESSMENT

- A desktop evaluation of historical reports, planning documentation, surrounding land uses and environmental setting.
- Identification of areas of environmental concern (AEC) (if any) to target during the intrusive investigation.
- A site walkover to characterise the property setting, including inspection of the site surface for visual or olfactory signs of potential contamination and/or contaminant sources.

1.3.2 SOIL INVESTIGATION

- Completion of project preliminaries, including Work, Health and Safety (WHS) documentation, a review of the dial-before-you-dig search and underground service location.
- Completion of seven (7) boreholes to a minimum of 0.5 m into natural material or refusal, whichever was encountered first.
- Soil samples were collected from each borehole from near surface (0.1-0.3 m below ground level (bgl)), 0.5 m bgl and 1.0 m bgl and every metre thereafter, and, where changes in geology or gross contamination was observed.
- Screening of fill material for visual presence of potential asbestos containing materials (PACM), nominally near surface material and every metre of fill material thereafter.
- Each soil sample location was logged in general accordance with the Unified Soil Classification System (USCS) and screened in the field using a Photo-ionisation Detector (PID) to detect the potential presence of volatile organic compounds (VOCs).
- Submission of primary soil samples and collected Quality Assurance/Quality Control (QA/QC) samples to the nominated National Association of Testing Authorities (NATA) accredited laboratory under a completed Chain of Custody (CoC) for analysis of:
  - Total recoverable hydrocarbons (TRH).
  - Benzene, toluene, ethylbenzene, xylenes (BTEX).
  - Polycyclic aromatic hydrocarbons (PAH).
  - Eight priority metals (including arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc).
  - Organochlorine pesticides (OCP) and organophosphate pesticides (OPP) (fill samples only).
  - Asbestos quantification (fill samples only).

1.3.3 GROUNDWATER INVESTIGATION

- Two (2) boreholes were extended to a maximum depth of 13.0 m bgl and converted into groundwater monitoring wells.
- Monitoring wells were surveyed for their relative height using a RTK Rover GPS System and developed to remove sediment and fines introduced during drilling/installation and to grade the gravel pack.
- The two onsite wells were gauged and sampled using low-flow techniques. The offsite well was gauged to enable groundwater flow elevation contours to be mapped.
- Submission of primary groundwater samples and QA/QC samples to a NATA accredited laboratory under a CoC for analysis of:
  - TRH.
  - BTEX.
  - PAH.
  - Eight priority metals.
  - Major cations/major anions and ionic balance (primary samples only).

- Nutrients (ammonia, nitrate, total nitrogen, oxidised nitrogen, total phosphorus and reactive phosphorus).
- Microbiological organisms (E. coli).

1.3.4 REPORTING

- Preparation of this DSI report in general accordance with the NSW EPA (2020) *Contaminated Land Guidelines – Consultants Reporting on Contaminated Land*, NEPC (2013) *National Environmental Protection (Assessment of Site Contamination) Measure (NEPM)*, SEPP Resilience and Hazards (2021) and other relevant NSW EPA reporting guidelines.

2 Site Identification

The site identification details have been prepared in general accordance with the NSW EPA (2020) Consultants Reporting on Contaminated Land and the ASC NEPM (2013) Field Checklist for 'site Information'. The site identification information is summarised in Error! Reference source not found. below.

Table 1. Site Identification

ITEM	DETAIL
Address	849, 853 and 859 Pacific Highway and 2 Wilson Street, Chatswood NSW 2067
Title and Land Information	SP 52947 (2 Wilson Street) SP 1496 (849 Pacific Highway) SP 60178 (853 Pacific Highway) SP 10110 (859 Pacific Highway) SP2 land fronting Pacific Highway
Site Area	3, 127 m^2
Local Government Area	Willoughby Council
Site Coordinates to the approximate centre of the site (GDA2020 MGA Zone 56)	Easting: 331538.402 Northing: 6259306.013
Zoning	MU1 – Mixed Use (Willoughby Local Environmental Plan 2012) SP2 – Infrastructure Classified Road (Willoughby Local Environmental Plan 2012) *fronting Pacific Highway*
Current Land Use	Four (4) multi-level residential flat buildings with two single level underground carparks beneath 2 Wilson Street and 853 Pacific Highway.
Future Land Use	The site is proposed to be redeveloped (in conjunction with 8 Wilson Street) into a 27-storey mixed use development which includes a two-storey podium with a mix of commercial uses, two split residential towers with communal open space and 4 level basement parking and basement loading dock.
Trigger for Assessment	To provide advice on the site's suitability for the proposed development from a contamination perspective. Such advice will inform a development application to be submitted to Council.
Surrounding Land Uses	The land uses currently surrounding the site include: • **North:** Wilson Street, followed by a former commercial building currently being demolished) and a Shell service station. • **South:** O'Brien Street followed by several high rise mixed-use buildings and a car wash. • **West:** Pacific Highway, followed by medium to high density residential buildings. • **East:** Former light industrial building (which will form part of the proposed development) the railway corridor followed by medium to low-density residential properties.
Site Layout	**Figure 2**, **Appendix A**

2.1 Site Condition

A site visit was conducted by Reditus' Environmental Scientist, Ross Kingswell on 2 November 2023. The following site observations were recorded during the site visit:

2.1.1 2 WILSON STREET

- The lot consists of a four-storey, high-density residential building with one level of underground basement parking.
- A landscaped courtyard is situated on the western side of the building. The building is constructed of brick with a tiled roof.

2.1.2 859 PACIFIC HIGHWAY

- This lot consists of a three-storey residential brick building with comprising ground level garage parking.
- A concrete driveway runs along the northern and eastern boundary of the lot. A concrete path runs along the southern boundary of the lot.
- The front of the property (i.e. western boundary) consists of a driveway accessed from the Pacific Highway and a small, grassed area which was often used for additional parking.
- A placard at the front of the property stated that asbestos containing materials (ACM) were contained within the structure.

2.1.3 853 PACIFIC HIGHWAY

- The property consists of a three-storey residential brick building with a one level basement carpark.
- A small, grassed area is situated at the front of the property with some landscaped areas surrounding the property.

2.1.4 849 PACIFIC HIGHWAY

- The property consists of a three-storey brick building with a split level carpark beneath the building which is accessible via O'Brien Street.
- The northern boundary and the western portion of the site are covered by grass and landscaping.

2.1.5 GENERAL SITE OBSERVATIONS

- No signs of current or former industrial uses were noted.
- No stored chemicals or signs of underground storage tanks were noted.
- No visual or olfactory indicators of contamination were observed across the site.
- ACM is likely to be contained within 859 Pacific Highway based off the placard observed at the front of the property. Although not noted, it is likely that the other three properties would also contain ACM.

3 Site Setting and Surrounding Environment

A summary of the site setting surrounding environment obtained from PSI completed by Reditus (March 2023) is provided below in **Table 2.**

Table 2. Site Setting and Surrounding Environment

ITEM	DETAIL
Topography	The site has an approximate elevation of 100 m Australian Height Datum (AHD). The site follows a minor grade towards the south, with each individual lot relatively flat.
Hydrology	Blue Gum Creek, a tributary of Lane Cove River, leading out into Sydney Harbour is located approximately 540 m north-west from the site. Surface water is likely to flow towards Blue Gum Creek and local storm water systems.
Regional geology	A review of the Sydney 1:100 000 Geological Series Sheet 9130, shows the site is underlain by middle-Triassic aged Ashfield Shale of the Wianamatta Group. The lithology is described as black to dark-grey shale and laminate.
Soil Classification	The soil landscape likely to be found on site is Glenorie (9130gn): Shallow to moderately deep (200 cm) Yellow Podzolic Soils (Dy5.11) and Gleyed Podzolic Soils (Dg4.11) along drainage lines. Dominant soil materials include friable dark brown loam; hard setting brown clay loam; whole-coloured, reddish-brown, strongly pedal clay; mottled grey plastic clay; and brownish-grey plastic silty clay.
Site Soil Description	**Fill** • Fill material was predominantly a silty to clayey SAND topsoil except for BH03 which was a silty clay underlying the concrete slab. • With the exception of BH02 and MW03 where fill was identified to depths of 0.8 m and 0.6 m respectively, fill thickness was between 0.1 and 0.2 m. • Anthropogenic materials were identified within fill material in most of the boreholes and included terracotta, concrete, brick and tile. **Natural** • Natural material was encountered in each borehole, underlying the fill material and was identified as orange to red brown silty CLAY. Inclusions were noted to be fine to medium grained gravels and traces of ash. **Rock** • Rock was encountered between 3.0 and 4.0 m bgl and was identified to be siltstone overlying shale which was encountered between 9 and 10 metres.
Acid Sulfate Soils (ASS)	Based on reviews of the Australian Soil Resource Information System and the NSW Government Acid Sulfate Soils Risk Map provided in the Sharing and Enabling Environmental Data (SEED) database (www.seed.nsw.gov.au), the site is located within an area of low probability of occurrence for acid sulphate soils. A review of the Willoughby Local Environmental Plan (2012) Acid Sulfate Soil Map, the site is in Class 5 land. Development consent is required for the carrying out of works in Class 5 land within 500 metres of adjacent Class 1,2, 3 or 4 land that is below 5 mAHD and by which the water table is likely to be lowered below 1 metre AHD on adjacent Class 1,2,3 or 4 land. Based on the above, it was deemed not necessary to assess ASS as part of this assessment.

ITEM	DETAIL
Registered Groundwater Bore Search	A review of Bureau of Meteorology's Australian Groundwater Explorer indicated that there are 18 registered bores within a 1 km radius of the site. Sixteen bores are used for monitoring purposes and the other two (2) are used for purposes listed as "other". These bores were located 661 m and 727 m to the south of the site. The drilled depths of the wells ranged from 2.0 – 162.6 m below ground level (mbgl). The closest bore is located 500 m north of the site. Thirteen bores are located to the north of the site and five (5) located to the south east of the site.
Regional Hydrogeology	A review of hydrogeology map of Australia (Geoscience Australia) indicated the aquifer type beneath the site is Mesozoic aged sediment, porous, extensive and of low-moderate productivity.
Site Hydrogeology	Local or perched groundwater at the site is expected to flow in a westerly direction, towards Blue Gum Creek to the west. However, it may potentially flow in an easterly direction, towards Scotts Creek, based on the local topography and the proximity and flow direction of these Creeks. It is expected that regional groundwater would be present at approximately 5.0 to 10 m depth below ground level, in the underlying shale. Groundwater in the Wianamatta shales is known to be both hard and saline.
Depth to Water Table	The depth to groundwater ranged between 7.75 mbgl (MW03) and 11.85 mbgl (MW02).
Yield and Inferred Groundwater Quality	There is no available information on the yield and groundwater quality in the surrounding area.
Groundwater Dependant Ecosystems	The Groundwater Dependant Ecosystem (GDE) Atlas reports that the are no identified groundwater dependant ecosystems within a 2km radius of the site.
Groundwater Embargoes	No groundwater embargoes apply to the site.
Sensitive Environments	View Street Reserve, a children's playground is located approximately 130 m south-west from the site. Beauchamp Park, a public sporting field is located approximately 480 m north-east from the site. Blue Gum Creek is located approximately 540 m north-west from the site.

4 Site History

4.1 Historical Aerial Photographs

The following historical aerial photography summary has been sourced from the Geotest Limited Environmental Investigation completed in October 2021 (Geotest, 2021).

The site has been primarily used for residential purposes since before 1943. It is apparent that 849 and 859 Pacific Highway were constructed circa 1965, 853 Pacific Highway and 2 Wilson Street were constructed between 1986 and 2005. The light industrial building which will form part of the proposed development was constructed between 1965 and 1970. The north-shore train line has been present to the east of the site since before 1943.

The Geotest (2021) report is provided in **Appendix G.**

4.2 Previous Investigations

Table 3. Previous Investigations

ITEM	DETAIL
Limited Environmental Investigation (Geotest 2021)	
Document Information	Limited Environmental Investigation – 849-859 Pacific Highway & 2 Wilson Street, Chatswood NSW 2067 Dated 6 October 2021
Prepared by	Geotest Services
Prepared for	Sanctuary Partners
Purpose	To identify preliminary environmental contamination risks at the site to support the client's acquisition of the Site.
Findings	**Scope of Works** • Site inspection and limited desktop assessment. • Completion of four boreholes, including sample collection and analysis. **Results** • The site inspection identified the following: – Assumed that hazardous materials such as lead and ACM were used as part of building construction and may be present in 849 to 859 Pacific Highway. 2 Wilson Street appears to have been constructed more recently. – No underground or above ground storage tanks were observed. – No obvious visual or olfactory contamination indicators were observed. – Vegetation at the site was in good condition with no signs of extensive stress or dieback. – Some elevated gardens and landscaping were present. It was assumed that fill (in addition to other topsoils across the site) is present within these areas. • Three (3) Areas of Environmental Concern were noted: – Footprints of former structures and deteriorated HAZMAT material. – Fill under building footprints, behind retaining/structural walls or any other uncontrolled fill area. – Adjacent industrial uses including light industrial office to the east and service station to the north. • Four boreholes were completed on-site, due to access restraints no boreholes were completed on 2 Wilson Street or within building footprints.

ITEM	DETAIL
	• Geotest noted the following within the boreholes: – A residual dark brown-red CLAY profile was overlain by a thin layer of uncontrolled fill/topsoil (clayey SILT) (up to 0.6 m) and underlain by shale bedrock. – The fill was observed to be free from any visual and olfactory contamination indicators. Small quantities of some asphaltic concrete fines and light concrete rubble was identified within select boreholes. – Groundwater was not encountered to a maximum depth of 7.5 mbgl. • The results of the analysed samples were compared to NEPM (2013) HIL-A, EIL and ESL (fine grained soils in urban residential and public open space). The results were reported as follows: – Concentrations of metals in soils were below or equal (BH03-1-0.4 m) to HIL-A. – Concentrations of OCP/OPP and PCB were all below laboratory limit of reporting (LOR) and site assessment criteria. – Concentrations of PAHs were below assessment criteria with the exception of for benzo(a)pyrene within BH03-1-0.4 m (1.2 mg/kg) which exceeded the EIL (0.7 mg/kg). – Concentrations of TRH and BTEX were reported below site assessment criteria. – Asbestos was not detected at or above the LOR in any of the samples.
Conclusions	• The results of laboratory analysis indicated that concentrations of CoPC in soil at the sampling locations did not exceed the most conservative human health assessment criteria and as such is likely to be suitable for sensitive residential land uses (HIL-A). • Field observations did not identify any aesthetically unsuitable soils or any visual or olfactory indications of contamination. • All reported results were less than the conservative EIL and ESLs adopted for metal and volatile compounds with the exception of BH03-1-0.4 m. This was likely associated with minor asphaltic concrete material in surface profiles. The NEPM 2013 notes that where B(a)P is present as a result of bituminous material, bioavailability of this material is low and is not considered to pose a risk to sensitive receptors.
Recommendations	Based on the conclusions of the limited investigation Geotest recommended that the site can be considered suitable for sensitive residential land use, however, further assessment of areas not previously investigated is required following the demolition of buildings at the site.

4.3 Regulatory Searches

A search of NSW EPA Contaminated Land Records of Notice and List of NSW Notified Sites (as of 27 November 2023) in relation to Section 58 and 60 of the Contaminated Land Management Act 1997 was undertaken for the site and surrounding area, which noted:

- The site is not listed on the NSW EPA record of notices under Section 60 of the Contaminated Land Management Act 1997.
- There are two sites within a 1km radius of the site that are listed on the NSW EPA record of contaminated sites, these are detailed within **Table 4**.

Table 4. NSW EPA Notified Contaminated Sites

ADDRESS	DISTANCE FROM SITE	SITE NAME	CONTAMINATING ACTIVITY	MANAGEMENT CLASS
877-879 Pacific Highway, Chatswood	~100 m North	Coles Express Service Station Chatswood	Service Station	Regulation under CLM Act not required.
728 Pacific Highway, Chatswood	~540 m south-west	Chatswood Toyota	Service Station	Contamination formerly regulated under the CLM Act

- A search of licenced activities under the Protection of the Environment Operations Act (1997) identified that the site does not contain an Environmental Protection License.
- A search of licenced activities under the Protection of the Environment Operations Act (1997) identified the following sites which contain licenses within a 1km radius of the site:
  - The Hospitals Contribution Fund of Australia Ltd *(trading as HCF Dental Centre)* at 6/13 Spring Street, Chatswood NSW (590 m south-east) for Hazardous, Industrial or Group A Waste Generation (0-10 tonnes). Issued in 2000. No longer in force.

Considering the location of the licensed activity, the small quantity of medical waste being generated it is very unlikely that potentially contaminating activities would influence the status of the soil or groundwater on the subject site.

4.4 Potentially Contaminating Processes

Potentially contaminating processes are listed below in **Table 5.**

Table 5. Potentially Contaminating Processes

ITEM	DETAIL
Past Industrial Processes	A review of historical imagery, previous investigations as well as observations made during the site walkover conducted by Reditus indicate that it is unlikely that industrial processes have occurred in the past.
Manufacturing Processes	A review of historical imagery, previous investigations as well as observations made during the site walkover conducted by Reditus indicate that it is unlikely that manufacturing processes have occurred in the past.
Hazardous Materials	A hazardous material survey has not been undertaken on-site. A review of historical imagery and the age of the buildings indicates that there is potential for hazardous material to have been used in the construction of the buildings on-site. Additionally, a placard on the front of 859 Pacific Highway indicated ACM was present in the building.
Storage Tanks	Evidence of underground petroleum storage systems (UPSS) or above ground storage tanks (AST) was not observed during the site walkover or historical imagery. As such, it is unlikely that the underground storage of fuel has occurred at the site.
Discharges to Land, Water and Air	Reditus has no records of discharges to land, water or air having historically occurred at the site.
Visible Signs of Contamination	Staining and other visible indications of contamination were not observed across the site.
Presence of Drums and Wastes	No drums or bulk storage of chemicals were observed on-site.
Odours	No olfactory indications of contamination were identified across the site.

4.5 PFAS Investigation Sites

Per- and poly-fluorinated substances (PFAS) have more recently been highlighted as a persistent and mobile contaminant, of significant toxicity. The potential risk posed by PFAS contamination has been evaluated by using available site history information with a preliminary decision tree assessment matrix. The potential risk presented by PFAS contamination is presented in **Table 6.**

Table 6. Summary of PFAS Preliminary Risk Assessment

ITEM	PROBABILITY	DETAIL
Did fire training occur on-site?	Low	Historical aerial imagery and title deed searches deem it unlikely that fire training occurred at the site.
Is an airport or fire station up gradient of or adjacent to the site? [2]	Low	There are no airports or fire stations within 1km of the site.
Have "fuel" fires ever occurred on-site? e.g., ignition of fuel (solvent, petrol, diesel, kerosene) tanks.	Low	Due to the residential land use since the 1940s, it is unlikely that fuel fires have occurred on site.
Have PFAS been used in manufacturing or stored on-site?	Low	Based on the site history, it is unlikely that the manufacturing or storage of PFAS has occurred at the site.
Have any activities associated with risk of fire and broad point source uses of PFAS contamination occurred on-site? [3]	Low	Due to the residential land use since the 1940s, it is unlikely any activities associated with point source PFAS contamination have taken place on-site.

Notes:

1. Runoff from fire training areas may impact surface water, sediment, and groundwater.
2. PFAS is used in a wide range of industrial processes and consumer products (https://www.industrialchemicals.gov.au/consumers-and-community/and-poly-fluorinated-substances-pfas

A list of activities is provided within HEPA PFAS NEMP (2020) Appendix B – Table B1 and Table B2.

5 Preliminary Conceptual Site Model

Based on the information presented in Sections 1-4 of this report, a Conceptual site Model (CSM) has been prepared for the site. The ASC 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 essential elements of the CSM, as required by the ASC NEPM (NEPC, 2013), include an understanding of:

- Known and potential sources of contamination and contaminants of concern including the mechanism(s) of contamination (e.g., 'top down' spill or sub-surface release from corroded tank or pipe).
- Potentially affected media (soil, sediment, groundwater, surface water, indoor and ambient air) and human and ecological receptors.
- Potential and complete exposure pathways.

A tabular CSM provided in Error! Reference source not found. identifies the complete and potential pathways between the known or potential source(s) of contamination and receptor(s).

5.1 Potential Sources of Contamination

The potential sources of contamination identified during the PSI are summarised in **Table 7.**

Table 7. Potential Sources of Contamination

SOURCE	AREAS OF CONCERN	CONTAMINANTS OF POTENTIAL CONCERN
Historical Use of Fill	Importation of fill from an unknown source used for site levelling, backfilling behind retaining walls and landscaped areas.	Metals, TRH, BTEX, PAHs, OCP, OPP, Asbestos
Weathering of potentially hazardous building materials	Surface soils surrounding on-site structures.	Asbestos and lead.
EPA Notified Service Station North of the Site	Potentially contaminated groundwater migrating onsite.[1]	Metals, TRH, BTEX and PAHs.

1. Although groundwater is presumed to flow to the east, due to the proximity of the service station to the site it is deemed appropriate to assess.

5.2 Potentially Affected Media

The potentially affected media at the site includes:

- Soil.
- Groundwater.

5.3 Potential Receptors and Pathways

5.3.1 PROPOSED LAND USE SCENARIO AND POTENTIAL RECEPTORS

The proposed development will comprise mixed-use commercial and residential with limited access to soils. The most sensitive receptors will be residents within the apartments. Consequently, the most relevant land-use scenario is residential with minimal access to soils.

Based on the proposed land use, the potential receptors at and near the site include the following:

- On-site receptors:
  - Current and future demolition/construction/maintenance workers.

- Current and future residents and visitors of the site.
- Future commercial/retail workers.
- Current and future site residents.
- Soil and groundwater receptors.

- Off-site receptors:
  - Current and future intrusive construction/maintenance workers on adjacent properties.
  - Surrounding groundwater and surface receptors.
  - Commercial/retail workers and visitors at surrounding properties.
  - Current and future occupants and visitors of residential properties.

5.3.2 HUMAN HEALTH – DIRECT CONTACT PATHWAY

It is considered appropriate to assess whether a direct contact source may be present on the site for construction and maintenance workers and future site users. Health impacts should be taken into consideration since there are accessible soils.

5.3.3 HUMAN HEALTH – INHALATION / VAPOUR INTRUSION PATHWAY

Given the proposed development plans, there is potential for volatilisation of volatile organic compounds bound to soils/groundwater to accumulate beneath the future building footprint and become an inhalation health risk via vapour intrusion for future site users and maintenance workers. Furthermore, leaching of CoPC into the groundwater aquifer can also lead to lateral migration with similar exposure to off-site receptors.

It is therefore considered appropriate to assess whether a vapour source may be present on the site and determine if there is an unacceptable risk to future users of the site.

5.3.4 AESTHETICS

No visual evidence of widespread or significant staining was observed at the site at the time of inspection. While it is considered that the proposed site hardstand materials will prevent visual exposure to potentially aesthetically impacted sub-surface soils, an assessment of aesthetics can be made during assessment of other pathways.

Hardstand is likely to cover the majority of the site and as such, any aesthetics impacts within soil and fill materials are unlikely to preclude the proposed development.

5.3.5 ECOLOGICAL – TERRESTRIAL ECOSYSTEMS

The NEPC (2013) NEPM requires a pragmatic risk-based approach should be taken in applying ecological investigation and screening levels in residential and commercial / industrial land use settings.

The EIL and ESL guidelines are considered by Reditus to only be applicable to proposed landscaped areas for the proposed development. The proposed development comprises of four basement levels, as such, these landscaped areas within the footprint of the proposed basement will be formed by importing soil from offsite. It is likely that the SP2 zoned area fronting the Pacific Highway will not be incorporated into the basement area and as such deep landscaping will be present.

It is considered that further assessment of risk to terrestrial ecosystems is warranted, an assessment against the NEPC (2013) NEPM EILs/ESL will be conducted as part of the investigation.

5.3.6 ECOLOGICAL – AQUATIC ECOSYSTEMS

There is potential leaching of contaminants from historical filling into the groundwater on-site. There are no significant watercourses within the immediate vicinity of the site, the closest being Blue Gum Creek (540 m north-west). Surface water is likely to drain into the local stormwater network.

5.4 Potential Transport Mechanisms and Exposure Pathways

Potential transport mechanisms of contamination relevant to the site include:

- Historical placement of fill materials.
- Leaching of CoPC from fill materials into groundwater.
- Weathering of hazardous building materials.
- Potential upgradient contamination of groundwater migrating onto the site.

Potential exposure pathways and receptors relevant to the site may include:

- Direct contact with potentially contaminated soils/groundwater during near or sub-surface works at the site (i.e., trenching and/or excavation works during construction or by future occupants).
- Inhalation/ingestion of groundwater and disturbed soil.
- Vapour intrusion from volatilisation of VOCs.
- Lateral migration of potentially contaminated groundwater to sites hydraulically down-gradient.
- Surface water run-off discharging into stormwater.

5.5 Source, Pathway and Receptor Linkages

A preliminary tabular CSM has been prepared for the site based on the outcomes of the desktop assessment in **Table 8** below. The tabular CSM describes potential linkages and assesses each of the linkages as probably, possible, or unlikely based on the likelihood of occurrence and availability of data.

Table 8. Exposure Pathway Assessment

SOURCE	EXPOSURE PATHWAY	RECEPTOR	EXPOSURE
Fill materials of unknown origin.	• Direct contact with potentially contaminated soils/groundwater during sub-surface works at the site (i.e., trenching and/or excavation works) or by future users of the area. • Inhalation of dust and vapours. • Ingestion of potentially contaminated soil and groundwater. • Surface water run-off.	• Construction Workers. • Site occupants. • Maintenance workers[1].	**Possible** The SPR linkage is potentially complete. Assessment of COPCs in sub-surface soils and groundwater warranted.
Weathering of potentially hazardous building materials.	• Direct contact with potentially contaminated soil during surface and sub-surface works or by current and futures users of the area. • Inhalation of dust. • Ingestion of potentially contaminated soil. • Surface water run-off.	• Construction Workers. • Site occupants. • Maintenance workers[1].	**Possible** The SPR linkage is potentially complete. Assessment of COPCs in surface and sub-surface soils.
EPA Notified Service Station North of the Site ***Potential upgradient contamination of groundwater associated with fuel storage migrating onto the site***	• Direct contact with contaminated soil. • Inhalation vapours. • Ingestion or direct contact with potentially contaminated groundwater.	• Site users. • Construction workers. • Maintenance workers[1]. • Offsite users.	**Possible** Potential source-pathway-receptor linkages have been identified with relation to the off-site, upgradient land uses (historical and current fuel

SOURCE	EXPOSURE PATHWAY	RECEPTOR	EXPOSURE
			storage), as such assessment of these linkages is warranted.

Notes:

1. Maintenance workers attending the site, particularly if works require excavation, trenching or any activities applicable to the sub-surface of the site.

6 Data Quality Objectives

The Data Quality Objective (DQO) process is a systematic planning tool based on the scientific method for establishing criteria for data quality and for developing data collection designs. The DQO defines the experimental process required to test a hypothesis. The DQO process has been developed to ensure that efforts relating to data collection are cost effective, by eliminating unnecessary, duplicative or overly precise data whilst at the same time, ensuring the data collected is of sufficient quality and quantity to support defensible decision making.

It is recognised that the most efficient way to accomplish these goals is to establish criteria for defensible decision making before data collection begins and develop a data collection design based on these criteria. By using the DQO process to plan the investigation effort, the relevant parties can improve the effectiveness, efficiency and defensibility of a decision in a resource and cost-effective manner.

The DQO process consists of seven steps, which are designed to clarify the study objectives, define the appropriate type of data and specify tolerable levels of potential decision errors. The seven-step DQO process adopted for this DSI can be summarised as:

- **Step 1: State the Problem** – concisely describe the problem to be studied. Review prior studies and existing information to gain a sufficient understanding to define the problem.
- **Step 2: Identify the Decision** – identify what questions the study will attempt to resolve, and what actions may result.
- **Step 3: Identify the Inputs to the Decision** – identify the information that needs to be obtained and the measurements that need to be taken to resolve the decision statement.
- **Step 4: Define the Study Boundaries** – specify the time periods and spatial area to which decisions will apply. Determine when and where data should be collected.
- **Step 5: Develop a Decision Rule** – define the statistical parameter of interest, specify the action level, and integrate the previous DQO outputs into a single statement that describes the logical basis for choosing among alternative actions.
- **Step 6: Specify Tolerable Limits on Decision Errors** – define the decision maker's tolerable decision error rates based on a consideration of the consequences of making an incorrect decision; and
- **Step 7: Optimise the Design** –evaluate information from the previous steps and generate alternative data collection designs. Choose the most resource-effective design that meets all DQOs.

The DQOs are provided in **Table 9**Error! Reference source not found. below and were derived in accordance with Australian Standard 4482.1-2005 'Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds' (AS 4482.1-1997).

Table 9. Data Quality Objectives

ITEM	DETAIL
Step 1: State the problem	The site is proposed to be redeveloped for mixed use commercial and residential land use. A DSI is required to inform the development application (DA) to inform Chapter 4 Remediation of Land of SEPP (Resilience and Hazards) 2021.

ITEM	DETAIL
Step 2: Identify the decision/goal of the study	If elevated concentrations of COPCs are identified at the site: • Have potentially contaminating activities occurred on the site? If so, what level of site investigation is required to define the nature, extent and degree of contamination (if any); to assess potential risk posed by contaminants to health and the environment (if any)? • What is the extent of the impact? • Does any COPC at the site occur at concentrations that pose or may pose an unacceptable liability or risk to the environment and/or human health to persons who will utilise the future development? • If so, what is the order of priority to minimise the risk and what additional measures are required to mitigate, remediate, or manage the risk? • Is the site suitable for the proposed land use setting, in the context of land contamination?
Step 3: Identify the information inputs	Key data required to resolve the project problem included concentrations of COPC in the soil and groundwater collected in the study area, and the structure and depth of the underlying site geology. The COPC selected were based on the historical assessment and the current site condition observed during fieldworks. The regulatory guidelines adopted by Reditus to assess the site are presented in **Section 7** below.
Step 4: Define the boundaries of the study	This investigation was restricted to the physical site boundaries, as shown in **Figure 2, Appendix A**. The vertical extent of the study boundaries was limited to a maximum depth of 13.0 mbgl. The temporal boundaries of the study were limited to the date that the investigations were completed.
Step 5: Develop a decision rule	If the concentrations of COPC in soil and groundwater are reported to be below the relevant adopted tier 1 assessment guidelines, then the site will be deemed suitable, and no management/remediation options will be proposed for the proposed land use at the site. If, however, the concentration of one or more COPC are greater than the guidelines, then further investigation will be required to horizontally and vertically delineate the extent of the impact and/or recommendations made for the remediation/management of contamination to render the site suitable for the proposed development.
Step 6: Specify tolerable limits on decision errors	The laboratory data quality indicators are as follows: • % RPD for laboratory duplicates for TPH and BTEX analysis is less than 60%; and • Recovery of matrix spikes and surrogate spikes is as per the laboratory's Quality Assurance targets accepted under their National Association of Testing Authorities (NATA) accreditation. Precision is measured using the standard deviation 'SD' or Relative Percent Difference '%RPD'. Replicate data for field duplicates of organics is expected to be as follows: • RPD criteria of 50% or less, for concentrations > or = 10 times practical quantitation limits (PQL); • RPD criteria of 75% or less, for concentrations between 5 and 10 times the EQL; and • RPD criteria of 100% or less, for concentrations < 5 times PQL. Replicate data for field duplicates for inorganics, including metals is expected to be as follows: • RPD criteria of 30% or less, for concentrations > or = 10 times PQL; • RPD criteria of 75% or less, for concentrations between 5 and 10 times the EQL; and • RPD criteria of 100% or less, for concentrations < 5 times PQL. Where acceptable limits for field duplicates were not met, a discussion on low biased error will be provided. For this investigation, a decision error of 5% will be considered acceptable This error rate is in accordance with Appendix B of Schedule B(2) of the ASC NEPM. In order to achieve this level of confidence, the investigation has been designed as described below.

ITEM	DETAIL
Step 7: Optimise the design	Soil and groundwater samples were collected on a systematic grid-based sampling design program (within accessible areas), with COPC analysis based on the known site history. Soil samples were collected at relevant intervals, changes in geology or in zones of gross contamination and locations selected for efficient and representative sampling. Groundwater monitoring wells were located in an approximate triangular formation with two onsite and one offsite to ensure suitable coverage of the site. Due to the proposed basement excavation these were situated in accessible areas that were unlikely to be disturbed during bulk excavation works. All media sampling was completed in accordance with Reditus standard operating procedures (SOPs) and relevant industry guidelines.

6.1 Extent of Uncertainties

The sampling methodologies used by Reditus during this investigation has been designed to limit uncertainty in the results. Reditus is confident that the results of this investigation give an accurate representation of the current status of the surface soils and groundwater onsite but note that in all subsurface investigations the potential remains for variability between sampling points and for conditions to be different on site from the conditions reported herein.

7 Tier 1 Assessment Criteria

Tier 1 assessment involves the comparison of monitoring data to published guideline criteria (typically presented as screening levels). Relevant criteria are selected based on the identified viable exposure pathways and COPCs and proposed land use.

In Australia, appropriate HILs (including interim HILs for vapour intrusion and, where applicable, HSLs for petroleum hydrocarbons and assessment criteria for asbestos) are used for Tier 1 screening to provide a rapid assessment of whether the site contamination may be of concern with respect to human health. Should contaminant concentrations at a site occur at levels that are below the Tier 1 levels, this implies that for the majority of the people in the population there is no significant health risk from contamination and that remedial action may not be required to protect human health.

Exceedances of the tier 1 HILs should be identified and considered. Tier 1 HIL exceedances do not imply that a risk is necessarily present, but that further assessment may be justified. Tier 1 HILs are not intended to indicate a clear demarcation between acceptable and unacceptable. Marginal exceedances may not require quantitative Tier 2 risk assessment to conclude that further assessment is not necessary. The magnitude of the exceedance should be considered in the context of the CSM (that is, whether the exposure pathways are plausible and whether exposure will result in harm).

Tier 1 screening criteria (including HILs and HSLs) should only be used where there has been adequate characterisation of a site (that is, appropriate representative sampling has been carried out). For this investigation, the maximum reported concentrations for each sample and analyte will be compared against the tier 1 criteria. Should any individual sample exceedance of the tier 1 criteria exist, the 95% Upper Confidence Limit (UCL) of the analyte for the site data set was calculated and compared to relevant Tier 1 screening criteria. However, the implications of localised elevated values should also be considered. In order to adopt the 95% UCL result, the analyte data set must also meet the following criteria:

- The standard deviation (SD) of the results should be less than 50% of the Tier 1 screening criteria.
- No single value exceeds 250% of the relevant Tier 1 screening criteria (characterised as a 'hot-spot').

Where site data exceeds the screening levels or suitable screening levels cannot be identified, further consideration (Tier 2 assessment) is required.

7.1 Soil Assessment Criteria

Tier 1 assessment involves the comparison of monitoring data to published guideline criteria (typically presented as screening levels). Relevant criteria are selected based on the identified viable exposure routes and the available data. Where site data exceeds the screening levels or suitable screening levels cannot be identified, further consideration (Tier 2 assessment) is required.

The tier 1 assessment criteria were adopted from:

- National Environment Protection Council (NEPC) 1999, 'Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater, National Environment Protection (Assessment of site Contamination) Measure (NEPM), as amended in 2013'.

The soil assessment criteria (SAC) adopted for this assessment were:

- NEPC (2013) NEPM HIL-B criteria values have been adopted to assess concentrations of COPC in soil for site suitability and human health in a high-density residential and commercial/industrial land use scenario.
- NEPC (2013) NEPM HSL-D guidelines for vapour intrusion have been adopted to evaluate the risk posed from vapour intrusion in a high-density residential and commercial/industrial land use scenario. As outlined in the NEPM (2013) and in the context of the proposed development HSL-D guidelines due to communal basement carparking would more appropriately characterise the majority of the site. The soil HSLs are based on depth of impacts, overlying soil type and land use. After a review of subsurface conditions, the guidelines for clay were selected.
- NEPC (2013) NEPM ML for a residential land use scenario have been adopted and are used to consider the potential formation of light non-aqueous phase liquids, fire and explosion risks and damage to buried

infrastructure. A fine-grained soil type was selected after a review of subsurface conditions encountered during investigation works completed at the site.

- NEPC (2013) NEPM ESLs and EILs were both selected to determine the risk of potential contamination to identified ecological receptors on the site, in the context of an urban residential/public open space. Both ESL and EIL criteria values are applicable for the first 2 m of the soil profile.
- EIL criteria values were derived using academic values and where appropriate, using the NEPM EIL Interactive Calculation Worksheet available at http://www.nepc.gov.au/nepms/assessment-site-contamination/toolbox. The output from the EIL calculation is available in **Appendix B**. The following input parameters were adopted from the NSW Government eSpade viewer to derive EILs, noting that where a range of values were given, the average of those two values was selected as an input:
  - **Cation exchange capacity (CEC)**: 12.5 $cmol_c$/kg
  - **Clay (%)**: 27.5 %
  - **pH**: 4.25
  - **Soil organic carbon (OC %)**: 1.25 %

Soil analytical results are tabulated in **Table 1**, **Appendix B** and guideline criteria are presented in **Table 10**.

Table 10. Adopted Soil Assessment Criteria (mg/kg)

CHEMICAL GROUP	ANALYTE	HIL-B	HSL-D, CLAY		EIL	ESL	ML
			0-1 m	1-2 m	URBAN RES & PUBLIC OPEN SPACE	URBAN RES, FINE, 0-2 M	URBAN RES, FINE SOIL
BTEX	Naphthalene	-	NL	NL	170	-	-
	Benzene	-	4	6	-	65	-
	Toluene	-	NL	NL	-	105	-
	Ethylbenzene	-	NL	NL	-	125	-
	Xylene Total	-	NL	NL	-	45	-
TRH	C_6-C_{10} Fraction (F1)	-	-	-	-	-	800
	C_6-C_{10} (F1 minus BTEX)	-	310	480	-	180	-
	>C_{10}-C_{16} Fraction (F2)	-	-	-	-	120	1,000
	>C_{10}-C_{16} Fraction (F2 minus Naphthalene)	-	NL	NL	-	120	-
	>C_{16}-C_{34} Fraction (F3)	-	-	-	-	1,300	3,500
	>C_{34}-C_{40} Fraction (F4)	-	-	-	-	5,600	10,000
PAH	Benzo(a) pyrene	-	-	-	-	0.7	-
	Benzo(a)pyrene TEQ (LOR)	4	-	-	-	-	-
	PAHs (Sum of total)	400	-	-	-	-	-
Metals	Arsenic	500	-	-	100	-	-
	Cadmium	150	-	-	-	-	-
	Chromium (III+VI)	500 [1]	-	-	570 [2]	-	-
	Copper	30,000	-	-	75	-	-

CHEMICAL GROUP	ANALYTE	HIL-B	HSL-D, CLAY		EIL	ESL	ML
			0-1 m	1-2 m	URBAN RES & PUBLIC OPEN SPACE	URBAN RES, FINE, 0-2 M	URBAN RES, FINE SOIL
	Lead	1,200	-	-	1,100	-	-
	Mercury	120	-	-	-	-	-
	Nickel	1,200	-	-	200	-	-
	Zinc	60,000	-	-	220	-	-
OCP	Aldrin + Dieldrin	10	-	-	-	-	-
	Chlordane	90	-	-	-	-	-
	DDT	-	-	-	180	-	-
	DDT+DDE+DDD	600	-	-	-	-	-
	Endosulfan	400	-	-	-	-	-
	Endrin	20	-	-	-	-	-
	Heptachlor	10	-	-	-	-	-
	Hexachlorobenzene	15	-	-	-	-	-
	Methoxychlor	500	-	-	-	-	-
OPP	Chlorpyrifos	340	-	-	-	-	-

NL – No limit

[1] Chromium (VI) HIL criteria has been applied to concentrations of Chromium (III+VI) for conservatism.
[2] Chromium (III) EIL criteria has been applied to concentrations of Chromium (III+VI) for conservatism.

7.2 Groundwater Assessment Criteria

Selection of the groundwater assessment criteria (GAC) was based on the proximity of the site to sensitive surrounding surface water receptors, groundwater extraction in the area, and water quality of the aquifer. The groundwater analytical data were compared against the following adopted Tier 1 screening criteria:

- NEPM ASC (2013) HSLs for vapour intrusion HSL-D for commercial/industrial land use with groundwater depth between 2 and <8 m within clay.
- ANZG 2018 – 95% species protection default guideline value (DGV) (supersedes the NEPM ASC (2013) Groundwater Investigation Levels (GILs)) for marine water as Homebush Bay and Brays Bay are brackish estuarine environments.

The ANZG (2018) is a revision of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000) presented as an online platform, to improve usability and facilitate updates as new information becomes available.

Revisions to DGVs since the ANZECC & ARMCANZ (2000) guidelines have been provided for the 'aquatic ecosystem' community value. DGVs have been revised for physical and chemical (PC) stressors based on increased understanding, broader monitoring data collected since 2000.

The NEPM ASC (2013) GILs were derived using the ANZECC & ARMCANZ (2000), which were subsequently revised (superseded) in ANZG (2018). As such, the ANZG (2018) DGVs will be used as an initial screening in replace of the NEPM ASC (2013) GILs as they provide concentrations which once exceeded require further investigation into receptors and points of extraction and use.

7.2.1 HUMAN HEALTH – VAPOUR INTRUSION

The groundwater concentrations have been assessed against the NEPC (2013) NEPM HSL-A&B and HSL-D to evaluate the risk posed from vapour intrusion. The selection of HSL-A&B was based on the proposed residential/commercial development, the potential receptor/s onsite, and the exposure that may be experienced. HSLs for clay have been adopted after a review of subsurface conditions encountered during investigation works completed at the site.

7.2.2 HUMAN HEALTH – DRINKING WATER

The NSW DECC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination* describes the process involved in identifying the likely environmental values which must be considered to be preserved in groundwater investigations at contaminated sites. Based on the NSW DECC (2007) Guidelines, determination of environmental values follows the steps below:

- Determine whether the aquifer beneath the site is included in the NSW Department of Natural Resources (NSW DNR) list of major aquifers of drinking water quality.
- Determine the identified uses of groundwater from the aquifer.
- Assess groundwater indicators to determine whether the aquifer is suitable for use as a drinking water source. The NSW DECC has stated that "Groundwater with TDS concentrations below 2000 mg/L is suitable for potential drinking water supply, and hence should be afforded this level of protection from contamination unless other site-specific factors, such as low yield, render such use unlikely." (NSW DECC, 2007).

Reditus note the following site hydrogeological conditions:

- The site is not situated within a known drinking water groundwater management unit (GMU) protected by the NSW DNR as an actual or potential drinking water supply (NSW DECC, 2007).
- The site is located within an urban area and is connected to a potable reticulated water supply. Therefore, groundwater is unlikely to be used for exaction purposes.
- The site and surrounding area have been used for residential and commercial/industrial uses since at least the early 1940s, therefore, groundwater in the area is unlikely to be used as a drinking water resource.

Based on the known urban nature of the surrounding area, the presence of a reticulated water supply in the highly urbanised environment and the absence of registered groundwater bores nominated for drinking water use within a 1 km radius of the site it is considered highly unlikely that the groundwater in the immediate vicinity of the site will be utilised for domestic purposes (both potable and non-potable use).

As such, the Australian Drinking Water Guidelines (2011) for both human health and aesthetics were not considered when adopting the GACs.

7.2.3 HUMAN HEALTH – RECREATIONAL WATER GUIDELINES

Considering the closest recreational water body is over 2 km to the east (Lane Cove River), it is unlikely that the groundwater from this site is directly impacting the groundwater discharging into the river. As such, it is not deemed necessary to assess recreational water at this stage of the investigation.

7.2.4 ECOLOGICAL GROUNDWATER ASSESSMENT CRITERIA

Use of the 95% protection level (for the ANZECC 2000 Guidelines) assumed that the surrounding watercourses are moderately disturbed ecosystems. This is as defined in Section 3.1 of the guidelines as receiving road and storm water runoff from adjacent industry and residential properties, consistent with the setting and surrounding environment of the site.

The ANZG (2018) 95% freshwater guidelines for groundwater were adopted as screening criteria, based on the nearest surface water receptors and discharge point for groundwater leaving the site being fresh water in nature**.**

Groundwater analytical results are tabulated against the groundwater assessment criteria in **Table 11.**

Table 11. Adopted Groundwater Assessment Criteria (µg/L)

CHEMICAL GROUP	ANALYTE	HSL-D - CLAY			ANZG (2018) 95% PROTECTION FRESH WATER
		2-4 m	4-8 m	>8 m	
BTEX	Naphthalene	NL	NL	NL	16
	Benzene	30,000	30,000	30,000	950
	Toluene	NL	NL	NL	180
	Ethylbenzene	NL	NL	NL	80
	Xylene (o)	NL	NL	NL	350
TRH	C_6-C_{10} Fraction (F1)	-	-	-	-
	C_6-C_{10} (F1 minus BTEX)	NL	NL	NL	-
	>C_{10}-C_{16} Fraction (F2)	-	-	-	-
	>C_{10}-C_{16} Fraction (F2 minus Naphthalene)	NL	NL	NL	-
	>C_{16}-C_{34} Fraction (F3)	-	-	-	-
	>C_{34}-C_{40} Fraction (F4)	-	-	-	-
PAH	Anthracene	-	-	-	0.4
	Benzo(a) pyrene	-	-	-	0.2
	Fluoranthene	-	-	-	1.4
	Phenanthrene	-	-	-	2
Metals	Arsenic	-	-	-	24
	Cadmium	-	-	-	0.2
	Chromium (III+VI)	-	-	-	1**

CHEMICAL GROUP	ANALYTE	HSL-D - CLAY			ANZG (2018) 95% PROTECTION FRESH WATER
		2-4 m	4-8 m	>8 m	
	Copper	-	-	-	1.4
	Lead	-	-	-	3.4
	Mercury	-	-	-	0.6
	Nickel	-	-	-	11
	Zinc	-	-	-	8

8 Sampling and Analysis Plan

The methods used for the collection of data are presented in the following sections.

8.1 Schedule of Works

The schedule of fieldworks completed at the site and Reditus personnel involved is provided in **Table 12** below. All Reditus personnel involved are suitably qualified and experienced in the collection of environmental samples and environmental site investigations.

Table 12. Schedule of Works

DATE	DETAIL OF WORKS	REDITUS PERSONNEL
2, 3 & 7 November 2023	Soil investigation, drilling and monitoring well install and development.	Ross Kingswell *Environmental Scientist*
10 November 2023	Groundwater monitoring event.	Ross Kingswell *Environmental Scientist*

8.2 Sampling Location Rationale

The intention of the sampling plan was to attain the objectives stated in **Section 1.2**. To achieve this a systematic grid-based sampling design program was adopted for this DSI. The sampling plan was based on the specific design plans for the site, site observations and accessibility. The NSW EPA (2022) Sampling Design Guidelines were adhered to in order to provide sufficient data for in-situ assessment and characterisation of soil and groundwater at the site.

Sample locations are presented on **Figure 2, Appendix A**. A total of seven boreholes were completed with two boreholes being converted into groundwater monitoring well locations. The number of sampling locations required for a 0.31 ha site is 10, in reference to the NSW EPA (2022) Sampling Design Guidelines – Minimum sampling density for site characterisation. The Geotest (2021) Limited Environmental Investigation of the site included drilling of 4 sample locations, however, that data was not relied upon. Additionally, the proposed development encompasses the adjacent lot to the east forming a total site area of 0.43 ha, an additional 8 samples were collected on this portion of the site. As such, the sampling density across the whole site meets the minimum sampling density as specified in Table 2 of the NSW EPA (2022) Sampling Design Guidelines.

8.3 Soil Sampling

8.3.1 GENERAL SAMPLING METHODOLOGY

Soil samples were collected from the near-surface (0-0.1m), at changes in lithology or zones with any visual (staining or discolouration) or olfactory signs of contamination.

Boreholes were formed using a drill rig with solid flight auger attachment. The soil samples were collected directly from the auger using dedicated nitrile gloves. Efforts were made to minimise disturbance of the material being sampled to the extent practicable. Such techniques included removing the outside layer of material and collecting from the centre of the recovered auger cuttings, to prevent cross-contamination and minimise the potential for loss of VOCs.

Part of the soil sample was placed into a snap lock plastic bag for screening with a photo-ionisation detector (PID) and part being placed directly into a laboratory prepared 250 mL glass jar with the details of the sample, including the sample name, the job number, the date of the sample and the sample depth.

Sample preservation was undertaken in accordance with NEPC (2013) NEPM, with samples immediately placed and stored in an ice filled esky to keep them chilled, prior to being couriered to the laboratory under a signed chain of custody (COC) form filled out with the required analysis.

Each soil sample was described in general accordance with the Unified Soil Classification System (USCS) and details of any discolouration, staining, odours or other indicators of contamination were also noted. Borehole logs are provided in **Appendix D**.

In summary, soil samples were collected in accordance with Reditus standard operating procedures which are based on the NEPC (2013) NEPM, Australian Standard AS4482.1-2005 and AS4482.2-1999 and EPA requirements.

8.3.2 ASBESTOS IN SOIL SAMPLING METHODOLGY

Composite soil samples were collected from the surface and near-surface (top 10 cm of fill profile)and every metre of fill material thereafter. Samples were collected in accordance with the NEPC (2013) NEPM methodology for asbestos gravimetric sampling and submitted for asbestos in soil quantification analysis.

500mL soil samples were placed into snap lock plastic bag (double bagged), with the details of the sample, including the sample name, the job number, the date of sample and the sample depth, for laboratory analysis of AF and FA asbestos in accordance with the NEPC (2013) NEPM, where possible.

A minimum of one (1) 10L sample from each sample location was collected from the fill material. All samples were spread over a contrast surface (i.e., tarpaulin) and inspected for bonded ACM fragments. Any ACM or FA identified was collected, bagged and submitted to the laboratory for asbestos identification and weight of asbestos fragments collected.

Percentage soil asbestos from collected ACM was calculated as follows:

$$\%Soil\ Asbestos = \frac{\%Asbestos\ Content \times ACM\ (kg)}{Soil\ Volume\ (L) \times Soil\ Density\ (kg/L)}$$

where:

% Asbestos Content by weight (within asbestos cement materials) = 10% to 15% (Reditus has adopted 15% for the sake of conservatism)

Soil Density (for sand material) = 1.65 kg/L

Soil samples were couriered to the laboratory under signed chain of custody (COC) forms filled out with the required analysis.

8.4 Groundwater

8.4.1 MONITORING WELL INSTALLATION

Two (2) onsite monitoring wells were drilled with solid flight auger and air hammer to a maximum depth of 13.0 m bgl.

Well construction, including screened intervals, were based on observations made during the drilling at each location. The well screens comprised of 50 mm internal diameter (ID), Class 18, threaded, flush jointed uPVC with machine slots of 0.4 mm width and casing comprised 50 mm ID, Class 18, threaded, flush jointed uPVC. Each groundwater monitoring well was gravel packed with 1-2mm of washed graded gravel to 0.5 m above the screen. A bentonite seal was installed above the gravel pack and cement grout was placed around the Gatic cover. Specific well construction details are provided within **Appendix D**.

All monitoring wells were developed using a stainless steel bailer until majority of the sediments are removed from the water column ensuring a good connection between the screened borehole interval and the surrounding aquifer. Where practicable, a minimum quantity of three casing volumes of water was removed. The wells were then left to stabilise for a minimum of one week prior to purging and sampling.

8.4.2 GROUNDWATER SAMPLING

All newly installed monitoring wells (MW02 and MW03) were gauged using an oil/water interface probe prior to purging and sampling. Depth to standing water level (SWL) was recorded from the top of casing (TOC).

The wells were purged utilising compressed air controlled through a micropurge controller until groundwater quality parameters stabilised. The water quality parameters were measured with a calibrated water quality meter to record measurements for pH, redox potential, electrical conductivity (mS/cm), dissolved oxygen and temperature (˚C). Due to limited volume of water, micropurge equipment was unable to be used for MW02, as such, this well was sampled with a dedicated HDPE plastic bailer.

Groundwater samples were collected directly into appropriately preserved laboratory supplied sampling containers and labelled with the date, location, and project identification number. The samples for dissolved metals were field filtered using a 0.45-micron Millipore filter.

Polyethylene tubing was changed between each monitoring well and the interface probe was thoroughly decontaminated between gauging events with a phosphate free detergent (Liquinox) and rinsed with deionised water.

Field records of the groundwater monitoring event are provided in **Appendix E**. The calibration certificate of the water quality meter is provided in **Appendix F.**

8.5 Laboratory Analysis and Methods

Laboratory analytical methods and analyte PQLs are shown in the analytical certificates provided in **Appendix C**. Furthermore, the analytical suites performed during this investigation are provided in **Section 0**.

9 Quality Assurance and Quality Control (QAQC)

9.1 Field Quality Assurance

9.1.1 DETAILS OF SAMPLING TEAM

Fieldworks completed as part of this assessment, detailed in **Section 8.1**, were completed by Reditus staff each of whom are suitably qualified and experienced in the collection of environmental samples and environmental site investigations.

9.1.2 DECONTAMINATION PROCEDURES CARRIED OUT BETWEEN SAMPLING EVENTS

All reusable sampling equipment was decontaminated in between each use to ensure no cross contamination occurred. The stainless-steel bailer and interface probe were decontaminated between uses using a three-stage process consisting of a rinse with potable water, a thorough cleanse using a combination of deionised water and Liquinox (a phosphate free detergent), and a final rinse using deionised water. Reditus considers this to be a suitable method to prevent cross contamination during sampling.

9.1.3 CHAIN OF CUSTODY DETAILS

All samples were transported to the laboratory under a chain of custody (COC). Information on the COC included the sampler, sample identifier, sample matrix, collection date, analyses to be performed, sample preservation method, sample release date and sample received date. COCs are provided in **Appendix C** along with the laboratory reports.

9.1.4 SAMPLING SPLITTING TECHNIQUES

A soil duplicates and triplicates were collected by taking representative samples of the soil at the same depth interval. Due to the potential loss of volatiles, samples were not mixed or homogenised during collection or splitting.

Water duplicates were collected by filling the required number of sample bottles concurrently with the primary samples to ensure that the same water was being collected in each sample container.

9.1.5 TRIP BLANKS AND TRIP SPIKES

Trip blanks are used to assess contamination from field conditions at the time of the sampling event and that the sampling procedures are adequate in preventing cross contamination of VOCs during sample transport and storage.

Based on the site history and observations made during the site walkover, it was not considered likely that high concentrations of VOCs would be encountered on site and as such no trip blanks and trip spikes were collected during the investigation.

9.1.6 RINSATE BLANKS

Rinsate blanks are used to assess the potential for cross contamination between sampling to ensure cross-contamination procedures are adequate throughout the investigation.

One (1) rinsate blank was collected by running deionised water off the decontaminated interface probe directly into appropriately preserved laboratory containers and submitted to the laboratory for analysis of all CoPC.

Results of rinsate blank analysis is provided in **Table 7, Appendix B.**

9.1.7 STATEMENT OF DUPLICATE FREQUENCY

Field duplicates and triplicates were collected at a rate of at least 1:20. This complies with the Australian Standard 4482.1-2005 'Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds and Reditus' QA frequency ranges.

The following soil QA/QC samples were collected:

- DUP01 and TRIP01 were respectively soil intra-laboratory and inter-laboratory duplicates of sample MW02-0.1.

The following groundwater QA/QC samples were collected:

- DUP01 and TRIP01 were respectively groundwater intra-laboratory and inter-laboratory duplicates of sample MW03.

9.2 Laboratory QA/QC

The following is a summary of the internal laboratory QA/QC procedures. Detailed laboratory QA/QC is provided in **Appendix C**.

9.2.1 SAMPLE HOLDING TIMES

All holding times were reported as being within specified ranges.

9.2.2 LABORATORY ACCREDITATION AND ANALYTICAL METHODS USED

The primary laboratory used for samples was Envirolab Services Pty Ltd (Envirolab), while the secondary laboratory was Australian Laboratory Services Pty Ltd (ALS).

Envirolab is accredited by NATA to ISO/IEC 17025 with the accreditation number 1261, while ALS is also accredited to this standard with the accreditation number 825.

9.2.3 LABORATORY CONTROL SAMPLES

Laboratory control samples were reported within acceptable ranges.

9.2.4 LABORATORY RELATIVE PERCENT DIFFERENCE (RPD)

All internal laboratory RPDs met acceptance criteria with the exception of sample 336965-29 which exceeded the criteria for copper. As such, a triplicate result was issued as laboratory sample number 336965-65.

9.3 Evaluation of the QA/QC Information Compared to the DQOs

9.3.1 DOCUMENTATION COMPLETENESS:

- Soil logs, chain-of-custody forms, calibration were complete and appropriate.

Data completeness:

- All samples were received by the laboratories and analytical results reported including laboratory QA/QC.

9.3.2 DATA COMPARABILITY:

- Reditus standard operating procedures, Australian Standards and industry best practice were followed during sampling.
- Consistent field conditions and similarly trained staff were used during sampling.
- The limits of reporting are appropriate and generally consistent from each laboratory.

9.3.3 DATA REPRESENTATIVENESS:

- Reditus is confident that cross contamination has not occurred, and primary samples are representative of actual soil conditions.
- The frequency of laboratory blanks was acceptable, and the results were within specified ranges.

9.3.4 PRECISION:

- Intra-laboratory and inter-laboratory duplicates were collected at the following rates:
  - Soil and groundwater intra-laboratory and inter-laboratory duplicates frequency were collected at least 1:20.
- QA/QC sample collection rate follows the guidance provided in the Australian Standard Field procedures (AS1482.1 1997).

9.3.5 RELATIVE PERCENT DIFFERENCE

Refer to **Table 5 & Table 6, Appendix C** for Relative Percent Differences (RPDs) calculations. Reditus notes that RPDs were only calculated for groups of compounds with detections above the laboratory detection limits. RPDs for soil were reported within acceptable ranges, with exception to the following:

- MW02 and DUP01

  - Benzo(a)pyrene – 64%
  - Fluoranthene – 75%.
  - Chromium (III+VI) – 42%.
  - Copper – 37%.
  - Lead – 35%.
  - Zinc – 46%.
- MW02 and TRIP01
  - TRH >C16 – C34 Fraction (F3) – 107%
  - Chromium (III+VI) – 42%.

Reditus considers that these RPD exceedances are likely to be due to the heterogeneity of sampled soil. Reditus hence does not consider that these RPD exceedances have affected the integrity of the analytical results.

RPDs for groundwater were reported within acceptable ranges.

10 Results

10.1 Field Observations

10.1.1 SOIL

Soil samples collected from the boreholes were logged in general accordance with the USCS. Borehole logs are provided as **Appendix D**. The soils encountered during the intrusive investigation are summarised below:

Fill

- Fill material was predominantly a silty to clayey SAND topsoil except for BH03 which was a silty clay underlying the concrete slab.
- With the exception of BH02 and MW03 where fill was identified to depths of 0.8 m and 0.6 m respectively, fill thickness was between 0.1 and 0.2 m.
- Anthropogenic materials were identified within fill material in most of the boreholes and included terracotta, concrete, brick and tile.

Natural

- Natural material was encountered in each borehole (with the exception of BH5 which was noted to refuse on natural material), underlying the fill material and was identified as orange to red brown silty CLAY. Inclusions were noted to be fine to medium grained gravels and traces of ash.

Rock

- Rock was encountered between 3.0 and 4.0 m bgl and was identified to be siltstone overlying shale which was encountered between 9 and 10 metres.

10.1.2 GROUNDWATER

All groundwater monitoring wells (two onsite and one offsite) were gauged for standing water level (SWL) and total depth on 10 November 2023 prior to commencing purging and sampling. The groundwater gauging data is summarised in **Table 13.**

Table 13. Groundwater Gauging Data

Well ID	LOCATION	DEPTH (mbTOC)	SWL (mbTOC)	TOC (mAHD)	SWL (mAHD)
MW01	Offsite (approx. 10 m south-east of south-eastern corner of site).	12.75	9.105	106.168	97.063
MW02	Front garden of 849 Pacific Highway.	12.88	11.85	111.331	99.481
MW03	Front garden of 853 Pacific Highway.	12.675	7.75	111.041	103.291

The monitoring wells were purged until stabilised physiochemical parameters were obtained, which are summarised in **Table 14** below. MW01 was sampled on the adjacent lot and the results are not discussed in this report.

Table 14. Stabilised Groundwater Physiochemical Properties

Well ID	pH	TEMP (ºC)	EC (mS/cm)	DO (ppm)	REDOX (mV)	COMMENTS
MW02	5.21	19.46	1.258	3.43	332.3*	Grab sample taken due to insufficient water column. Brown, turbid with no odour.

Well ID	pH	TEMP (ºC)	EC (mS/cm)	DO (ppm)	REDOX (mV)	COMMENTS
MW03	4.94	19.02	0.926	3.67	397.6*	Slightly turbid, brown, no odour.

* 199mV have been added to redox field values to adjust to Standard Hydrogen Electrode (SHE) results.

Based on the physico-chemical parameters recorded during the groundwater monitoring event the following observations have been made:

- pH indicates a slightly acidic environment in the groundwater underlying the site.
- Electrical conductivity readings indicated a moderately fresh groundwater.
- Dissolved oxygen indicates moderate levels of dissolved oxygen in the groundwater.
- ORP indicates an oxidising environment is present in the groundwater.

10.2 Analytical Results

10.2.1 SOIL

A summary of the soil analytical results can be found in **Table 1, Appendix B**. The following section outlines the key findings of the comparison between laboratory results and the site assessment criteria.

Soil sample locations are presented on **Figure 2, Appendix A**.

BTEX

Concentrations of BTEX were reported below the limit of reporting and the adopted soil assessment criteria in all soil samples submitted for analysis.

TRH

Concentrations of TRH were reported below the adopted soil assessment criteria in all soil samples submitted for analysis except for the F3 fraction in MW02-0.1 (330 mg/kg) which exceeded the ESL criteria (300 mg/kg).

PAH

Concentrations of PAHs were reported below the adopted soil assessment criteria in all soil samples submitted for analysis with the exception of benzo(a)pyrene in BH05-0.1 (1.7 mg/kg) which exceeded the ESL criteria (0.7 mg/kg).

Heavy Metals

Concentration of heavy metals were reported below the adopted soil assessment criteria in all soil samples submitted for analysis except for zinc within BH01-0.1 (240 mg/kg) which exceeded the EIL criteria of 220 mg/kg.

OCP & OPP

Concentrations of OCP/OPP were reported below the laboratory LOR and below the adopted soil assessment criteria in all soil samples submitted for analysis.

Asbestos

No asbestos was detected in all soil samples submitted for identification analysis. A summary of Asbestos in soil analytical results is presented in **Table 2, Appendix B.**

10.2.2 PRELIMINARY WASTE CLASSIFICATION

The analytical data were compared to the criteria provided in the NSW EPA (2014) Waste Classification Guidelines, for preliminary waste classification, the data is summarised in **Table 3** in **Appendix B**.

It can be seen from **Table 3** that the concentrations of lead at BH01_0.1, BH02_0.5, BH03_0.15, BH05_0.1, MW02_0.1 and benzo(a)pyrene at BH05_0.1 exceeded the general solid waste (GSW) criteria. The preliminary in-situ waste classification for the shallow fill material is therefore RESTRICTED SOLID WASTE (Non-Putrescible).

Given the presence of ash in the fill material is likely that this material will have low leachability, Further sampling including Toxicity Characteristic Leaching Procedure (TCLP) analysis for lead and benzo(a)pyrene is required to confirm the waste classification the material prior to offsite disposal. As the proposed development will result in the

disposal of these soils to a licensed waste facility, proper classification under the NSW EPA NSW (2014) Waste Classification guidelines is required.

Results of the preliminary waste classification can be found in **Table 3, Appendix B**.

10.2.3 GROUNDWATER

A summary of the groundwater analytical results compared to the site assessment criteria can be found in **Table 4, Appendix B** This section outlines the key findings of the comparison between laboratory results and the site assessment criteria as summarised in the subsections below.

Metals

Concentrations of metals were reported below the adopted assessment criteria in all groundwater samples submitted for analysis except for the following:

- Copper within DUP01 (2 µg/L) and MW02 (2 µg/L) exceeds the ANZG 95% Freshwater Toxicant DGV of 1.4 µg/L.
- Nickel within DUP01 (42 µg/L) and MW03 (39 µg/L) exceeds the ANZG 95% Freshwater Toxicant DGV of 11 µg/L.
- Zinc within DUP01 (58 µg/L), MW02 (17 µg/L) and MW03 (62 µg/L) exceeds the ANZG 95% Freshwater Toxicant DGV of 8 µg/L.

TRH

Concentrations of TRHs were reported below the laboratory LOR and adopted assessment criteria in all groundwater samples submitted for analysis.

BTEX

Concentrations of BTEX were reported below the laboratory LOR and adopted assessment criteria in all groundwater samples submitted for analysis.

PAH

Concentrations of PAHs were reported below the laboratory LOR and adopted assessment criteria in all groundwater samples submitted for analysis.

10.3 Extent of Uncertainties in the Results

The sampling methodologies used by Reditus during this investigation has been designed to limit uncertainty in the results. Reditus is confident that the results of this investigation give an accurate representation of the current status of the site but note that in all subsurface investigations the potential remains for variability between sampling points and for conditions to be different onsite from the conditions reported herein.

11 Discussion

11.1 Soil

Minor exceedances of the ecological guideline criteria for benzo(a)pyrene, TRH and zinc were detected in isolated locations within the fill material. Due to the limited horizontal and vertical extent of impact, the risk posed under the current landuse is considered low. Given the proposed development will require bulk excavation for the basement, these exceedances will be removed off-site during development.

11.2 Groundwater

Copper and zinc concentrations were reported above the ANZG 95% Freshwater Toxicant DGVs at location MW02 and MW03, whilst nickel was reported to exceed the criteria at MW03. All concentrations are noted to be within an order of magnitude of the adopted criteria, additionally the concentrations are considered to be typical of metals within groundwater in urban environment.

12 Refined Conceptual Site Model

Based on the results of the investigation and the preliminary CSM presented in **Section 5** has been refined to identify complete and potential pathways between the known or potential source(s) and the receptor(s).

Table 15. Refined Conceptual Site Model

SOURCE	EXPOSURE PATHWAY	RECEPTOR	EXPOSURE
Fill materials of unknown origin.	• Direct contact with potentially contaminated soils/groundwater during sub-surface works at the site (i.e., trenching and/or excavation works) or by future users of the area. • Inhalation of dust and vapours. • Ingestion of potentially contaminated soil and groundwater. • Surface water run-off.	• Construction Workers. • Site occupants. • Maintenance workers[1].	**Unlikely** Groundwater and soil results indicate that a source of significant soil contamination is not present.
Weathering of potentially hazardous building materials.	• Direct contact with potentially contaminated soils/groundwater during sub-surface works at the site (i.e., trenching and/or excavation works) or by future users of the area. • Inhalation of dust. • Ingestion of potentially contaminated soil and groundwater. • Surface water run-off.	• Construction Workers. • Site occupants. • Maintenance workers[1].	**Unlikely** Groundwater and soil results indicate that weathering of hazardous building materials does not appear to have occurred/impacted soils at the site.
Service Station North of the Site	• Direct contact with contaminated soil. • Inhalation vapours. • Ingestion or direct contact with potentially contaminated groundwater.	• Site users. • Construction workers. • Maintenance workers[1]. • Offsite users.	**Unlikely** Concentrations of CoPC indicate that no significant groundwater contamination is migrating on the site.

13 Conclusions and Recommendations

13.1 Conclusions

Based on a review of the site history, observations made during fieldwork, results of laboratory analysis and the proposed land use scenario, Reditus concludes the following:

- Historical sources of potential contamination included fill material, potentially hazardous building materials, and an offsite service station.
- Fill material was predominantly a silty to clayey SAND topsoil except for BH03 which was a silty clay underlying the concrete slab and extended to a maximum of 0.8 m. Anthropogenic materials were identified within fill material in most of the boreholes and included terracotta, concrete, brick and tile.
- Groundwater was encountered between 99.481 mAHD (11.85 mbTOC) and 103.291 mAHD (11.85 mbTOC) and was observed to be slightly turbid and brown with no odour.
- Concentrations of contaminants of potential concern (CoPC) in soil were reported below the applicable site assessment criteria with the exception of TRH F3 fraction in MW02-0.1 and benzo(a)pyrene in BH05-0.1 which both marginally exceeded the ecological screening level (ESL).
  - These exceedances are within an order of magnitude of the site assessment criteria and as such are unlikely to preclude the proposed development. It is likely that shallow fill material will be removed off site as part of bulk excavation works.
- Concentrations of CoPC in groundwater were reported below the site assessment criteria with the exception of copper (MW02), nickel (MW03) and zinc (MW02 and MW03) which exceeded the site assessment criteria.
  - These exceedances are within an order of magnitude of the site assessment criteria and are considered to be typical concentrations of metals within groundwater in an urban environment.

Reditus considers that the consent authority may be satisfied that the required considerations of Clause 4.6 of State Environmental Planning Policy (Resilience and Hazards) 2021are satisfied for the following reasons:

- This DSI (Reditus) completed on the development site has adequately assessed the site history to identify potential sources of contamination, and has suitability assessed the potential risk posed by contaminants to health and the environment. As such, Clause 4.6(1)(a) of SEPP (Resilience and Hazards) 2021 has been successfully achieved.
- This DSI has determined that the land can be made suitable in its current state for the purposes for which the development is proposed to be carried out (as a mixed use residential/commercial development). As such, Clause 4.6(1)(c) of SEPP (Resilience and Hazards) 2021 has been successfully achieved.
- The DSI has been completed in accordance with the contaminated land planning guidelines, satisfying Clause 4.6(2) and 4.6(3) of SEPP (Resilience and Hazards) 2021.

Based on the findings of the DSI, Reditus considers that the site can be made suitable for the proposed mixed use residential/commercial development, subject to implementation of the following recommendations.

13.2 Recommendations

Based on the findings of the investigation, Reditus recommends the following to make the site suitable in the context of the proposed development.

- The shallow fill soils at BH01, BH05 and MW02 are required to be removed or managed due to minor exceedances of the ecological screening criteria for benzo(a)pyrene, TRH and zinc. It is assumed that the soils will be removed as part of the bulk excavation works however, if the soils within this area are to remain onsite, they will require remediation through removal or management of the soils. This will be confirmed after a review of the finalised design of the site is performed.
- Completion of a pre-demolition hazardous materials survey to inform appropriate safety measures for demolition.

14 Limitations

This report has been prepared in accordance with the scope of services described in the **Section 0**. The letter has been prepared for the sole use of the client and has been prepared in accordance with a scope of work agreed by the client.

The report or document does not purport to provide legal advice and any conclusions or recommendations made should not be relied upon as a substitute for such advice.

The report does not constitute a recommendation by Reditus for the client or any other party to engage in any commercial or financial transaction and any decision by the client or other party to engage in such activities is strictly a matter for the client.

The report relies upon data, surveys, measurements and results taken at or under the Site at particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the client. Furthermore, the report has been prepared solely for use by the client and Reditus accepts no responsibility for its use by other parties. The client agrees that Reditus' report or associated correspondence will not be used or reproduced in full or in part for promotional purposes and cannot be used or relied upon by any other individual, party, group or company in any prospectus or offering. Any individual, party, group or company seeking to rely on this report cannot do so and should seek their own independent advice.

No warranties, express or implied, are made. Subject to the scope of work undertaken, Reditus assessment is limited strictly to identifying typical environmental conditions associated with the subject property based on the scope of work and testing undertaken and does not include and evaluation of the structural conditions of any buildings on the subject property or any other issues that relate to the operation of the Site and operational compliance of the Site with state or federal laws, guidelines, standards or other industry recommendations or best practice. Scope of work undertaken for assessments are agreed in advance with the client and may not necessarily comply with state or federal laws or industry guidelines for the type of assessment conducted.

Additionally, unless otherwise stated Reditus did not conduct soil, air or wastewater analyses including asbestos or perform contaminated sampling of any kind. Nor did Reditus investigate any waste material from the property that may have been disposed off-site or undertake and assessment or review of related site waste management practices.

The results of this assessment are based upon (if undertaken as part of the scope work) a site inspection conducted by Reditus personnel and/or information from interviews with people who have knowledge of site conditions and/or information provided by regulatory agencies. All conclusions and recommendations regarding the property are the professional opinions of the Reditus personnel involved with the project, subject to the qualifications made above.

While normal assessments of data reliability have been made, Reditus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Reditus, or developments resulting from situations outside the scope of this project/assessment.

Reditus is not engaged in environmental auditing and/or reporting of any kind for the purpose of advertising sales promoting, or endorsement of any client's interests, including raising investment capital, recommending investment decisions, or other publicity purposes. Reditus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Reditus, or developments resulting from situations outside the scope of this project.

In relation the conduct of asbestos inspections or the preparation of hazardous materials reports Reditus has conducted inspections and the identification of hazardous material within the constraints presented by the property. Whilst efforts are made to access areas not normally accessed during normal use of the Site to identify the presence of asbestos or other hazardous material, unless explicitly tested no guarantee can be provided that such material is or is not present.

Reditus' professional opinions are based upon its professional judgment, experience, and training. These opinions are also based upon data derived from the limited testing and analysis described in this report or reports reviewed. It is possible that additional testing and analysis might produce different results and/or different opinions or other opinions. Reditus has limited its investigation(s) to the scope agreed upon with its client. Reditus believes that its opinions are reasonably supported by the testing and analysis that has been undertaken (if any), and that those opinions have been developed according to the professional standard of care for the environmental consulting

profession in this area at this time. Other opinions and interpretations may be possible. That standard of care may change and new methods and practices of exploration, testing and analysis may develop in the future, which might produce different results.

15 References

Environmental Planning

NSW Environmental Planning and Assessment Act (the EP&A Act 1979).

NSW State Environmental Planning Policy Number (SEPP) Resilience and Hazards 2021. Superseding SEPP55 – Remediation of Land, 1998.

Site Contamination

CRC Care (2011) Health screening levels for petroleum hydrocarbons in soil and groundwater. Part 1: Technical development document.

NSW Contaminated Land Management Act (the CLM Act 1997).

NSW EPA statutory guidelines made or approved under section 105 of the CLM Act, including:

- *NSW EPA Guidelines for the NSW Site Auditor Scheme (3rd Edition), 2017.*
- *NSW EPA Guidelines for Consultants Reporting on Contaminated Land, 2020.*
- *NSW EPA Sampling Design Guidelines, August 2022.*
- *NSW EPA Guidelines for the Assessment and Management of Groundwater Contamination, 2007.*
- *NSW EPA Guidelines for Assessment and Management of Hazardous Ground Gases, 2020.*

National Environment Protection Council (1999, Revised 2013) National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 – Schedule B1 Guideline on Investigation levels for Soil and Groundwater (NEPC, 2013).

Australian and New Zealand Governments Guidelines for Fresh and Marine Water Quality 2018.

Australian Standard AS4482.1-2005. Guide to the Investigation and Sampling of sites with Potentially Contaminated Soil. Part 1: Non-volatile and Semi-volatile Compounds, 2005.

Australian Standard AS4482.2-1999. Guide to the Investigation and Sampling of sites with Potentially Contaminated Soil. Part 2: Volatile Substances,1999.

PFAS National Environmental Management Plan version 2.0 (the PFAS NEMP 2.0), 2020.

Acid Sulfate Soils

The Acid Sulfate Soil Management Advisory Committee (ASSMAC) Acid Sulfate Soils Assessment Guidelines 1998 (Also referred to as the "Acid Sulfate Soils Manual").

Waste

NSW Protection of the Environment Operations Act (POEO Act) 1997.

NSW Protection of the Environment Operations (Waste) Regulations 2014.

NSW EPA Waste Classification Guidelines, Part 1 Classifying Waste, 2014.

NSW EPA Resource Recovery Order, Excavated Natural Material Order under Part 9, Clause 93 of POEO Waste Regulation 2014 (the ENM Order 2014).

Asbestos

NSW Work Health and Safety Act, 2011 (WHS Act 2011).

NSW Work Health and Safety Regulations, 2017 (WHS Reg 2017), Chapter 8 Asbestos, 2017 (NSW WHS Reg 2017).

NSW EPA Managing Asbestos in or on Soil, 2014 (NSW EPA 2014).

Western Australia Department of Health Guidelines for the Assessment Remediation and Management of Asbestos Contaminated Sites in Western Australia 2009 (WA DoH, 2009) as referred to by NEPM 2013

A

Figures

REDITUS

Map	
23210_rp01_f01_siteloc_v01	
Date of Export	
28/11/2023	
Author	**Approver**
RK	TP
Data Source	
Metromap, Google Maps, Open Street Map, NSW Government	

Legend

- Site Boudary
- Major Roads
- Railways
- Surface Water

Watercourses

- Rivers
- Stream (Perennial)
- Stream (Non-Perennial)
- Unnamed Stream (Non-Perennial)
- Other Channels

Figure 1 - Site Location

Wilson Street and Pacific Highway, Chatswood NSW

23210 - Detailed Site Investigation

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Map	
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Date of Export	**Map Scale (approx. at A3)**
28/11/2023	1:400
Author	**Approver**
RK	TP
Data Source	
Metromap, Google Maps, Open Street Map, Geoscience Australia	

Legend

- Site Boundary
- Borehole Locations
- Monitoring Well Locations

Figure 2 - Sample Locations

Wilson Street and Pacific Highway, Chatswood NSW

23210 - Detailed Site Investigation

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28/11/2023	1:400
Author	**Approver**
RK	TP
Data Source	
Metromap, Google Maps, Open Street Map, Geoscience Australia	

Legend

- Site Boundary
- Groundwater Monitoring Well
- Groundwater Contours (0.5 m)
- Groundwater Flow Direction

Figure 3 - Groundwater Contours

Wilson Street and Pacific Highway, Chatswood NSW

23210 - Detailed Site Investigation

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B

Analytical Result Summary Tables

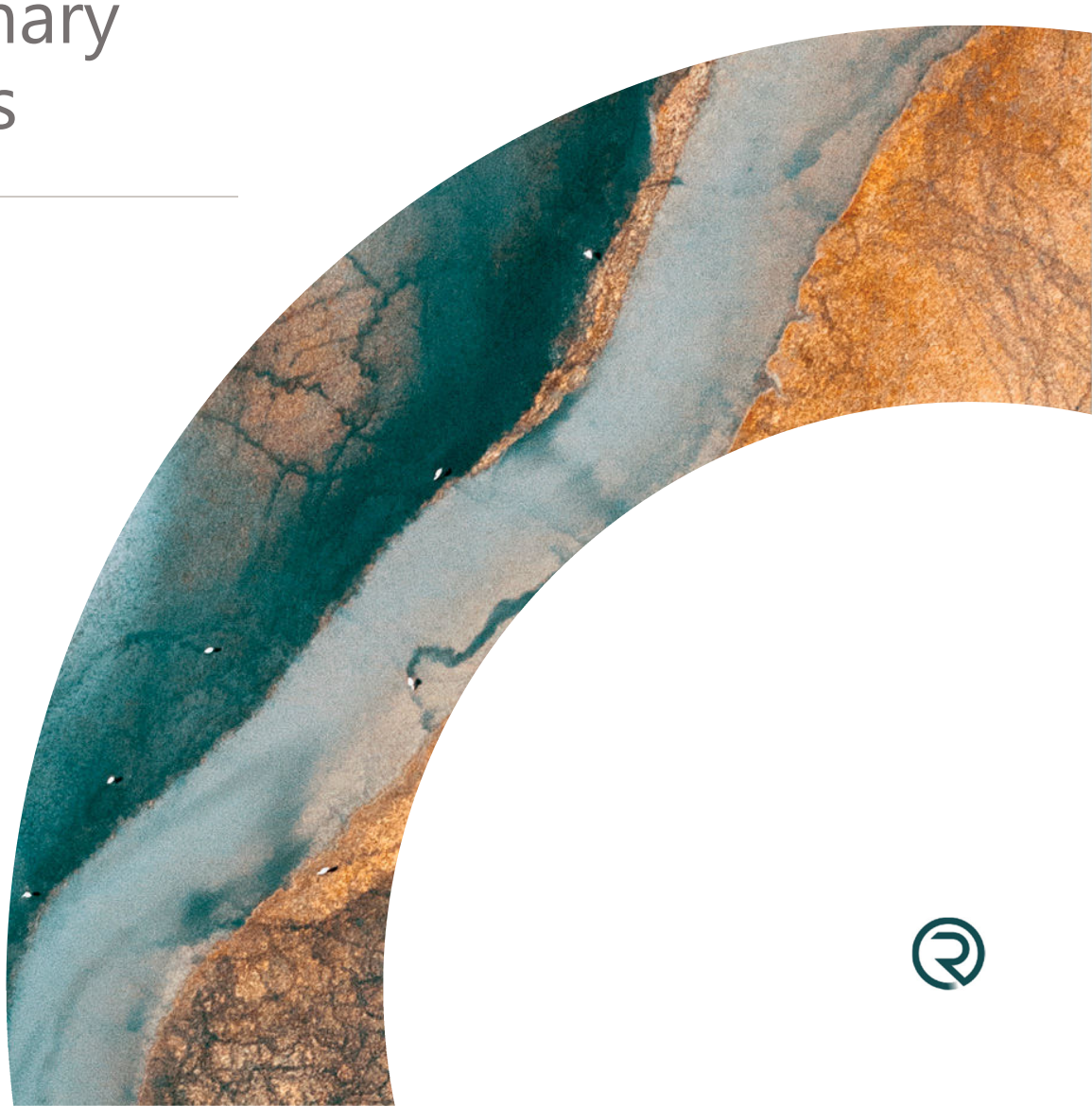

Table 4
Soil Analytical Results Summary

REDITUS

			BTEX							TRH							TPH				
			Naphthalene (BTEX)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			1	0.2	0.5	0.5	0.5	0.5	0.5	10	10	50	50	100	100	50	10	50	100	100	50
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Fine Soil										800		1,000		3,500	10,000						
NEPM 2013 Table 1A(3)Comm/Ind D Soil HSL for Vapour Intrusion, Clay																					
>=0m, <1m			NL	4	NL	NL			NL		310		NL								
>=1m, <2m			NL	6	NL	NL			NL		480		NL								
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space			170																		
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil (0-2 m)				50	85	70			105		180	120	120	300	2,800						
NEPM 2013 Table 1A(1) HILs Res B Soil																					
Field ID	**Depth (m)**	**Date**																			
BH01	**0.1**	**03 Nov 2023**	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH01	**0.8**	**03 Nov 2023**	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH02	**0.5**	**03 Nov 2023**	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH02	**0.8**	**03 Nov 2023**	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH03	**0.15**	**03 Nov 2023**	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH03	**0.8**	**03 Nov 2023**	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH04	**0.05**	**02 Nov 2023**	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH05	**0.1**	**02 Nov 2023**	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<25	<50	<50	260	<100	260	<25	<50	160	120	280
MW02	**0.1**	**02 Nov 2023**	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<25	64	64	330	140	540	<25	52	160	200	410
MW02	**0.3**	**02 Nov 2023**	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
MW03	**0.1**	**02 Nov 2023**	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<25	<50	<50	170	<100	170	<25	<50	120	<100	120
MW03	**0.7**	**02 Nov 2023**	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50

Notes:
* - Adopting a low CEC of 10 cmol/kg and a slightly acidic pH of 5.5.

Environmental Standards
NEPM, NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil
2013, NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand
2013, NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil
2013, NEPM 2013 Table 1A(1) HILs Res B Soil

Table 4
Soil Analytical Results Summary

REDITUS

				PAH																		Metals							
			Naphthalene (BTEX)	Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ calc (Half)	Benzo(a)pyrene TEQ (LOR)	PAHs (Sum of positives)	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			1	0.2	0.1	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.05	4	0.4	1	1	1	0.1	1	1
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Fine Soil																													
NEPM 2013 Table 1A(3)Comm/Ind D Soil HSL for Vapour Intrusion, Clay																													
>=0m, <1m			NL													NL													
>=1m, <2m			NL													NL													
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space			170													170						100		570	75	1100		200	220
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil (0-2 m)									0.7																				
NEPM 2013 Table 1A(1) HILs Res B Soil																			4	4	400	500	150	500	30,000	1,200	120	1,200	60,000
Field ID	**Depth (m)**	**Date**																											
BH01	**0.1**	**03 Nov 2023**	<1	0.3	<0.1	<0.1	<0.1	0.2	0.2	0.1	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.1	0.3	<0.5	<0.5	1.9	8	<0.4	15	41	110	0.1	12	240
BH01	**0.8**	**03 Nov 2023**	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.05	9	<0.4	49	1	26	<0.1	3	16
BH02	**0.5**	**03 Nov 2023**	<1	0.3	<0.1	<0.1	<0.1	0.2	0.2	0.1	0.2	<0.1	0.4	<0.1	0.1	<0.1	0.1	0.4	<0.5	<0.5	1.9	7	<0.4	34	9	170	0.3	4	59
BH02	**0.8**	**03 Nov 2023**	<1	<0.2	<0.1	<0.1	<0.1	<0.1	0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	0.05	9	<0.4	43	<1	35	<0.1	3	7
BH03	**0.15**	**03 Nov 2023**	<1	<0.2	<0.1	<0.1	<0.1	<0.1	0.05	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.5	<0.5	0.3	7	<0.4	26	29	160	0.2	8	130
BH03	**0.8**	**03 Nov 2023**	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.05	7	<0.4	33	<1	31	<0.1	2	9
BH04	**0.05**	**02 Nov 2023**	<1	0.3	<0.1	<0.1	<0.1	0.1	0.2	0.1	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.1	0.3	<0.5	<0.5	1.7	<4	<0.4	9	16	48	<0.1	3	81
BH05	**0.1**	**02 Nov 2023**	<1	2.4	<0.1	0.3	0.3	1.4	1.7	1	1.4	0.3	2.4	<0.1	0.9	<0.1	0.8	2.5	2.5	2.5	15	6	<0.4	15	36	360	0.2	7	180
MW02	**0.1**	**02 Nov 2023**	<1	0.5	<0.1	<0.1	<0.1	0.2	0.3	0.2	0.3	<0.1	0.5	<0.1	0.1	<0.1	0.2	0.5	<0.5	<0.5	2.7	5	<0.4	20	32	270	0.2	6	160
MW02	**0.3**	**02 Nov 2023**	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.05	6	<0.4	30	1	37	<0.1	2	28
MW03	**0.1**	**02 Nov 2023**	<1	0.5	<0.1	0.1	0.1	0.3	0.3	0.2	0.3	<0.1	0.7	<0.1	0.2	<0.1	0.4	0.6	<0.5	0.5	3.7	7	<0.4	29	18	64	<0.1	4	130
MW03	**0.7**	**02 Nov 2023**	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.05	5	<0.4	25	<1	22	<0.1	2	10

Notes:
* - Adopting a low CEC of 10 cmol/kg and a slightly acidic pH of 5.5.

Environmental Standards
NEPM, NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil
2013, NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand
2013, NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil
2013, NEPM 2013 Table 1A(1) HILs Res B Soil

Table 4
Soil Analytical Results Summary

REDITUS

				Organochlorine Pesticides																					
			Naphthalene (BTEX)	4,4-DDE	a-BHC	Aldrin	Dieldrin	b-BHC	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	Mirex
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Fine Soil																									
NEPM 2013 Table 1A(3)Comm/Ind D Soil HSL for Vapour Intrusion, Clay																									
>=0m, <1m			NL																						
>=1m, <2m			NL																						
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space			170										180												
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil (0-2 m)																									
NEPM 2013 Table 1A(1) HILs Res B Soil						10								600				20			10		15	500	20
Field ID	**Depth (m)**	**Date**																							
BH01	**0.1**	**03 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH01	**0.8**	**03 Nov 2023**	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02	**0.5**	**03 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH02	**0.8**	**03 Nov 2023**	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03	**0.15**	**03 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH03	**0.8**	**03 Nov 2023**	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04	**0.05**	**02 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH05	**0.1**	**02 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW02	**0.1**	**02 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW02	**0.3**	**02 Nov 2023**	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW03	**0.1**	**02 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW03	**0.7**	**02 Nov 2023**	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
* - Adopting a low CEC of 10 cmol/kg and a slightly acidic pH of 5.5.

Environmental Standards
NEPM, NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil
2013, NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand
2013, NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil
2013, NEPM 2013 Table 1A(1) HILs Res B Soil

Table 4
Soil Analytical Results Summary

REDITUS

				Organophosphorous Pesticides																				
			Naphthalene (BTEX)	Azinophos methyl	Bromophos-ethyl	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Diazinon	Dichlorvos	Dimethoate	Disulfoton	Ethion	Fenitrothion	Fenthion	Malathion	Methidathion	Methyl parathion	Mevinphos (Phosdrin)	Parathion	Phorate	Ronnel	Fenamiphos	Phosalone
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			1	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.1	0.05	0.1	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.05	0.1
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Fine Soil																								
NEPM 2013 Table 1A(3)Comm/Ind D Soil HSL for Vapour Intrusion, Clay																								
>=0m, <1m			NL																					
>=1m, <2m			NL																					
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space			170																					
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil (0-2 m)																								
NEPM 2013 Table 1A(1) HILs Res B Soil						340																		
Field ID	**Depth (m)**	**Date**																						
BH01	**0.1**	**03 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH01	**0.8**	**03 Nov 2023**	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02	**0.5**	**03 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH02	**0.8**	**03 Nov 2023**	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03	**0.15**	**03 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH03	**0.8**	**03 Nov 2023**	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04	**0.05**	**02 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH05	**0.1**	**02 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW02	**0.1**	**02 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW02	**0.3**	**02 Nov 2023**	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW03	**0.1**	**02 Nov 2023**	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW03	**0.7**	**02 Nov 2023**	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
* - Adopting a low CEC of 10 cmol/kg and a slightly acidic pH of 5.5.

Environmental Standards
NEPM, NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil
2013, NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand
2013, NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil
2013, NEPM 2013 Table 1A(1) HILs Res B Soil

Table 4
Groundwater Analytical Results Summary

REDITUS

			Asbestos (<2mm AF/FA)	Asbestos Identification - Soil
			%w/w	Detect
EQL				
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand				
Field ID	**Depth (m)**	**Date**		
BH01	**0.1 - 0.3**	**03 Nov 2023**	<0.001	ND
BH02	**0.2 - 0.8**	**03 Nov 2023**	<0.001	ND
BH03	**0.15 - 0.25**	**03 Nov 2023**	<0.001	ND
BH04	**0 - 0.1**	**02 Nov 2023**	<0.001	ND
BH05	**0.1**	**02 Nov 2023**	<0.001	ND
MW02	**0.1 - 0.2**	**02 Nov 2023**	<0.001	ND
MW03	**0.1 - 0.6**	**02 Nov 2023**	<0.001	ND

Environmental Standards
NEPM, NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil
2013, NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand
2013, NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil
2013, NEPM 2013 Table 1A(1) HILs Res B Soil

Table 4
Groundwater Analytical Results Summary

REDITUS

			Asbestos			BTEX							TRH						TPH				
			Asbestos (<2mm AF/FA)	Asbestos Identification - Soil	Asbestos Identification - Material	Naphthalene (BTEX)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)
			%w/w	Commenn	Comment	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL						1	0.2	0.5	0.5	0.5	0.5	0.5	10	50	50	100	100	50	10	50	100	100	50
NSW 2014 General Solid Waste CT1 (No Leaching)							10	288	600			1,000							650				10,000
NSW 2014 Restricted Solid Waste CT2 (No Leaching)							40	1,152	2,400			4,000							2,600				40,000
Field ID	**Date**	**Depth (m)**																					
BH01	**03 Nov 2023**	**0.1**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH01	**03 Nov 2023**	**0.1 - 0.3**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01	**03 Nov 2023**	**0.8**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH02	**03 Nov 2023**	**0.2 - 0.8**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02	**03 Nov 2023**	**0.5**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH02	**03 Nov 2023**	**0.8**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH02 - [TRIPLICATE]	**03 Nov 2023**	**0.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03	**03 Nov 2023**	**0.15**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH03	**03 Nov 2023**	**0.15 - 0.25**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03	**03 Nov 2023**	**0.8**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH04	**02 Nov 2023**	**0 - 0.1**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04	**02 Nov 2023**	**0.05**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH05	**02 Nov 2023**	**0.1**	<0.001	ND	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	260	<100	260	<25	<50	160	120	280
MW01	**02 Nov 2023**	**0.2 - 1.3**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW01	**02 Nov 2023**	**0.5**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
MW01	**02 Nov 2023**	**1.4**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
MW02	**02 Nov 2023**	**0.1**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	64	64	330	140	540	<25	52	160	200	410
MW02	**02 Nov 2023**	**0.1 - 0.2**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW02	**02 Nov 2023**	**0.3**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50

AD - Asbestos Detected

Table 4
Groundwater Analytical Results Summary

REDITUS

				PAH																	Metals							
			Asbestos (<2mm AF/FA)	Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ calc (Half)	Benzo(a)pyrene TEQ (LOR)	PAHs (Sum of positives)	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
			%w/w	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	0.1	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.05	4	0.4	1	1	1	0.1	1	1
NSW 2014 General Solid Waste CT1 (No Leaching)									0.8													100	20			100	4	40	
NSW 2014 Restricted Solid Waste CT2 (No Leaching)									3.2													400	80			400	16	160	
Field ID	**Date**	**Depth (m)**																											
BH01	**03 Nov 2023**	**0.1**	-	0.3	<0.1	<0.1	<0.1	0.2	0.2	0.1	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.1	0.3	<0.5	<0.5	1.9	8	<0.4	15	41	110	0.1	12	240
BH01	**03 Nov 2023**	**0.1 - 0.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01	**03 Nov 2023**	**0.8**	-	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.05	9	<0.4	49	1	26	<0.1	3	16
BH02	**03 Nov 2023**	**0.2 - 0.8**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02	**03 Nov 2023**	**0.5**	-	0.3	<0.1	<0.1	<0.1	0.2	0.2	0.1	0.2	<0.1	0.4	<0.1	0.1	<0.1	0.1	0.4	<0.5	<0.5	1.9	7	<0.4	34	9	170	0.3	4	59
BH02	**03 Nov 2023**	**0.8**	-	<0.2	<0.1	<0.1	<0.1	<0.1	0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	0.05	9	<0.4	43	<1	35	<0.1	3	7
BH02 - [TRIPLICATE]	**03 Nov 2023**	**0.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	<0.4	32	16	170	0.3	4	71
BH03	**03 Nov 2023**	**0.15**	-	<0.2	<0.1	<0.1	<0.1	<0.1	0.05	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.5	<0.5	0.3	7	<0.4	26	29	160	0.2	8	130
BH03	**03 Nov 2023**	**0.15 - 0.25**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03	**03 Nov 2023**	**0.8**	-	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.05	7	<0.4	33	<1	31	<0.1	2	9
BH04	**02 Nov 2023**	**0 - 0.1**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04	**02 Nov 2023**	**0.05**	-	0.3	<0.1	<0.1	<0.1	0.1	0.2	0.1	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.1	0.3	<0.5	<0.5	1.7	<4	<0.4	9	16	48	<0.1	3	81
BH05	**02 Nov 2023**	**0.1**	<0.001	2.4	<0.1	0.3	0.3	1.4	1.7	1	1.4	0.3	2.4	<0.1	0.9	<0.1	0.8	2.5	2.5	2.5	15	6	<0.4	15	36	360	0.2	7	180
MW01	**02 Nov 2023**	**0.2 - 1.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW01	**02 Nov 2023**	**0.5**	-	0.6	<0.1	0.1	0.4	0.3	0.4	0.2	0.4	<0.1	0.8	<0.1	0.2	<0.1	0.4	0.8	0.6	0.6	4.7	6	<0.4	22	17	25	<0.1	8	13
MW01	**02 Nov 2023**	**1.4**	-	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	0.1	11	<0.4	38	4	25	<0.1	6	7
MW02	**02 Nov 2023**	**0.1**	-	0.5	<0.1	<0.1	<0.1	0.2	0.3	0.2	0.3	<0.1	0.5	<0.1	0.1	<0.1	0.2	0.5	<0.5	<0.5	2.7	5	<0.4	20	32	270	0.2	6	160
MW02	**02 Nov 2023**	**0.1 - 0.2**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW02	**02 Nov 2023**	**0.3**	-	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.05	6	<0.4	30	1	37	<0.1	2	28

AD - Asbestos Detected

Table 4
Groundwater Analytical Results Summary

REDITUS

				SVOCs		Organochlorine Pesticides																				
			Asbestos (<2mm AF/FA)	Fenamiphos	Phosalone	4,4-DDE	a-BHC	Aldrin	Dieldrin	b-BHC	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor
			%w/w	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	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1
NSW 2014 General Solid Waste CT1 (No Leaching)																										
NSW 2014 Restricted Solid Waste CT2 (No Leaching)																										
Field ID	**Date**	**Depth (m)**																								
BH01	**03 Nov 2023**	**0.1**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH01	**03 Nov 2023**	**0.1 - 0.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01	**03 Nov 2023**	**0.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02	**03 Nov 2023**	**0.2 - 0.8**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02	**03 Nov 2023**	**0.5**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH02	**03 Nov 2023**	**0.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02 - [TRIPLICATE]	**03 Nov 2023**	**0.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03	**03 Nov 2023**	**0.15**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH03	**03 Nov 2023**	**0.15 - 0.25**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03	**03 Nov 2023**	**0.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04	**02 Nov 2023**	**0 - 0.1**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04	**02 Nov 2023**	**0.05**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH05	**02 Nov 2023**	**0.1**	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW01	**02 Nov 2023**	**0.2 - 1.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW01	**02 Nov 2023**	**0.5**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW01	**02 Nov 2023**	**1.4**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW02	**02 Nov 2023**	**0.1**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW02	**02 Nov 2023**	**0.1 - 0.2**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW02	**02 Nov 2023**	**0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

AD - Asbestos Detected

Table 4
Groundwater Analytical Results Summary

REDITUS

				Organophosphorous Pesticides																			
			Asbestos (<2mm AF/FA)	Azinophos methyl	Bromophos-ethyl	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Diazinon	Dichlorvos	Dimethoate	Disulfoton	Ethion	Fenitrothion	Fenthion	Malathion	Methidathion	Methyl parathion	Mevinphos (Phosdrin)	Parathion	Phorate	Ronnel	Mirex
			%w/w	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	0.1	0.05	0.05	0.05	0.1	0.05	0.1	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NSW 2014 General Solid Waste CT1 (No Leaching)						4																	
NSW 2014 Restricted Solid Waste CT2 (No Leaching)						16																	
Field ID	**Date**	**Depth (m)**																					
BH01	**03 Nov 2023**	**0.1**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH01	**03 Nov 2023**	**0.1 - 0.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01	**03 Nov 2023**	**0.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02	**03 Nov 2023**	**0.2 - 0.8**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02	**03 Nov 2023**	**0.5**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH02	**03 Nov 2023**	**0.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02 - [TRIPLICATE]	**03 Nov 2023**	**0.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03	**03 Nov 2023**	**0.15**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH03	**03 Nov 2023**	**0.15 - 0.25**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03	**03 Nov 2023**	**0.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04	**02 Nov 2023**	**0 - 0.1**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04	**02 Nov 2023**	**0.05**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH05	**02 Nov 2023**	**0.1**	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW01	**02 Nov 2023**	**0.2 - 1.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW01	**02 Nov 2023**	**0.5**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW01	**02 Nov 2023**	**1.4**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW02	**02 Nov 2023**	**0.1**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW02	**02 Nov 2023**	**0.1 - 0.2**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW02	**02 Nov 2023**	**0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

AD - Asbestos Detected

Table 4 - Groundwater Results Summary

REDITUS

			BTEX						TRH							TPH				
			Naphthalene (BTEX)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)
			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
EQL			1	1	1	1	2	1	10	10	50	50	100	100	50	10	50	100	100	50
ANZG Freshwater Toxicant DGVs LOSP 95% (July 2023)			16	950	180	80		350												
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Clay																				
>=2m, <4m				30,000																
>=4m, <8m				30,000																
>=8m				30,000																
Field ID	**Date**	**Lab Report Number**																		
DUP01	**10 Nov 2023**	**337552**	<1	<1	<1	<1	<2	<1	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50
MW01	**10 Nov 2023**	**337552**	<1	<1	<1	<1	<2	<1	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50
MW02	**10 Nov 2023**	**337552**	<1	<1	<1	<1	<2	<1	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50
MW03	**10 Nov 2023**	**337552**	<1	<1	<1	<1	<2	<1	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50

Environmental Standards
ANZG, July 2023, ANZG Freshwater Toxicant DGVs LOSP 95% (July 2023)

Table 4 - Groundwater Results Summary

REDITUS

				PAH																	Metals										
			Naphthalene (BTEX)	Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ	PAHs (Sum of positives)	Arsenic (filtered)	Cadmium (filtered)	Calcium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Lead (filtered)	Magnesium (filtered)	Mercury (filtered)	Nickel (filtered)	Potassium (filtered)	Zinc (filtered)
			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
EQL			1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.1	1	0.1	500	1	1	1	500	0.05	1	500	1
ANZG Freshwater Toxicant DGVs LOSP 95% (July 2023)			16				0.4		0.2				1.4			16	2				13	0.2		1	1.4	3.4		0.6	11		8
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Clay																															
>=2m, <4m																															
>=4m, <8m																															
>=8m																															
Field ID	**Date**	**Lab Report Number**																													
DUP01	**10 Nov 2023**	**337552**	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	**4**	<0.1	**-**	<1	**2**	<1	**-**	<0.05	**42**	**-**	**58**
MW01	**10 Nov 2023**	**337552**	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	**3**	**0.2**	**2,000**	<1	**6**	<1	**1,000**	<0.05	**14**	**3,000**	**44**
MW02	**10 Nov 2023**	**337552**	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	**1**	<0.1	**1,000**	<1	**2**	<1	**7,700**	<0.05	**5**	**4,000**	**17**
MW03	**10 Nov 2023**	**337552**	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	**3**	<0.1	**5,600**	<1	**1**	<1	**14,000**	<0.05	**39**	**10,000**	**62**

Environmental Standards
ANZG, July 2023, ANZG Freshwater Toxicant DGVs LOSP 95% (July 2023)

Table 4 - Groundwater Results Summary

REDITUS

				Inorganics																Biological
			Naphthalene (BTEX)	Hardness (filtered)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N (filtered)	Chloride	Ionic Balance	Nitrate (as N) (filtered)	Nitrogen (Total Oxidised)	Nitrogen (Total)	Total Phosphorus (Organic Phosphate)	Reactive Phosphorus as P (Orthophosphate as P) (filtered)	Sodium (filtered)	Sulphate	E. Coli
			ug/L	ngCaCO3/	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	%	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mpn/100 ml
EQL			1	3	5,000	5,000	5,000	5,000	5	1,000		5	5	100	50	5	500	1,000	18
ANZG Freshwater Toxicant DGVs LOSP 95% (July 2023)			16						900										
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Clay																			
>=2m, <4m																			
>=4m, <8m																			
>=8m																			
Field ID	**Date**	**Lab Report Number**																	
DUP01	**10 Nov 2023**	**337552**	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW01	**10 Nov 2023**	**337552**	<1	**9.6**	**10,000**	<5,000	<5,000	**10,000**	**18**	**45,000**	**-1.0**	**10**	**10**	<100	**200**	**30**	**73,000**	**98,000**	<18
MW02	**10 Nov 2023**	**337552**	<1	**35**	**13,000**	<5,000	<5,000	**13,000**	**16**	**150,000**	**2.0**	<5	<5	**100**	**1,800**	**40**	**200,000**	**210,000**	<18
MW03	**10 Nov 2023**	**337552**	<1	**70**	**24,000**	<5,000	<5,000	**24,000**	**37**	**390,000**	**0**	**20**	**20**	**100**	**520**	<5	**300,000**	**140,000**	<18

Environmental Standards
ANZG, July 2023, ANZG Freshwater Toxicant DGVs LOSP 95% (July 2023)

Table 5
Soil Relative Percent Difference Results Summary

REDITUS

					BTEX								TRH						TPH				PAH																				
					Naphthalene (BTEX)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ calc (Half)	Benzo(a)pyrene TEQ (LOR)	PAHs (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	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					1	0.2	0.5	0.5	0.5	0.5	0.5	0.2	10	10	50	50	100	100	10	50	100	100	0.2	0.1	0.1	0.1	0.1	0.05	0.5	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.5
Field ID	**Depth**	**Date**	**Lab Report Nun**	**Matrix Type**																																							
MW02	**0.1**	**02 Nov 2023**	**336965**	**Soil**	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	**64**	**64**	**330**	**140**	<25	**52**	**160**	**200**	**0.5**	<0.1	<0.1	<0.1	**0.2**	**0.3**	-	**0.2**	-	**0.3**	<0.1	**0.5**	<0.1	**0.1**	<0.1	**0.2**	**0.5**	<0.5	<0.5	-
DUP01		**02 Nov 2023**	**336965**	**Soil**	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	**210**	<100	<25	<50	**110**	**120**	**0.9**	<0.1	**0.1**	**0.1**	**0.5**	**0.58**	-	**0.4**	-	**0.5**	<0.1	**1.1**	<0.1	**0.3**	<0.1	**0.4**	**1.0**	**0.8**	**0.9**	-
RPD					0	0	0	0	0	0	0	-	0	0	25	25	44	33	0	4	37	50	57	0	0	0	86	64	-	67	-	50	0	75	0	100	0	67	67	46	57	-
MW02	**0.1**	**02 Nov 2023**	**336965**	**Soil**	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	**64**	**64**	**330**	**140**	<25	**52**	**160**	**200**	**0.5**	<0.1	<0.1	<0.1	**0.2**	**0.3**	-	**0.2**	-	**0.3**	<0.1	**0.5**	<0.1	**0.1**	<0.1	**0.2**	**0.5**	<0.5	<0.5	-
TRIP01		**02 Nov 2023**	**ES2338272**	**Soil**	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<10	<50	<50	<100	<100	<10	<50	<100	<100	-	<0.5	<0.5	<0.5	**0.5**	<0.5	**0.8**	<0.5	<0.5	<0.5	<0.5	**1.1**	<0.5	<0.5	<0.5	<0.5	**1.2**	**0.7**	**1.2**	**3.6**
RPD					0	0	0	0	0	0	0	-	0	0	25	25	107	33	0	4	46	67	-	0	0	0	86	0	-	0	-	0	0	75	0	0	0	0	82	33	82	-
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	**150**	<100	<25	<50	<100	<100	**0.4**	<0.1	<0.1	<0.1	**0.2**	**0.3**	-	**0.2**	-	**0.2**	<0.1	**0.4**	<0.1	**0.1**	<0.1	**0.1**	**0.4**	<0.5	<0.5	-
DUP02		**03 Nov 2023**	**336965**	**Soil**	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	**160**	<100	<25	<50	<100	<100	**0.3**	<0.1	<0.1	<0.1	**0.2**	**0.2**	-	**0.2**	-	**0.2**	<0.1	**0.3**	<0.1	**0.1**	<0.1	**0.1**	**0.3**	<0.5	<0.5	-
RPD					0	0	0	0	0	0	0	-	0	0	0	0	6	0	0	0	0	0	29	0	0	0	0	40	-	0	-	0	0	29	0	0	0	0	29	0	0	-
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	**150**	<100	<25	<50	<100	<100	**0.4**	<0.1	<0.1	<0.1	**0.2**	**0.3**	-	**0.2**	-	**0.2**	<0.1	**0.4**	<0.1	**0.1**	<0.1	**0.1**	**0.4**	<0.5	<0.5	-
TRIP02		**03 Nov 2023**	**ES2338272**	**Soil**	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<10	<50	<50	<100	<100	<10	<50	<100	<100	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	<0.5	<0.5	<0.5	<0.5	**0.6**	**0.6**	**1.2**	**1.2**
RPD					0	0	0	0	0	0	0	-	0	0	0	0	40	0	0	0	0	0	-	0	0	0	0	0	-	0	-	0	0	40	0	0	0	0	40	18	82	-

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 100 (0 - 5 x EQL); 75 (5 - 10 x EQL); 30 (> 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**

Table 5
Soil Relative Percent Difference Results Summary

REDITUS

					Metals								SVOCs		Organochlorine Pesticides																									
					Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Fenamiphos	Phosalone	4,4-DDE	a-BHC	Aldrin	Dieldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	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	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					4	0.4	1	1	1	0.1	1	1	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1
Field ID	Depth	Date	Lab Report Nur	Matrix Ty																																				
MW02	0.1	02 Nov 2023	336965	Soil	5	<0.4	20	32	270	0.2	6	160	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1
DUP01		02 Nov 2023	336965	Soil	<4	<0.4	13	22	190	0.1	4	100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1
RPD					22	0	42	37	36	67	40	46	0	0	0	0	0	0	-	0	-	0	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0
MW02	0.1	02 Nov 2023	336965	Soil	5	<0.4	20	32	270	0.2	6	160	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1
TRIP01		02 Nov 2023	ES2338272	Soil	<5	<1	13	25	212	0.1	3	130	<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	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
RPD					0	0	42	25	24	67	67	21	0	-	0	0	0	0	-	0	-	0	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0
BH08	0.1	03 Nov 2023	336965	Soil	6	0.9	11	41	250	0.3	6	490	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1
DUP02		03 Nov 2023	336965	Soil	5	0.9	13	38	280	0.3	6	490	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1
RPD					18	0	17	8	11	0	0	0	0	0	0	0	0	0	-	0	-	0	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0
BH08	0.1	03 Nov 2023	336965	Soil	6	0.9	11	41	250	0.3	6	490	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1
TRIP02		03 Nov 2023	ES2338272	Soil	5	<1	12	43	289	0.2	5	494	<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	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
RPD					18	0	9	5	14	40	18	1	0	-	0	0	0	0	-	0	-	0	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0

***RPDs have only been considered where a concentration is greate**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acc**
*****Interlab Duplicates are matched on a per compound basis as n**

Table 5
Soil Relative Percent Difference Results Summary

REDITUS

					Organophosphorous Pesticides																							Pesticides		
					Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Diazinon	Dichlorvos	Dimethoate	Disulfoton	Ethion	Fenitrothion	Fenthion	Malathion	Methidathion	Methyl parathion	Mevinphos (Phosdrin)	Monocrotophos	Parathion	Phorate	Prothiofos	Ronnel	Demeton-S-methyl	Mirex	Pirimphos-ethyl
					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					0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.1	0.05	0.1	0.05	0.05	0.1	0.1	0.1	0.2	0.1	0.1	0.05	0.1	0.05	0.1	0.05
Field ID	**Depth**	**Date**	**Lab Report Nur**	**Matrix Ty**																										
MW02	**0.1**	**02 Nov 2023**	**336965**	**Soil**	<0.1	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	-	<0.1	-
DUP01		**02 Nov 2023**	**336965**	**Soil**	<0.1	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	-	<0.1	-
RPD					0	0	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	-	0	-	0	-
MW02	**0.1**	**02 Nov 2023**	**336965**	**Soil**	<0.1	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	-	<0.1	-
TRIP01		**02 Nov 2023**	**ES2338272**	**Soil**	<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	-	<0.05
RPD					0	0	-	-	0	0	-	0	0	0	-	0	-	0	0	-	0	-	-	0	-	-	-	-	-	-
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	<0.1	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	-	<0.1	-
DUP02		**03 Nov 2023**	**336965**	**Soil**	<0.1	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	-	<0.1	-
RPD					0	0	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	-	0	-	0	-
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	<0.1	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	-	<0.1	-
TRIP02		**03 Nov 2023**	**ES2338272**	**Soil**	<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	-	<0.05
RPD					0	0	-	-	0	0	-	0	0	0	-	0	-	0	0	-	0	-	-	0	-	-	-	-	-	-

***RPDs have only been considered where a concentration is greate**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acc**
*****Interlab Duplicates are matched on a per compound basis as n**

Table 6
Water Relative Percent Difference Results Summary

REDITUS

				BTEX								TRH								TPH				
				Naphthalene (BTEX)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)
				ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
EQL				1	1	1	1	2	1	2	1	10	10	50	50	100	100	50	10	50	100	50	50
Field ID	**Date**	**Lab Report Number**	**Matrix Type**																					
MW03	**10 Nov 2023**	**337552**	**Water**	<1	<1	<1	<1	<2	<1	-	-	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50
DUP01	**10 Nov 2023**	**337552**	**Water**	<1	<1	<1	<1	<2	<1	-	-	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50
RPD				0	0	0	0	0	0	-	-	0	0	0	0	0	0	0	0	0	0	0	0
MW03	**10 Nov 2023**	**337552**	**Water**	<1	<1	<1	<1	<2	<1	-	-	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50
TRIP01	**10 Nov 2023**	**ES2339232**	**Water**	<5	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50
RPD				0	0	0	0	0	0	-	-	0	0	0	0	0	0	0	0	0	0	0	0

				PAH																								Metals							
				Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ	PAHs (Sum of total)	PAHs (Sum of positives)	Arsenic (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Lead (filtered)	Mercury (filtered)	Nickel (filtered)	Zinc (filtered)
				ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
EQL				0.2	0.1	0.1	0.1	0.1	0.1	1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.1	1	0.1	1	1	1	0.05	1	1
Field ID	**Date**	**Lab Report Number**	**Matrix Type**																												
MW03	**10 Nov 2023**	**337552**	**Water**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	<0.1	**3**	<0.1	<1	**1**	<1	<0.05	**39**	**62**
DUP01	**10 Nov 2023**	**337552**	**Water**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	<0.1	**4**	<0.1	<1	**2**	<1	<0.05	**42**	**58**
RPD				0	0	0	0	0	0	-	0	-	0	0	0	0	0	0	0	0	0	-	0	29	0	0	67	0	0	7	7
MW03	**10 Nov 2023**	**337552**	**Water**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	<0.1	**3**	<0.1	<1	**1**	<1	<0.05	**39**	**62**
TRIP01	**10 Nov 2023**	**ES2339232**	**Water**	-	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<0.5	-	**4**	<0.1	<1	<1	<1	<0.1	**42**	**51**
RPD				-	0	0	0	0	0	-	0	-	0	0	0	0	0	0	0	0	-	-	-	29	0	0	0	0	0	7	19

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 100 (0 - 5 x EQL); 75 (5 - 10 x EQL); 30 (> 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**

Table 7
Rinsate Blank Analytical Results Summary

REDITUS

			BTEX						TRH							TPH					PAH																		Metals							
			Naphthalene (BTEX)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)	Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ	PAHs (Sum of positives)	Arsenic (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Lead (filtered)	Mercury (filtered)	Nickel (filtered)	Zinc (filtered)
			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
EQL			1	1	1	1	2	1	10	10	50	50	100	100	50	10	50	100	100	50	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.1	1	0.1	1	1	1	0.05	1	1
Field ID	**Date**	**Lab Report Number**																																												
RB01	**10 Nov 2023**	**337552**	<1	<1	<1	<1	<2	<1	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<1	<0.1	<1	<1	<1	<0.05	<1	**2**

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Laboratory Reports

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CERTIFICATE OF ANALYSIS 336965

Client Details

Client	Reditus Consulting
Attention	Natasha Pasley
Address	Shop 1, 29-33 Waratah St, KIRRAWEE, NSW, 2232

Sample Details

Your Reference	**23210**
Number of Samples	63 Soil, 1 Material
Date samples received	03/11/2023
Date completed instructions received	03/11/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	10/11/2023
Date of Issue	10/11/2023

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Asbestos Approved By
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Authorised by Asbestos Approved Signatory: Lucy Zhu, Nyovan Moonean

Results Approved By
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Liam Timmins, Organics Supervisor
Loren Bardwell, Development Chemist
Lucy Zhu, Asbestos Supervisor
Nyovan Moonean, Asbestos Approved Identifier/Counter

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		336965-2	336965-4	336965-10	336965-11	336965-17
Your Reference	UNITS	MW01	MW01	MW02	MW02	MW03
Depth		0.5	1.4	0.1	0.3	0.1
Date Sampled		2/11/2023	2/11/2023	2/11/2023	2/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	92	124	88	87	91

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		336965-18	336965-24	336965-26	336965-29	336965-30
Your Reference	UNITS	MW03	BH01	BH01	BH02	BH02
Depth		0.7	0.1	0.8	0.5	0.8
Date Sampled		2/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	91	87	82	92	89

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		336965-34	336965-36	336965-38	336965-41	336965-44
Your Reference	UNITS	BH03	BH03	BH04	BH05	BH07
Depth		0.15	0.8	0.05	0.1	0.3
Date Sampled		3/11/2023	3/11/2023	2/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	3
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	87	88	92	92	91

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		336965-47	336965-50	336965-51	336965-52	336965-54
Your Reference	UNITS	BH08	BH09	BH10	BH10	BH11
Depth		0.1	0.1	0.1	0.4	0.1
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	09/11/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	90	88	89	90	91

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		336965-59	336965-63	336965-64
Your Reference	UNITS	BH12	DUP01	DUP02
Depth		0.4	-	-
Date Sampled		3/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	09/11/2023	09/11/2023	09/11/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	87	93	91

svTRH (C10-C40) in Soil						
Our Reference		336965-2	336965-4	336965-10	336965-11	336965-17
Your Reference	UNITS	MW01	MW01	MW02	MW02	MW03
Depth		0.5	1.4	0.1	0.3	0.1
Date Sampled		2/11/2023	2/11/2023	2/11/2023	2/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	52	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	160	<100	120
TRH C_{29} - C_{36}	mg/kg	<100	<100	200	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	410	<50	120
TRH >C_{10} -C_{16}	mg/kg	<50	<50	64	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	64	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	330	<100	170
TRH >C_{34} -C_{40}	mg/kg	<100	<100	140	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	540	<50	170
Surrogate o-Terphenyl	%	126	121	128	119	122

svTRH (C10-C40) in Soil						
Our Reference		336965-18	336965-24	336965-26	336965-29	336965-30
Your Reference	UNITS	MW03	BH01	BH01	BH02	BH02
Depth		0.7	0.1	0.8	0.5	0.8
Date Sampled		2/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	118	123	124	123	125

svTRH (C10-C40) in Soil						
Our Reference		336965-34	336965-36	336965-38	336965-41	336965-44
Your Reference	UNITS	BH03	BH03	BH04	BH05	BH07
Depth		0.15	0.8	0.05	0.1	0.3
Date Sampled		3/11/2023	3/11/2023	2/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	210
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	160	8,500
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	120	4,700
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	280	13,000
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	640
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	640
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	260	13,000
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	2,900
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	260	16,000
Surrogate o-Terphenyl	%	124	122	119	133	#

svTRH (C10-C40) in Soil						
Our Reference		336965-47	336965-50	336965-51	336965-52	336965-54
Your Reference	UNITS	BH08	BH09	BH10	BH10	BH11
Depth		0.1	0.1	0.1	0.4	0.1
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	320	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	230	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	550	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	59	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	59	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	150	510	130	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	180	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	150	750	130	<50	<50
Surrogate o-Terphenyl	%	127	123	130	125	123

svTRH (C10-C40) in Soil				
Our Reference		336965-59	336965-63	336965-64
Your Reference	UNITS	BH12	DUP01	DUP02
Depth		0.4	-	-
Date Sampled		3/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	110	<100
TRH C_{29} - C_{36}	mg/kg	<100	120	<100
Total +ve TRH (C10-C36)	mg/kg	<50	230	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	210	160
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	210	160
Surrogate o-Terphenyl	%	124	131	125

PAHs in Soil						
Our Reference		336965-2	336965-4	336965-10	336965-11	336965-17
Your Reference	UNITS	MW01	MW01	MW02	MW02	MW03
Depth		0.5	1.4	0.1	0.3	0.1
Date Sampled		2/11/2023	2/11/2023	2/11/2023	2/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	<0.1	<0.1	0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.4	<0.1	0.2	<0.1	0.4
Anthracene	mg/kg	0.4	<0.1	<0.1	<0.1	0.1
Fluoranthene	mg/kg	0.8	0.1	0.5	<0.1	0.7
Pyrene	mg/kg	0.8	<0.1	0.5	<0.1	0.6
Benzo(a)anthracene	mg/kg	0.3	<0.1	0.2	<0.1	0.3
Chrysene	mg/kg	0.4	<0.1	0.3	<0.1	0.3
Benzo(b,j+k)fluoranthene	mg/kg	0.6	<0.2	0.5	<0.2	0.5
Benzo(a)pyrene	mg/kg	0.4	<0.05	0.3	<0.05	0.3
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	<0.1	0.1	<0.1	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.2	<0.1	0.2	<0.1	0.2
Total +ve PAH's	mg/kg	4.7	0.1	2.7	<0.05	3.7
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.6	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.6	<0.5	<0.5	<0.5	0.5
Surrogate p-Terphenyl-d14	%	93	92	93	92	93

PAHs in Soil						
Our Reference		336965-18	336965-24	336965-26	336965-29	336965-30
Your Reference	UNITS	MW03	BH01	BH01	BH02	BH02
Depth		0.7	0.1	0.8	0.5	0.8
Date Sampled		2/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.1	<0.1	0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	0.3	<0.1	0.4	<0.1
Pyrene	mg/kg	<0.1	0.3	<0.1	0.4	<0.1
Benzo(a)anthracene	mg/kg	<0.1	0.2	<0.1	0.2	<0.1
Chrysene	mg/kg	<0.1	0.2	<0.1	0.2	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	0.3	<0.2	0.3	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.2	<0.05	0.2	0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.1	<0.1	0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.1	<0.1	0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	1.9	<0.05	1.9	0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	93	91	89	92	94

PAHs in Soil						
Our Reference		336965-34	336965-36	336965-38	336965-41	336965-44
Your Reference	UNITS	BH03	BH03	BH04	BH05	BH07
Depth		0.15	0.8	0.05	0.1	0.3
Date Sampled		3/11/2023	3/11/2023	2/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	3.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	0.3	13
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	12
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	14
Phenanthrene	mg/kg	<0.1	<0.1	0.1	0.8	240
Anthracene	mg/kg	<0.1	<0.1	<0.1	0.3	61
Fluoranthene	mg/kg	0.1	<0.1	0.3	2.4	220
Pyrene	mg/kg	0.1	<0.1	0.3	2.5	200
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.1	1.4	83
Chrysene	mg/kg	<0.1	<0.1	0.2	1.4	81
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	0.3	2.4	110
Benzo(a)pyrene	mg/kg	0.05	<0.05	0.2	1.7	85
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	0.1	0.9	29
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	0.3	11
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	0.1	1.0	35
Total +ve PAH's	mg/kg	0.3	<0.05	1.7	15	1,200
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	2.5	120
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	2.5	120
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	2.5	120
Surrogate p-Terphenyl-d14	%	92	96	96	93	90

PAHs in Soil						
Our Reference		336965-47	336965-50	336965-51	336965-52	336965-54
Your Reference	UNITS	BH08	BH09	BH10	BH10	BH11
Depth		0.1	0.1	0.1	0.4	0.1
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Naphthalene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.3	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	0.4	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	0.6	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	6.2	<0.1	<0.1	0.2
Anthracene	mg/kg	<0.1	1.4	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.4	6.4	0.1	0.2	0.3
Pyrene	mg/kg	0.4	5.4	0.1	0.1	0.3
Benzo(a)anthracene	mg/kg	0.2	2.4	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.2	2.3	<0.1	<0.1	0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.4	3.3	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.3	2.4	0.05	0.07	0.09
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	1.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.3	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.2	1.4	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	2.4	34	0.3	0.4	1.0
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	3.4	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	3.4	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	3.4	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	93	90	94	90	89

PAHs in Soil				
Our Reference		336965-59	336965-63	336965-64
Your Reference	UNITS	BH12	DUP01	DUP02
Depth		0.4	-	-
Date Sampled		3/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.4	0.1
Anthracene	mg/kg	<0.1	0.1	<0.1
Fluoranthene	mg/kg	0.1	1.1	0.3
Pyrene	mg/kg	0.1	1.0	0.3
Benzo(a)anthracene	mg/kg	<0.1	0.5	0.2
Chrysene	mg/kg	<0.1	0.5	0.2
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	0.9	0.3
Benzo(a)pyrene	mg/kg	0.06	0.58	0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.3	0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.4	0.2
Total +ve PAH's	mg/kg	0.3	5.9	2.0
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	0.8	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	0.8	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	0.9	<0.5
Surrogate p-Terphenyl-d14	%	93	90	88

Organochlorine Pesticides in soil						
Our Reference		336965-2	336965-10	336965-17	336965-24	336965-29
Your Reference	UNITS	MW01	MW02	MW03	BH01	BH02
Depth		0.5	0.1	0.1	0.1	0.5
Date Sampled		2/11/2023	2/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	98	91	90	91	90

Organochlorine Pesticides in soil						
Our Reference		336965-34	336965-38	336965-41	336965-44	336965-47
Your Reference	UNITS	BH03	BH04	BH05	BH07	BH08
Depth		0.15	0.05	0.1	0.3	0.1
Date Sampled		3/11/2023	2/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Surrogate TCMX	%	96	96	93	90	94

Organochlorine Pesticides in soil						
Our Reference		336965-50	336965-51	336965-54	336965-59	336965-63
Your Reference	UNITS	BH09	BH10	BH11	BH12	DUP01
Depth		0.1	0.1	0.1	0.4	-
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	10/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	102	94	92	94	91

Organochlorine Pesticides in soil		
Our Reference		336965-64
Your Reference	UNITS	DUP02
Depth		-
Date Sampled		3/11/2023
Type of sample		Soil
Date extracted	-	06/11/2023
Date analysed	-	08/11/2023
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Mirex	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	92

Organophosphorus Pesticides in Soil						
Our Reference		336965-2	336965-10	336965-17	336965-24	336965-29
Your Reference	UNITS	MW01	MW02	MW03	BH01	BH02
Depth		0.5	0.1	0.1	0.1	0.5
Date Sampled		2/11/2023	2/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	98	91	90	91	90

Organophosphorus Pesticides in Soil						
Our Reference		336965-34	336965-38	336965-41	336965-44	336965-47
Your Reference	UNITS	BH03	BH04	BH05	BH07	BH08
Depth		0.15	0.05	0.1	0.3	0.1
Date Sampled		3/11/2023	2/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Surrogate TCMX	%	96	96	93	90	94

Organophosphorus Pesticides in Soil						
Our Reference		336965-50	336965-51	336965-54	336965-59	336965-63
Your Reference	UNITS	BH09	BH10	BH11	BH12	DUP01
Depth		0.1	0.1	0.1	0.4	-
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	93	94	92	94	91

Organophosphorus Pesticides in Soil		
Our Reference		336965-64
Your Reference	UNITS	DUP02
Depth		-
Date Sampled		3/11/2023
Type of sample		Soil
Date extracted	-	06/11/2023
Date analysed	-	08/11/2023
Dichlorvos	mg/kg	<0.1
Mevinphos	mg/kg	<0.1
Phorate	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Disulfoton	mg/kg	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1
Parathion-Methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Fenthion	mg/kg	<0.1
Parathion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Methidathion	mg/kg	<0.1
Fenamiphos	mg/kg	<0.1
Ethion	mg/kg	<0.1
Phosalone	mg/kg	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1
Coumaphos	mg/kg	<0.1
Surrogate TCMX	%	92

Acid Extractable metals in soil						
Our Reference		336965-2	336965-4	336965-10	336965-11	336965-17
Your Reference	UNITS	MW01	MW01	MW02	MW02	MW03
Depth		0.5	1.4	0.1	0.3	0.1
Date Sampled		2/11/2023	2/11/2023	2/11/2023	2/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Arsenic	mg/kg	6	11	5	6	7
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	22	38	20	30	29
Copper	mg/kg	17	4	32	1	18
Lead	mg/kg	25	25	270	37	64
Mercury	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Nickel	mg/kg	8	6	6	2	4
Zinc	mg/kg	13	7	160	28	130

Acid Extractable metals in soil						
Our Reference		336965-18	336965-24	336965-26	336965-29	336965-30
Your Reference	UNITS	MW03	BH01	BH01	BH02	BH02
Depth		0.7	0.1	0.8	0.5	0.8
Date Sampled		2/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Arsenic	mg/kg	5	8	9	7	9
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	25	15	49	34	43
Copper	mg/kg	<1	41	1	9	<1
Lead	mg/kg	22	110	26	170	35
Mercury	mg/kg	<0.1	0.1	<0.1	0.3	<0.1
Nickel	mg/kg	2	12	3	4	3
Zinc	mg/kg	10	240	16	59	7

Acid Extractable metals in soil						
Our Reference		336965-34	336965-36	336965-38	336965-41	336965-44
Your Reference	UNITS	BH03	BH03	BH04	BH05	BH07
Depth		0.15	0.8	0.05	0.1	0.3
Date Sampled		3/11/2023	3/11/2023	2/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Arsenic	mg/kg	7	7	<4	6	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	26	33	9	15	6
Copper	mg/kg	29	<1	16	36	120
Lead	mg/kg	160	31	48	360	64
Mercury	mg/kg	0.2	<0.1	<0.1	0.2	<0.1
Nickel	mg/kg	8	2	3	7	17
Zinc	mg/kg	130	9	81	180	170

Acid Extractable metals in soil						
Our Reference		336965-47	336965-50	336965-51	336965-52	336965-54
Your Reference	UNITS	BH08	BH09	BH10	BH10	BH11
Depth		0.1	0.1	0.1	0.4	0.1
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Arsenic	mg/kg	6	11	<4	19	8
Cadmium	mg/kg	0.9	<0.4	<0.4	<0.4	7.3
Chromium	mg/kg	11	19	9	17	9
Copper	mg/kg	41	81	19	12	45
Lead	mg/kg	250	68	28	100	34
Mercury	mg/kg	0.3	0.1	<0.1	<0.1	0.1
Nickel	mg/kg	6	8	4	3	6
Zinc	mg/kg	490	240	180	75	49

Acid Extractable metals in soil					
Our Reference		336965-59	336965-63	336965-64	336965-65
Your Reference	UNITS	BH12	DUP01	DUP02	BH02 - [TRIPLICATE]
Depth		0.4	-	-	0.5
Date Sampled		3/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Arsenic	mg/kg	13	<4	5	11
Cadmium	mg/kg	<0.4	<0.4	0.9	<0.4
Chromium	mg/kg	10	13	13	32
Copper	mg/kg	27	22	38	16
Lead	mg/kg	31	190	280	170
Mercury	mg/kg	<0.1	0.1	0.3	0.3
Nickel	mg/kg	4	4	6	4
Zinc	mg/kg	47	100	490	71

Moisture						
Our Reference		336965-2	336965-4	336965-10	336965-11	336965-17
Your Reference	UNITS	MW01	MW01	MW02	MW02	MW03
Depth		0.5	1.4	0.1	0.3	0.1
Date Sampled		2/11/2023	2/11/2023	2/11/2023	2/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Moisture	%	21	24	9.6	20	4.9

Moisture						
Our Reference		336965-18	336965-24	336965-26	336965-29	336965-30
Your Reference	UNITS	MW03	BH01	BH01	BH02	BH02
Depth		0.7	0.1	0.8	0.5	0.8
Date Sampled		2/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Moisture	%	21	13	27	19	24

Moisture						
Our Reference		336965-34	336965-36	336965-38	336965-41	336965-44
Your Reference	UNITS	BH03	BH03	BH04	BH05	BH07
Depth		0.15	0.8	0.05	0.1	0.3
Date Sampled		3/11/2023	3/11/2023	2/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Moisture	%	24	24	5.7	9.4	6.2

Moisture						
Our Reference		336965-47	336965-50	336965-51	336965-52	336965-54
Your Reference	UNITS	BH08	BH09	BH10	BH10	BH11
Depth		0.1	0.1	0.1	0.4	0.1
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Moisture	%	19	19	21	20	24

Moisture				
Our Reference		336965-59	336965-63	336965-64
Your Reference	UNITS	BH12	DUP01	DUP02
Depth		0.4	-	-
Date Sampled		3/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023
Moisture	%	13	13	15

Asbestos ID - soils NEPM						
Our Reference		336965-9	336965-16	336965-23	336965-27	336965-33
Your Reference	UNITS	MW01	MW02	MW03	BH01	BH02
Depth		0.2-1.3	0.1-0.2	0.1-0.6	0.1-0.3	0.2-0.8
Date Sampled		2/11/2023	2/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	09/11/2023	09/11/2023	09/11/2023	09/11/2023	09/11/2023
Sample mass tested	g	519.11	633.43	586.53	633.33	528.79
Sample Description	-	Brown coarse-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos[#1]	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM						
Our Reference		336965-37	336965-40	336965-41	336965-46	336965-48
Your Reference	UNITS	BH03	BH04	BH05	BH07	BH08
Depth		0.15-0.25	0-0.1	0.1	0.2-0.3	0.1-0.3
Date Sampled		3/11/2023	2/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	09/11/2023	09/11/2023	09/11/2023	09/11/2023	09/11/2023
Sample mass tested	g	510.37	679.37	690.93	652.97	557.47
Sample Description	-	Brown coarse-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Black coarse-grained soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	Chrysotile asbestos detected Amosite asbestos detected Crocidolite asbestos detected Organic fibre detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos#1	g/kg	<0.1	<0.1	<0.1	<0.1	0.5190
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	See Above
ACM >7mm Estimation*	g	–	–	–	–	0.2894
FA and AF Estimation*	g	–	–	–	–	–
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM					
Our Reference		336965-50	336965-53	336965-56	336965-62
Your Reference	UNITS	BH09	BH10	BH11	BH12
Depth		0.1	0.1-0.3	0.1-0.2	0.2-0.7
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil
Date analysed	-	09/11/2023	09/11/2023	09/11/2023	09/11/2023
Sample mass tested	g	572.17	601.19	606.21	716.06
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos#1	g/kg	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	Chrysotile Crocidolite	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–
FA and AF Estimation*	g	0.0017	–	–	–
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001

Asbestos ID - materials		
Our Reference		336965-49
Your Reference	UNITS	BH08-0.1-0.3_PACM
Depth		0.1-0.3
Date Sampled		3/11/2023
Type of sample		Material
Date analysed	-	06/11/2023
Mass / Dimension of Sample	-	50x40x5mm
Sample Description	-	Grey fibre cement material
Asbestos ID in materials	-	Chrysotile asbestos detected
Trace Analysis	-	[NT]

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. **NOTE** #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) **NOTE** #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	336965-10
Date extracted	-			06/11/2023	2	06/11/2023	06/11/2023		06/11/2023	06/11/2023
Date analysed	-			09/11/2023	2	08/11/2023	08/11/2023		08/11/2023	08/11/2023
TRH C_6 - C_9	mg/kg	25	Org-023	<25	2	<25	<25	0	110	106
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	2	<25	<25	0	110	106
Benzene	mg/kg	0.2	Org-023	<0.2	2	<0.2	<0.2	0	110	107
Toluene	mg/kg	0.5	Org-023	<0.5	2	<0.5	<0.5	0	108	102
Ethylbenzene	mg/kg	1	Org-023	<1	2	<1	<1	0	105	102
m+p-xylene	mg/kg	2	Org-023	<2	2	<2	<2	0	114	110
o-Xylene	mg/kg	1	Org-023	<1	2	<1	<1	0	113	110
Naphthalene	mg/kg	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	85	2	92	96	4	94	89

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date extracted	-			[NT]	29	06/11/2023	06/11/2023		06/11/2023	[NT]
Date analysed	-			[NT]	29	08/11/2023	08/11/2023		09/11/2023	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	29	<25	<25	0	108	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	29	<25	<25	0	108	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	29	<0.2	<0.2	0	107	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	29	<0.5	<0.5	0	107	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	29	<1	<1	0	104	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	29	<2	<2	0	112	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	29	<1	<1	0	111	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	29	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	29	92	87	6	92	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	44	06/11/2023	08/11/2023		[NT]	[NT]
Date analysed	-			[NT]	44	08/11/2023	09/11/2023		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	44	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	44	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	44	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	44	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	44	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	44	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	44	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	44	3	4	29	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	44	91	91	0	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	336965-10
Date extracted	-			06/11/2023	2	06/11/2023	06/11/2023		06/11/2023	06/11/2023
Date analysed	-			07/11/2023	2	07/11/2023	07/11/2023		07/11/2023	08/11/2023
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	2	<50	<50	0	115	112
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	2	<100	<100	0	119	92
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	2	<100	<100	0	86	114
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	2	<50	<50	0	115	112
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	2	<100	<100	0	119	92
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	2	<100	<100	0	86	114
Surrogate o-Terphenyl	%		Org-020	114	2	126	123	2	126	138

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date extracted	-			[NT]	29	06/11/2023	06/11/2023		06/11/2023	[NT]
Date analysed	-			[NT]	29	08/11/2023	08/11/2023		08/11/2023	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	29	<50	<50	0	127	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	29	<100	<100	0	127	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	29	<100	<100	0	100	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	29	<50	<50	0	127	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	29	<100	<100	0	127	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	29	<100	<100	0	100	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	29	123	123	0	136	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	336965-10
Date extracted	-			06/11/2023	2	06/11/2023	06/11/2023		06/11/2023	06/11/2023
Date analysed	-			08/11/2023	2	08/11/2023	08/11/2023		08/11/2023	08/11/2023
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	93	92
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	2	0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	95	93
Fluorene	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	88	86
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	2	0.4	0.1	120	94	92
Anthracene	mg/kg	0.1	Org-022/025	<0.1	2	0.4	<0.1	120	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	2	0.8	0.3	91	98	93
Pyrene	mg/kg	0.1	Org-022/025	<0.1	2	0.8	0.2	120	97	98
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	2	0.3	0.1	100	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	2	0.4	0.2	67	85	81
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	2	0.6	0.2	100	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	2	0.4	0.2	67	88	87
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	2	0.2	<0.1	67	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	2	0.2	0.1	67	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	88	2	93	92	1	93	91

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date extracted	-			[NT]	29	06/11/2023	06/11/2023		06/11/2023	[NT]
Date analysed	-			[NT]	29	08/11/2023	08/11/2023		08/11/2023	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	90	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	93	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	86	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	29	0.1	<0.1	0	92	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	29	0.4	0.3	29	94	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	29	0.4	0.3	29	93	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	29	0.2	0.2	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	29	0.2	0.2	0	81	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	29	0.3	0.3	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	29	0.2	0.2	0	92	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	29	0.1	0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	29	0.1	0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	29	92	97	5	89	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	336965-10
Date extracted	-			06/11/2023	2	06/11/2023	06/11/2023		06/11/2023	06/11/2023
Date analysed	-			08/11/2023	2	08/11/2023	08/11/2023		08/11/2023	08/11/2023
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	100	96
HCB	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	98	98
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	93	95
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	85	87
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	96	102
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	105	109
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	116	118
Endrin	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	86	98
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	86	93
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	120	140
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	95	2	98	94	4	99	92

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date extracted	-			[NT]	29	06/11/2023	06/11/2023		06/11/2023	[NT]
Date analysed	-			[NT]	29	08/11/2023	08/11/2023		08/11/2023	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	96	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	96	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	89	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	83	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	96	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	103	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	112	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	84	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	84	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	100	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	29	90	94	4	96	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	50	06/11/2023	06/11/2023		[NT]	[NT]
Date analysed	-			[NT]	50	10/11/2023	10/11/2023		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	50	102	100	2	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	336965-10
Date extracted	-			06/11/2023	2	06/11/2023	06/11/2023		06/11/2023	06/11/2023
Date analysed	-			08/11/2023	2	08/11/2023	08/11/2023		08/11/2023	08/11/2023
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	101	113
Mevinphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	91	97
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	87	107
Malathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	83	105
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	94	100
Fenthion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	84	100
Bromophos-ethyl	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	68	91
Phosalone	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	95	2	98	94	4	99	92

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date extracted	-			[NT]	29	06/11/2023	06/11/2023		06/11/2023	[NT]
Date analysed	-			[NT]	29	08/11/2023	08/11/2023		08/11/2023	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	103	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	91	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	89	[NT]
Malathion	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	83	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	92	[NT]
Fenthion	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	80	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	72	[NT]
Phosalone	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	29	90	94	4	96	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	336965-10
Date prepared	-			06/11/2023	2	06/11/2023	06/11/2023		06/11/2023	06/11/2023
Date analysed	-			07/11/2023	2	07/11/2023	07/11/2023		07/11/2023	07/11/2023
Arsenic	mg/kg	4	Metals-020	<4	2	6	7	15	110	96
Cadmium	mg/kg	0.4	Metals-020	<0.4	2	<0.4	<0.4	0	104	87
Chromium	mg/kg	1	Metals-020	<1	2	22	21	5	107	91
Copper	mg/kg	1	Metals-020	<1	2	17	13	27	104	93
Lead	mg/kg	1	Metals-020	<1	2	25	28	11	109	73
Mercury	mg/kg	0.1	Metals-021	<0.1	2	<0.1	<0.1	0	101	101
Nickel	mg/kg	1	Metals-020	<1	2	8	9	12	106	91
Zinc	mg/kg	1	Metals-020	<1	2	13	12	8	109	77

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date prepared	-			[NT]	29	06/11/2023	06/11/2023		06/11/2023	[NT]
Date analysed	-			[NT]	29	07/11/2023	07/11/2023		07/11/2023	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	29	7	5	33	113	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	29	<0.4	<0.4	0	104	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	29	34	26	27	111	[NT]
Copper	mg/kg	1	Metals-020	[NT]	29	9	16	56	105	[NT]
Lead	mg/kg	1	Metals-020	[NT]	29	170	190	11	112	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	29	0.3	0.3	0	99	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	29	4	4	0	107	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	29	59	68	14	110	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

TRH Soil C10-C40 NEPM - # Percent recovery for the surrogate is not possible to report as the high concentration of analytes in sample 336965-44 have caused interference.

PAHs in Soil - The RPD for duplicate results is accepted due to the non homogenous nature of sample 336965-2.

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 336965-29 for Cu. Therefore a triplicate result has been issued as laboratory sample number 336965-65.

OCP_S_MSMS:The PQL has been raised due to interferences from analytes (other than those being tested) in sample/s 336965-44.

OP_S_MSMS:The PQL has been raised due to interferences from analytes (other than those being tested) in sample/s 336965-44.

Asbestos-ID in soil: NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

Factual description of asbestos identified in the soil samples: NEPM
Sample 336965-48; Chrysotile, Amosite & Crocidolite asbestos identified in 1.9290g of fibre cement material >7mm

Sample 336965-50; Chrysotile & Crocidolite asbestos identified in 0.0021g of fibrous matted material

COC 3/11/23 1504

CHAIN OF CUSTODY FORM - Client

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Melbourne Lab - Envirolab Services
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Darwin Office - Envirolab Services
Unit 7, 17 Willes Rd, Berrimah, NT 0820
T 08 8967 1201 | darwin@envirolab.com.au

Client: Reditus Consulting
Contact Person: Natasha Pasley
Project Mgr: Natasha Pasley
Sampler: Ross Kingswell
Address: Unit 1A, Level 1, 29-33 Waratah Street Kirrawee NSW
Phone: 02 9521 8567 Mob:
Email Invoice To: accounts@reditusconsulting.com
Email Results To: natashapasley@reditus.com.au, rosskingswell@reditus.com.au

Client Project Name/Number/Site etc (ie report title): 23210
PO No.:
Envirolab Quote No.:
Date results required:
Or choose: standard
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Additional report format: esdat
Lab Comments:

Envirolab Sample ID	Client Sample ID or Information	Depth	Date sampled	Type of sample	Combo 3	Combo 5b	Combo 5bAN	Asbestos NEPM	Asbestos ID	Hold	Comments (Provide as much information about the sample as you can)
1	MW01	0.1	2/11/2023	Soil						x	
2	MW01	0.5	2/11/2023	Soil		x					
3	MW01	1	2/11/2023	Soil						x	
4	MW01	1.4	2/11/2023	Soil	x						
5	MW01	3	2/11/2023	Soil						x	
6	MW01	5	2/11/2023	Soil						x	
7	MW01	9	2/11/2023	Soil						x	
8	MW01	0.1-0.2	2/11/2023	Soil						x	
9	MW01	0.2-1.3	2/11/2023	Soil				x			
10	MW02	0.1	2/11/2023	Soil		x					
11	MW02	0.3	2/11/2023	Soil	x						
12	MW02	1	2/11/2023	Soil						x	
13	MW02	4	2/11/2023	Soil						x	
14	MW02	8	2/11/2023	Soil						x	
15	MW02	10	2/11/2023	Soil						x	
16	MW02	0.1-0.2	2/11/2023	Soil				x			
17	MW03	0.1	2/11/2023	Soil		x					
18	MW03	0.7	2/11/2023	Soil	x						
19	MW03	1.5	2/11/2023	Soil						x	
20	MW03	3	2/11/2023	Soil						x	
21	MW03	6	2/11/2023	Soil						x	
22	MW03	9	2/11/2023	Soil						x	
23	MW03	0.1-0.6	2/11/2023	Soil				x			
24	BH01	0.1	3/11/2023	Soil		x					
25	BH01	0.4	3/11/2023	Soil						x	
26	BH01	0.8	3/11/2023	Soil	x						
27	BH01	0.1-0.3	3/11/2023	Soil				x			
28	BH02	0.1	3/11/2023	Soil						x	
29	BH02	0.5	3/11/2023	Soil		x					
30	BH02	0.8	3/11/2023	Soil	x						
31	BH02	1.3	3/11/2023	Soil						x	
32	BH02	0.1-0.2	3/11/2023	Soil						x	
33	BH02	0.2-0.8	3/11/2023	Soil				x			
34	BH03	0.15	3/11/2023	Soil		x					
35	BH03	0.3	3/11/2023	Soil						x	
36	BH03	0.8	3/11/2023	Soil	x						
37	BH03	0.15-0.25	3/11/2023	Soil				x			
38	BH04	0.05	2/11/2023	Soil		x					
39	BH04	0.2	2/11/2023	Soil						x	
40	BH04	0-0.1	2/11/2023	Soil				x			
41	BH05	0.1	2/11/2023	Soil			x				
42	BH05	0.2	2/11/2023	Soil						x	
43	BH07	0.1	3/11/2023	Soil						x	
44	BH07	0.3	3/11/2023	Soil		x					
45	BH07	0.1-0.2	3/11/2023	Soil						x	
46	BH07	0.2-0.3	3/11/2023	Soil				x			
47	BH08	0.1	3/11/2023	Soil		x					
48	BH08	0.1-0.3	3/11/2023	Soil				x			
49	BH08-0.1-0.3_PACM	0.1-0.3	3/11/2023	Soil					x		
50	BH09	0.1	3/11/2023	Soil			x				
51	BH10	0.1	3/11/2023	Soil		x					
52	BH10	0.4	3/11/2023	Soil	x						
53	BH10	0.1-0.3	3/11/2023	Soil				x			
54	BH11	0.1	3/11/2023	Soil		x					
55	BH11	0.4	3/11/2023	Soil						x	
56	BH11	0.1-0.2	3/11/2023	Soil				x			
57	BH11	0.2-0.4	3/11/2023	Soil						x	
58	BH12	0.1	3/11/2023	Soil						x	
59	BH12	0.4	3/11/2023	Soil		x					
60	BH12	0.7	3/11/2023	Soil						x	
61	BH12	0.1-0.2	3/11/2023	Soil						x	
62	BH12	0.2-0.7	3/11/2023	Soil				x			
63	DUP01		2/11/2023	Soil		x					
~~64~~	TRIP01		2/11/2023	Soil		x					Please forward to ALS
64 ~~65~~	DUP02		3/11/2023	Soil		x					
~~66~~	TRIP02		3/11/2023	Soil		x					Please forward to ALS
				Sample Count	7	16	2	12	1	23	

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): Reditus	Received by (Company):	Lab Use Only	
Print Name: Ross Kingswell	Print Name:	Job number:	Cooling: Ice / Ice pack / None
Date & Time: 3/11/2023	Date & Time:	Temperature:	Security seal: Intact / Broken / None
Signature:	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 336965
Date Received: 3/11
Time Received: 1340
Received By: Paul
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

65: 13+09 = Oct-0.2 Extra

Envirolab Services Pty Ltd
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12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Reditus Consulting
Attention	Natasha Pasley

Sample Login Details

Your reference	23210
Envirolab Reference	336965
Date Sample Received	03/11/2023
Date Instructions Received	03/11/2023
Date Results Expected to be Reported	10/11/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	63 Soil, 1 Material
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	18
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	sVTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM	Asbestos ID - materials	On Hold
MW01-0.1									✓
MW01-0.5	✓	✓	✓	✓	✓	✓			
MW01-1									✓
MW01-1.4	✓	✓	✓			✓			
MW01-3									✓
MW01-5									✓
MW01-9									✓
MW01-0.1-0.2									✓
MW01-0.2-1.3							✓		
MW02-0.1	✓	✓	✓	✓	✓	✓			
MW02-0.3	✓	✓	✓			✓			
MW02-1									✓
MW02-4									✓
MW02-8									✓
MW02-10									✓
MW02-0.1-0.2							✓		
MW03-0.1	✓	✓	✓	✓	✓	✓			
MW03-0.7	✓	✓	✓			✓			
MW03-1.5									✓
MW03-3									✓
MW03-6									✓
MW03-9									✓
MW03-0.1-0.6							✓		
BH01-0.1	✓	✓	✓	✓	✓	✓			
BH01-0.4									✓
BH01-0.8	✓	✓	✓			✓			
BH01-0.1-0.3							✓		
BH02-0.1									✓
BH02-0.5	✓	✓	✓	✓	✓	✓			
BH02-0.8	✓	✓	✓			✓			
BH02-1.3									✓
BH02-0.1-0.2									✓

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	sVTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM	Asbestos ID - materials	On Hold
BH02-0.2-0.8							✓		
BH03-0.15	✓	✓	✓	✓	✓	✓			
BH03-0.3									✓
BH03-0.8	✓	✓	✓			✓			
BH03-0.15-0.25							✓		
BH04-0.05	✓	✓	✓	✓	✓	✓			
BH04-0.2									✓
BH04-0-0.1							✓		
BH05-0.1	✓	✓	✓	✓	✓	✓	✓		
BH05-0.2									✓
BH07-0.1									✓
BH07-0.3	✓	✓	✓	✓	✓	✓			
BH07-0.1-0.2									✓
BH07-0.2-0.3							✓		
BH08-0.1	✓	✓	✓	✓	✓	✓			
BH08-0.1-0.3							✓		
BH08-0.1-0.3_PACM-0.1-0.3								✓	
BH09-0.1	✓	✓	✓	✓	✓	✓	✓		
BH10-0.1	✓	✓	✓	✓	✓	✓			
BH10-0.4	✓	✓	✓			✓			
BH10-0.1-0.3							✓		
BH11-0.1	✓	✓	✓	✓	✓	✓			
BH11-0.4									✓
BH11-0.1-0.2							✓		
BH11-0.2-0.4									✓
BH12-0.1									✓
BH12-0.4	✓	✓	✓	✓	✓	✓			
BH12-0.7									✓
BH12-0.1-0.2									✓
BH12-0.2-0.7							✓		
DUP01	✓	✓	✓	✓	✓	✓			
DUP02	✓	✓	✓	✓	✓	✓			

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

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Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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CERTIFICATE OF ANALYSIS 337219

Client Details

Client	Reditus Consulting
Attention	Ross Kingswell
Address	Shop 1, 29-33 Waratah St, KIRRAWEE, NSW, 2232

Sample Details

Your Reference	**23210**
Number of Samples	5 Soil
Date samples received	07/11/2023
Date completed instructions received	07/11/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	14/11/2023
Date of Issue	14/11/2023

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Asbestos Approved By
Analysed by Asbestos Approved Analyst: Stuart Chen
Authorised by Asbestos Approved Signatory: Matt Mansfield

Results Approved By
Dragana Tomas, Senior Chemist
Loren Bardwell, Development Chemist
Matt Mansfield, QHSE manager
Steven Luong, Senior Chemist
Tim Toll, Chemist (FAS)

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date extracted	-	08/11/2023
Date analysed	-	09/11/2023
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
Naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	82

svTRH (C10-C40) in Soil		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date extracted	-	08/11/2023
Date analysed	-	09/11/2023
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
Total +ve TRH (C10-C36)	mg/kg	<50
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	82

PAHs in Soil		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date extracted	-	08/11/2023
Date analysed	-	08/11/2023
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	93

Organochlorine Pesticides in soil		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date extracted	-	08/11/2023
Date analysed	-	08/11/2023
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Mirex	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	105

Organophosphorus Pesticides in Soil		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date extracted	-	08/11/2023
Date analysed	-	08/11/2023
Dichlorvos	mg/kg	<0.1
Mevinphos	mg/kg	<0.1
Phorate	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Disulfoton	mg/kg	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1
Parathion-Methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Fenthion	mg/kg	<0.1
Parathion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Methidathion	mg/kg	<0.1
Fenamiphos	mg/kg	<0.1
Ethion	mg/kg	<0.1
Phosalone	mg/kg	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1
Coumaphos	mg/kg	<0.1
Surrogate TCMX	%	105

Acid Extractable metals in soil		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date prepared	-	08/11/2023
Date analysed	-	09/11/2023
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	5
Copper	mg/kg	19
Lead	mg/kg	5
Mercury	mg/kg	0.3
Nickel	mg/kg	8
Zinc	mg/kg	10

Moisture		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date prepared	-	08/11/2023
Date analysed	-	09/11/2023
Moisture	%	26

Asbestos ID - soils NEPM - ASB-001		
Our Reference		337219-1
Your Reference	UNITS	BH06
Depth		0.15-0.25
Date Sampled		07/11/2023
Type of sample		Soil
Date analysed	-	13/11/2023
Sample mass tested	g	361.24
Sample Description	-	Grey coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected Synthetic mineral fibres detected
Trace Analysis	-	No asbestos detected
Total Asbestos#1	g/kg	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected
ACM >7mm Estimation*	g	–
FA and AF Estimation*	g	–
ACM >7mm Estimation*	%(w/w)	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. **NOTE** #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) **NOTE** #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Date analysed	-			09/11/2023	[NT]	[NT]	[NT]	[NT]	09/11/2023	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	105	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	105	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	[NT]	[NT]	[NT]	[NT]	107	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	[NT]	[NT]	[NT]	[NT]	101	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	107	[NT]
o-Xylene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Naphthalene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	101	[NT]	[NT]	[NT]	[NT]	109	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Date analysed	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	09/11/2023	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	111	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	111	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	111	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	111	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate o-Terphenyl	%		Org-020	83	[NT]	[NT]	[NT]	[NT]	90	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Date analysed	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	109	[NT]
Fluorene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	87	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	87	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	98	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	94	[NT]	[NT]	[NT]	[NT]	96	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Date analysed	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
HCB	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	87	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	111	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	135	[NT]
Endrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	84	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	110	[NT]	[NT]	[NT]	[NT]	111	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Date analysed	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	75	[NT]
Malathion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	89	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Fenthion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	76	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	74	[NT]
Phosalone	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	110	[NT]	[NT]	[NT]	[NT]	111	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Date analysed	-			09/11/2023	[NT]	[NT]	[NT]	[NT]	09/11/2023	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	89	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	88	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	121	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Asbestos-ID in soil: NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

CHAIN OF CUSTODY FORM - Client

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Company:	Reditus	Client Project Name/Number/Site etc (ie report title):	23210
Contact Person:	Ross K.		
Project Mgr:	Natasha. P.	~~PO No. (if applicable)~~:	Please report with 336965
Sampler:	Ross K.	Envirolab Quote No. :	
Address:	~~Unit~~ 1A / 29-33 Wharatah St, Kirrawee	Date results required:	
		Or choose:	☒ Standard ☐ Same Day ☐ 1 day ☐ 2 day ☐ 3 day
Phone:	Mob: 0428 992 391	Note: Inform lab in advance if urgent turnaround is required - surcharges apply	
Email Results to:	rosskingswell natashapasley@reditus.com.au	Additional report format:	☒ Esdat ☐ Equis
Email Invoice to:	"	Lab Comments:	

Sample information					Tests Required																Comments
Envirolab Sample ID (Lab use only)	Client Sample ID or Information	Depth	Date Sampled	Type of Sample	~~Asbestos~~	Combo 5b	Asbestos ~~Quant~~ NEPM	HOLD													Provide as much information about the sample as you can
1	BH06	0.15-0.25	7.11.23	Soil			X														
2	BH06	0.25-0.6	↓	↓				X													
3	BH06	0.15				X															
4	BH06	0.5						X													
5	BH06	0.8	↓	↓				X													

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company):	Reditus	Received by (Company):	ELS SYD	*Lab Use Only*	
Print Name:	Ross Kingswell	Print Name:	Nam Pirth	Job number: 337219	Cooling: Ice / Ice pack / None
Date & Time:	2:40 PM 7.11.23	Date & Time:	7/11/23 14:45	Temperature: 4	Security seal: Intact / Broken / None
Signature:		Signature:		TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

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SAMPLE RECEIPT ADVICE

Client Details

Client	Reditus Consulting
Attention	Ross Kingswell

Sample Login Details

Your reference	23210
Envirolab Reference	337219
Date Sample Received	07/11/2023
Date Instructions Received	07/11/2023
Date Results Expected to be Reported	14/11/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	5 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	4
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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Analysis Underway, details on the following page:

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www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM - ASB-001	On Hold
BH06-0.15-0.25							✓	
BH06-0.25-0.6								✓
BH06-0.15	✓	✓	✓	✓	✓	✓		
BH06-0.5								✓
BH06-0.8								✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

CERTIFICATE OF ANALYSIS

Work Order	: **ES2338272**	Page	: 1 of 7
Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Contact	: Customer Services ES
Address	: 1A/29-33 Waratah Street KIRRAWEE	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: 23210	Date Samples Received	: 06-Nov-2023 15:04
Order number	: ----	Date Analysis Commenced	: 09-Nov-2023
C-O-C number	: ----	Issue Date	: 14-Nov-2023 11:40
Sampler	: Ross Kingswell		
Site	:		
Quote number	: EN/333		
No. of samples received	: 2		
No. of samples analysed	: 2		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Rassem Ayoubi	Senior Organic Chemist	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TRIP01	TRIP02	----	----	----
			Sampling date / time	02-Nov-2023 00:00	03-Nov-2023 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2338272-001	ES2338272-002	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**12.9**	**10.5**	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	**5**	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	**13**	**12**	----	----	----
Copper	7440-50-8	5	mg/kg	**25**	**43**	----	----	----
Lead	7439-92-1	5	mg/kg	**212**	**289**	----	----	----
Nickel	7440-02-0	2	mg/kg	**3**	**5**	----	----	----
Zinc	7440-66-6	5	mg/kg	**130**	**494**	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	**0.1**	**0.2**	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TRIP01	TRIP02	----	----	----
			Sampling date / time	02-Nov-2023 00:00	03-Nov-2023 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2338272-001	ES2338272-002	--------	--------	--------
				Result	Result	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	----	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	----	----	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	----	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	----	----	----
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	----	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	----	----	----
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	**1.1**	**0.6**	----	----	----
Pyrene	129-00-0	0.5	mg/kg	**1.2**	**0.6**	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	**0.5**	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TRIP01	TRIP02	----	----	----
			Sampling date / time	02-Nov-2023 00:00	03-Nov-2023 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2338272-001	ES2338272-002	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	**0.8**	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	**3.6**	**1.2**	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.7**	**0.6**	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TRIP01	TRIP02	----	----	----
			Sampling date / time	02-Nov-2023 00:00	03-Nov-2023 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2338272-001	ES2338272-002	--------	--------	--------
				Result	Result	----	----	----
EP080: BTEXN - Continued								
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	97.6	87.0	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	96.1	80.9	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	87.6	102	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	96.2	102	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	75.4	74.7	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	103	92.3	----	----	----
Anthracene-d10	1719-06-8	0.5	%	97.0	104	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	102	99.6	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	72.1	71.0	----	----	----
Toluene-D8	2037-26-5	0.2	%	89.9	90.9	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	103	102	----	----	----

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	63	125
Toluene-D8	2037-26-5	67	124
4-Bromofluorobenzene	460-00-4	66	131

QUALITY CONTROL REPORT

Work Order	: **ES2338272**	Page	: 1 of 10
Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Contact	: Customer Services ES
Address	: 1A/29-33 Waratah Street KIRRAWEE	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: 23210	Date Samples Received	: 06-Nov-2023
Order number	: ----	Date Analysis Commenced	: 09-Nov-2023
C-O-C number	: ----	Issue Date	: 14-Nov-2023
Sampler	: Ross Kingswell		
Site	:		
Quote number	: EN/333		
No. of samples received	: 2		
No. of samples analysed	: 2		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Rassem Ayoubi	Senior Organic Chemist	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 5413953)									
ES2338272-002	TRIP02	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	12	11	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	5	5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	5	5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	43	36	19.8	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	289	257	11.5	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	494	430	13.9	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5413963)									
ES2338272-002	TRIP02	EA055: Moisture Content	----	0.1	%	10.5	16.0	41.2	0% - 50%
EW2304892-004	Anonymous	EA055: Moisture Content	----	0.1	%	0.2	0.1	70.2	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5413951)									
ES2338153-025	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2338255-004	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5413954)									
ES2338272-002	TRIP02	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	0.3	38.7	No Limit
EW2304892-007	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 5408076)									
ES2338272-001	TRIP01	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP068A: Organochlorine Pesticides (OC) (QC Lot: 5408076) - continued									
ES2338272-001	TRIP01	EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 5408076)									
ES2338272-001	TRIP01	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 5408074)									
ES2338272-001	TRIP01	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
				Laboratory Duplicate (DUP) Report					
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 5408074) - continued									
ES2338272-001	TRIP01	EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.1	1.0	13.2	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.2	0.9	20.8	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	0.8	0.7	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	3.6	2.6	32.3	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5408075)									
ES2338272-001	TRIP01	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5413877)									
ES2338153-028	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES2338255-008	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5408075)									
ES2338272-001	TRIP01	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5413877)									
ES2338153-028	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES2338255-008	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080: BTEXN (QC Lot: 5413877)									
ES2338153-028	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES2338255-008	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 5413877) - continued									
ES2338255-008	Anonymous	EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5413953)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	101	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	98.1	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	108	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	102	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	94.6	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	85.9	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	87.6	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5413951)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	104	70.0	125
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5413954)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	86.2	70.0	125
EP068A: Organochlorine Pesticides (OC) (QCLot: 5408076)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	83.0	69.0	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	85.5	65.0	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	79.1	67.0	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	97.5	68.0	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	81.1	65.0	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	84.4	67.0	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	89.7	69.0	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	89.0	62.0	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	84.9	63.0	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	86.8	66.0	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	84.9	64.0	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	87.5	66.0	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	83.9	67.0	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	87.0	67.0	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	88.2	69.0	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	87.9	69.0	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	75.1	56.0	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	86.3	62.0	124

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP068A: Organochlorine Pesticides (OC) (QCLot: 5408076) - continued								
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	84.8	66.0	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	88.7	64.0	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	84.3	54.0	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 5408076)								
EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	0.5 mg/kg	85.3	59.0	119
EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	93.8	62.0	128
EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	0.5 mg/kg	78.7	54.0	126
EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	0.5 mg/kg	88.1	67.0	119
EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	0.5 mg/kg	88.8	70.0	120
EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	0.5 mg/kg	84.1	72.0	120
EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	0.5 mg/kg	76.2	68.0	120
EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	0.5 mg/kg	86.5	68.0	122
EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	0.5 mg/kg	80.2	69.0	117
EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	0.5 mg/kg	91.4	76.0	118
EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	0.5 mg/kg	75.6	64.0	122
EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	0.5 mg/kg	84.8	70.0	116
EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	0.5 mg/kg	85.1	69.0	121
EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	0.5 mg/kg	89.5	66.0	118
EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	0.5 mg/kg	84.8	68.0	124
EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	0.5 mg/kg	87.8	62.0	112
EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	0.5 mg/kg	91.6	68.0	120
EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	0.5 mg/kg	87.6	65.0	127
EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	0.5 mg/kg	69.6	41.0	123
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5408074)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	93.6	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	99.7	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	102	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	99.2	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	102	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	90.0	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	107	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	99.9	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	98.8	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	97.3	75.0	127

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low	Acceptable Limits (%) High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5408074) - continued								
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	96.0	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	97.2	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	95.2	70.0	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	95.0	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	98.8	62.0	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	97.2	63.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5408075)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	105	75.0	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	104	77.0	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	107	71.0	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5413877)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	85.6	72.2	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5408075)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	105	77.0	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	103	74.0	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	104	63.0	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5413877)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	77.3	72.4	133
EP080: BTEXN (QCLot: 5413877)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	94.8	76.0	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	86.3	78.5	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	88.6	77.4	121
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	92.6	78.2	121
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	91.9	81.3	121
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	104	78.8	122

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Acceptable Limits (%) Low	Acceptable Limits (%) High

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Acceptable Limits (%) Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5413953)							
ES2338272-002	TRIP02	EG005T: Arsenic	7440-38-2	50 mg/kg	109	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	106	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	106	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	101	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	102	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	107	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	102	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5413951)							
ES2338153-025	Anonymous	EG035T: Mercury	7439-97-6	10 mg/kg	79.6	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5413954)							
ES2338272-002	TRIP02	EG035T: Mercury	7439-97-6	5 mg/kg	105	70.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 5408076)							
ES2338272-001	TRIP01	EP068: gamma-BHC	58-89-9	0.5 mg/kg	80.6	70.0	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	85.5	70.0	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	97.7	70.0	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	93.2	70.0	130
		EP068: Endrin	72-20-8	2 mg/kg	99.9	70.0	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	95.1	70.0	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 5408076)							
ES2338272-001	TRIP01	EP068: Diazinon	333-41-5	0.5 mg/kg	94.8	70.0	130
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5 mg/kg	84.4	70.0	130
		EP068: Pirimphos-ethyl	23505-41-1	0.5 mg/kg	97.8	70.0	130
		EP068: Bromophos-ethyl	4824-78-6	0.5 mg/kg	80.2	70.0	130
		EP068: Prothiofos	34643-46-4	0.5 mg/kg	75.8	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5408074)							
ES2338272-001	TRIP01	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	96.9	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	97.5	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5408075)							
ES2338272-001	TRIP01	EP071: C10 - C14 Fraction	----	480 mg/kg	91.2	73.0	137
		EP071: C15 - C28 Fraction	----	3100 mg/kg	102	53.0	131
		EP071: C29 - C36 Fraction	----	2060 mg/kg	111	52.0	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5413877)							
ES2338153-028	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	74.1	60.4	142
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5408075)							
ES2338272-001	TRIP01	EP071: >C10 - C16 Fraction	----	860 mg/kg	98.8	73.0	137
		EP071: >C16 - C34 Fraction	----	4320 mg/kg	106	53.0	131

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5408075) - continued							
ES2338272-001	TRIP01	EP071: >C34 - C40 Fraction	----	890 mg/kg	104	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5413877)							
ES2338153-028	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	70.1	61.1	142
EP080: BTEXN (QCLot: 5413877)							
ES2338153-028	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	79.5	62.1	122
		EP080: Toluene	108-88-3	2.5 mg/kg	73.9	66.6	119
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	77.8	67.4	123
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	86.2	66.4	121
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	88.3	70.7	121
		EP080: Naphthalene	91-20-3	2.5 mg/kg	94.0	61.1	115

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2338272**	Page	: 1 of 5
Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Telephone	: +61-2-8784 8555
Project	: 23210	Date Samples Received	: 06-Nov-2023
Site	:	Issue Date	: 14-Nov-2023
Sampler	: Ross Kingswell	No. of samples received	: 2
Order number	: ----	No. of samples analysed	: 2

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) TRIP01	**02-Nov-2023**	**----**	----	----	**09-Nov-2023**	16-Nov-2023	✓
Soil Glass Jar - Unpreserved (EA055) TRIP02	**03-Nov-2023**	**----**	----	----	**09-Nov-2023**	17-Nov-2023	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) TRIP01	**02-Nov-2023**	**09-Nov-2023**	30-Apr-2024	✓	**10-Nov-2023**	30-Apr-2024	✓
Soil Glass Jar - Unpreserved (EG005T) TRIP02	**03-Nov-2023**	**09-Nov-2023**	01-May-2024	✓	**10-Nov-2023**	01-May-2024	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) TRIP01	**02-Nov-2023**	**09-Nov-2023**	30-Nov-2023	✓	**12-Nov-2023**	30-Nov-2023	✓
Soil Glass Jar - Unpreserved (EG035T) TRIP02	**03-Nov-2023**	**09-Nov-2023**	01-Dec-2023	✓	**12-Nov-2023**	01-Dec-2023	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068) TRIP01	**02-Nov-2023**	**09-Nov-2023**	16-Nov-2023	✓	**11-Nov-2023**	19-Dec-2023	✓
Soil Glass Jar - Unpreserved (EP068) TRIP02	**03-Nov-2023**	**09-Nov-2023**	17-Nov-2023	✓	**11-Nov-2023**	19-Dec-2023	✓
EP068B: Organophosphorus Pesticides (OP)							
Soil Glass Jar - Unpreserved (EP068) TRIP01	**02-Nov-2023**	**09-Nov-2023**	16-Nov-2023	✓	**11-Nov-2023**	19-Dec-2023	✓
Soil Glass Jar - Unpreserved (EP068) TRIP02	**03-Nov-2023**	**09-Nov-2023**	17-Nov-2023	✓	**11-Nov-2023**	19-Dec-2023	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) TRIP01	**02-Nov-2023**	**09-Nov-2023**	16-Nov-2023	✓	**10-Nov-2023**	19-Dec-2023	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) TRIP02	**03-Nov-2023**	**09-Nov-2023**	17-Nov-2023	✓	**10-Nov-2023**	19-Dec-2023	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) TRIP01	**02-Nov-2023**	**09-Nov-2023**	16-Nov-2023	✓	**10-Nov-2023**	16-Nov-2023	✓
Soil Glass Jar - Unpreserved (EP080) TRIP02	**03-Nov-2023**	**09-Nov-2023**	17-Nov-2023	✓	**10-Nov-2023**	17-Nov-2023	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080) TRIP01	**02-Nov-2023**	**09-Nov-2023**	16-Nov-2023	✓	**10-Nov-2023**	16-Nov-2023	✓
Soil Glass Jar - Unpreserved (EP080) TRIP02	**03-Nov-2023**	**09-Nov-2023**	17-Nov-2023	✓	**10-Nov-2023**	17-Nov-2023	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) TRIP01	**02-Nov-2023**	**09-Nov-2023**	16-Nov-2023	✓	**10-Nov-2023**	16-Nov-2023	✓
Soil Glass Jar - Unpreserved (EP080) TRIP02	**03-Nov-2023**	**09-Nov-2023**	17-Nov-2023	✓	**10-Nov-2023**	17-Nov-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	33	**12.12**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2338272**

Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Contact	: Customer Services ES
Address	: 1A/29-33 Waratah Street KIRRAWEE	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: natashapasley@reditusconsulting.com	E-mail	: ALSEnviro.Sydney@ALSGlobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: 23210	Page	: 1 of 2
Order number	: ----	Quote number	: EP2023REDITUS0001 (EN/333)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	:		
Sampler	: Ross Kingswell		

Dates

Date Samples Received	: 06-Nov-2023 15:04	Issue Date	: 06-Nov-2023
Client Requested Due Date	: 13-Nov-2023	Scheduled Reporting Date	: **13-Nov-2023**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 10.5'C, 11.1'C, 11.0'C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 2 / 2

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - EA055-103 Moisture Content	SOIL - S-12 OC/OP Pesticides	SOIL - S-26 8 metals/TRH/BTEXN/PAH
ES2338272-001	02-Nov-2023 00:00	TRIP01	✓	✓	✓
ES2338272-002	03-Nov-2023 00:00	TRIP02	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

Accounts		
- A4 - AU Tax Invoice (INV)	Email	accounts@reditus.com.au
Esdat Deliverables		
- EDI Format - ESDAT (ESDAT)	Email	reditusconsulting@esdat.com.au
NATASHA PASLEY		
- *AU Certificate of Analysis - NATA (COA)	Email	natashapasley@reditusconsulting.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	natashapasley@reditusconsulting.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	natashapasley@reditusconsulting.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	natashapasley@reditusconsulting.com
- Chain of Custody (CoC) (COC)	Email	natashapasley@reditusconsulting.com
- EDI Format - ENMRG (ENMRG)	Email	natashapasley@reditusconsulting.com
- EDI Format - ESDAT (ESDAT)	Email	natashapasley@reditusconsulting.com
Ross Kingswell		
- *AU Certificate of Analysis - NATA (COA)	Email	rosskingswell@reditus.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	rosskingswell@reditus.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	rosskingswell@reditus.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	rosskingswell@reditus.com.au
- Chain of Custody (CoC) (COC)	Email	rosskingswell@reditus.com.au
- EDI Format - ENMRG (ENMRG)	Email	rosskingswell@reditus.com.au
- EDI Format - ESDAT (ESDAT)	Email	rosskingswell@reditus.com.au

COC 3/11/23 1504

CHAIN OF CUSTODY FORM - Client

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Rec: ERW 6/11/23 1504

Client: Reditus Consulting
Contact Person: Natasha Pasley
Project Mgr: Natasha Pasley
Sampler: Ross Kingswell
Address: Unit 1A, Level 1, 29-33 Waratah Street Kirrawee NSW
Phone: 02 9521 6567 Mob:
Email Invoice To: accounts@redituisconsulting.com
Email Results To: natashapasley@reditus.com.au; rosskingswell@reditus.com.au

Client Project Name/Number/Site etc (ie report title): 23210
PO No.:
Envirolab Quote No. :
Date results required:
Or choose: standard
Note. Inform lab in advance if urgent turnaround is required - surcharges apply
Additional report format: esdat
Lab Comments:

Environmental Division Sydney
Work Order Reference
ES2338272
Telephone : + 61-2-8784 8555

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Combo 3	Combo 5b	Combo 5bAN	Asbestos NEPM	Asbestos ID	Hold	Comments: Provide as much information about the sample as you can
1	MW01	0.1	2/11/2023	Soil						x	
2	MW01	0.5	2/11/2023	Soil		x					
3	MW01	1	2/11/2023	Soil						x	
4	MW01	1.4	2/11/2023	Soil	x						
5	MW01	3	2/11/2023	Soil						x	
6	MW01	5	2/11/2023	Soil						x	
7	MW01	9	2/11/2023	Soil						x	
8	MW01	0.1-0.2	2/11/2023	Soil						x	
9	MW01	0.2-1.3	2/11/2023	Soil				x			
10	MW02	0.1	2/11/2023	Soil		x					
11	MW02	0.3	2/11/2023	Soil	x						
12	MW02	1	2/11/2023	Soil						x	
13	MW02	4	2/11/2023	Soil						x	
14	MW02	8	2/11/2023	Soil						x	
15	MW02	10	2/11/2023	Soil						x	
16	MW02	0.1-0.2	2/11/2023	Soil				x			
17	MW03	0.1	2/11/2023	Soil		x					
18	MW03	0.7	2/11/2023	Soil	x						
19	MW03	1.5	2/11/2023	Soil						x	
20	MW03	3	2/11/2023	Soil						x	
21	MW03	6	2/11/2023	Soil						x	
22	MW03	9	2/11/2023	Soil						x	
23	MW03	0.1-0.5	2/11/2023	Soil				x			
24	BH01	0.1	3/11/2023	Soil		x					
25	BH01	0.4	3/11/2023	Soil						x	
26	BH01	0.8	3/11/2023	Soil	x						
27	BH01	0.1-0.3	3/11/2023	Soil				x			
28	BH02	0.1	3/11/2023	Soil						x	
29	BH02	0.5	3/11/2023	Soil		x					
30	BH02	0.8	3/11/2023	Soil	x						
31	BH02	1.3	3/11/2023	Soil						x	
32	BH02	0.1-0.2	3/11/2023	Soil						x	
33	BH02	0.2-0.8	3/11/2023	Soil				x			
34	BH03	0.15	3/11/2023	Soil		x					
35	BH03	0.3	3/11/2023	Soil						x	
36	BH03	0.8	3/11/2023	Soil	x						
37	BH03	0.15-0.25	3/11/2023	Soil				x			
38	BH04	0.05	2/11/2023	Soil		x					
39	BH04	0.2	2/11/2023	Soil						x	
40	BH04	0-0.1	2/11/2023	Soil				x			
41	BH05	0.1	2/11/2023	Soil			x				
42	BH05	0.2	2/11/2023	Soil						x	
43	BH07	0.1	3/11/2023	Soil						x	
44	BH07	0.3	3/11/2023	Soil		x					
45	BH07	0.1-0.2	3/11/2023	Soil						x	
46	BH07	0.2-0.3	3/11/2023	Soil				x			
47	BH08	0.1	3/11/2023	Soil		x					
48	BH08	0.1-0.3	3/11/2023	Soil				x			
49	BH08-0.1-0.3_PACM	0.1-0.3	3/11/2023	Soil					x		
50	BH09	0.1	3/11/2023	Soil			x				
51	BH10	0.1	3/11/2023	Soil		x					
52	BH10	0.4	3/11/2023	Soil	x						
53	BH10	0.1-0.3	3/11/2023	Soil				x			
54	BH11	0.1	3/11/2023	Soil		x					
55	BH11	0.4	3/11/2023	Soil						x	
56	BH11	0.1-0.2	3/11/2023	Soil				x			
57	BH11	0.2-0.4	3/11/2023	Soil						x	
58	BH12	0.1	3/11/2023	Soil						x	
59	BH12	0.4	3/11/2023	Soil		x					
60	BH12	0.7	3/11/2023	Soil						x	
61	BH12	0.1-0.2	3/11/2023	Soil						x	
62	BH12	0.2-0.7	3/11/2023	Soil				x			
63	DUP01		2/11/2023	Soil		x					
(1) ~~64~~	TRIP01		2/11/2023	Soil		x					Please forward to ALS
64 ~~65~~	DUP02		3/11/2023	Soil		x					
(2) ~~66~~	TRIP02		3/11/2023	Soil		x					Please forward to ALS
				Sample Count	7	16	2	12	1	28	

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 336965
Date Received: 3/11
Time Received: 1340
Received By: Paul
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): Reditus	Received by (Company):	Lab Use Only	
Print Name: Ross Kingswell	Print Name:	Job number:	Cooling: Ice / Ice pack / None
Date & Time: 3/11/2023	Date & Time:	Temperature:	Security seal: Intact / Broken / None
Signature:	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

65: 13H09-0.1-0.2 Extra

Relinquished by: ELS SYD Sarah P Saal 06/11/23 1130

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
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CERTIFICATE OF ANALYSIS 337552

Client Details

Client	Reditus Consulting
Attention	Natasha Pasley
Address	Shop 1, 29-33 Waratah St, KIRRAWEE, NSW, 2232

Sample Details

Your Reference	**23210**
Number of Samples	5 Water
Date samples received	10/11/2023
Date completed instructions received	10/11/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	17/11/2023
Date of Issue	17/11/2023

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diana Korniewicz, Chemist
Greta Petzold, Operation Manager
Liam Timmins, Organics Supervisor
Loren Bardwell, Development Chemist
Priya Samarawickrama, Senior Chemist
Tim Toll, Chemist (FAS)

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water						
Our Reference		337552-1	337552-2	337552-3	337552-4	337552-5
Your Reference	UNITS	MW01	MW02	MW03	RB01	DUP01
Date Sampled		10/11/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	13/11/2023	13/11/2023	13/11/2023	13/11/2023	13/11/2023
Date analysed	-	14/11/2023	14/11/2023	14/11/2023	14/11/2023	14/11/2023
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	95	95	95	94	96
Surrogate Toluene-d8	%	94	94	93	93	94
Surrogate 4-Bromofluorobenzene	%	106	106	108	108	108

svTRH (C10-C40) in Water						
Our Reference		337552-1	337552-2	337552-3	337552-4	337552-5
Your Reference	UNITS	MW01	MW02	MW03	RB01	DUP01
Date Sampled		10/11/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	14/11/2023	14/11/2023	14/11/2023	14/11/2023	14/11/2023
Date analysed	-	14/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	94	91	76	85	76

PAHs in Water						
Our Reference		337552-1	337552-2	337552-3	337552-4	337552-5
Your Reference	UNITS	MW01	MW02	MW03	RB01	DUP01
Date Sampled		10/11/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	14/11/2023	14/11/2023	14/11/2023	14/11/2023	14/11/2023
Date analysed	-	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023
Naphthalene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	98	106	100	101	87

HM in water - dissolved						
Our Reference		337552-1	337552-2	337552-3	337552-4	337552-5
Your Reference	UNITS	MW01	MW02	MW03	RB01	DUP01
Date Sampled		10/11/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	13/11/2023	13/11/2023	13/11/2023	13/11/2023	13/11/2023
Date analysed	-	13/11/2023	13/11/2023	13/11/2023	13/11/2023	13/11/2023
Arsenic-Dissolved	µg/L	3	1	3	<1	4
Cadmium-Dissolved	µg/L	0.2	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	6	2	1	<1	2
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	14	5	39	<1	42
Zinc-Dissolved	µg/L	44	17	62	2	58

Miscellaneous Inorganics				
Our Reference		337552-1	337552-2	337552-3
Your Reference	UNITS	MW01	MW02	MW03
Date Sampled		10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water
Date prepared	-	10/11/2023	10/11/2023	10/11/2023
Date analysed	-	10/11/2023	10/11/2023	10/11/2023
Nitrate as N in water	mg/L	0.01	<0.005	0.02
Ammonia as N in water	mg/L	0.018	0.016	0.037
Total Nitrogen in water	mg/L	<0.1	0.1	0.1
NOx as N in water	mg/L	0.01	<0.005	0.02
Phosphate as P in water	mg/L	0.03	0.04	<0.005

Metals in Waters - Total				
Our Reference		337552-1	337552-2	337552-3
Your Reference	UNITS	MW01	MW02	MW03
Date Sampled		10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water
Date prepared	-	13/11/2023	13/11/2023	13/11/2023
Date analysed	-	13/11/2023	13/11/2023	13/11/2023
Phosphorus - Total	mg/L	0.2	1.8	0.52

Ion Balance				
Our Reference		337552-1	337552-2	337552-3
Your Reference	UNITS	MW01	MW02	MW03
Date Sampled		10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water
Date prepared	-	10/11/2023	10/11/2023	10/11/2023
Date analysed	-	10/11/2023	10/11/2023	10/11/2023
Calcium - Dissolved	mg/L	2	1	5.6
Potassium - Dissolved	mg/L	3	4	10
Sodium - Dissolved	mg/L	73	200	300
Magnesium - Dissolved	mg/L	1	7.7	14
Hardness	mgCaCO 3 /L	9.6	35	70
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	10	13	24
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	10	13	24
Sulphate, SO4	mg/L	98	210	140
Chloride, Cl	mg/L	45	150	390
Ionic Balance	%	-1.0	2.0	0

Microbiologocal Testing				
Our Reference		337552-1	337552-2	337552-3
Your Reference	UNITS	MW01	MW02	MW03
Date Sampled		10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water
Date of testing	-	11/11/2023	11/11/2023	11/11/2023
E. coli	mpn/100mL	<18	<18	<18

Method ID	Methodology Summary
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055/062/127	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determinined stoichiometrically from the base metal concentration.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			13/11/2023	1	13/11/2023	14/11/2023		13/11/2023	[NT]
Date analysed	-			14/11/2023	1	14/11/2023	15/11/2023		14/11/2023	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	1	<10	<10	0	95	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	1	<10	<10	0	95	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	94	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	94	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	96	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	96	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	96	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	95	1	95	101	6	91	[NT]
Surrogate Toluene-d8	%		Org-023	95	1	94	96	2	96	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	108	1	106	108	2	102	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			14/11/2023	1	14/11/2023	14/11/2023		14/11/2023	[NT]
Date analysed	-			14/11/2023	1	14/11/2023	14/11/2023		14/11/2023	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	1	<50	<50	0	85	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	1	<100	<100	0	99	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	1	<100	<100	0	86	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	1	<50	<50	0	85	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	1	<100	<100	0	99	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	1	<100	<100	0	86	[NT]
Surrogate o-Terphenyl	%		Org-020	78	1	94	79	17	82	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Date extracted	-			14/11/2023	1	14/11/2023	14/11/2023		14/11/2023	[NT]
Date analysed	-			15/11/2023	1	15/11/2023	15/11/2023		15/11/2023	[NT]
Naphthalene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	101	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	[NT]
Fluorene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	89	[NT]
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	96	[NT]
Anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	98	[NT]
Pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	104	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	91	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	107	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	97	1	98	107	9	98	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	337552-2
Date prepared	-			13/11/2023	1	13/11/2023	13/11/2023		13/11/2023	13/11/2023
Date analysed	-			13/11/2023	1	13/11/2023	13/11/2023		13/11/2023	13/11/2023
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	3	[NT]		83	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	0.2	[NT]		83	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		86	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	1	6	[NT]		82	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		97	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	108	74
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	14	[NT]		85	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	44	[NT]		84	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	3	13/11/2023	13/11/2023		[NT]	[NT]
Date analysed	-			[NT]	3	13/11/2023	13/11/2023		[NT]	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	[NT]	3	3	3	0	[NT]	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	[NT]	3	<0.1	<0.1	0	[NT]	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	[NT]	3	<1	<1	0	[NT]	[NT]
Copper-Dissolved	µg/L	1	Metals-022	[NT]	3	1	2	67	[NT]	[NT]
Lead-Dissolved	µg/L	1	Metals-022	[NT]	3	<1	<1	0	[NT]	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	[NT]	3	<0.05	[NT]		[NT]	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	[NT]	3	39	38	3	[NT]	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	[NT]	3	62	70	12	[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			10/11/2023	[NT]	[NT]	[NT]	[NT]	10/11/2023	[NT]
Date analysed	-			10/11/2023	[NT]	[NT]	[NT]	[NT]	10/11/2023	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	98	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	[NT]	[NT]	[NT]	[NT]	99	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	[NT]	[NT]	[NT]	[NT]	103	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	98	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	[NT]	[NT]	[NT]	[NT]	108	[NT]

QUALITY CONTROL: Metals in Waters - Total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			13/11/2023	[NT]	[NT]	[NT]	[NT]	13/11/2023	[NT]
Date analysed	-			13/11/2023	[NT]	[NT]	[NT]	[NT]	13/11/2023	[NT]
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			10/11/2023	1	10/11/2023	10/11/2023		10/11/2023	[NT]
Date analysed	-			10/11/2023	1	10/11/2023	10/11/2023		10/11/2023	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	2	2	0	102	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	3	3	0	108	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	73	73	0	104	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	1	1	0	104	[NT]
Hardness	mgCaCO 3 /L	3	Metals-020	[NT]	1	9.6	9.4	2	[NT]	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	10	[NT]		[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	[NT]		[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	10	[NT]		101	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	98	[NT]		115	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	1	45	[NT]		110	[NT]
Ionic Balance	%		Inorg-040	[NT]	1	-1.0	[NT]		[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Microbiology analysed by Sonic Food & Water Testing. Report No. W2326549

The time between collection and the commencement of testing should not exceed 24 hours. Samples tested outside this time may have their results compromised

CHAIN OF CUSTODY FORM - Client

[Copyright and Confidential]

ENVIROLAB GROUP
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Unit 7, 17 Willes Rd, Berrimah, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Client: Reditus Consulting	Client Project Name/Number/Site etc (ie report title): 23210
Contact Person: Ross Kingswell	
Project Mgr: Natasha Pasley	PO No.:
Sampler: Ross Kingswell	Envirolab Quote No. :
Address: Unit 1A, Level 1, 29-33 Waratah Street Kirrawee NSW	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: 02 9521 6567 Mob: 0426992391	Additional report format: esdat
Email Invoice To: accounts@reditusconsulting.com	Lab Comments:
Email Results To: natashapasley@reditus.com.au rosskingswell@reditus.com.au	

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Major Cations	Major Anions	Combo 3 (TRH, BTEX, PAHs, 8 heavy metals (dissolved))	Ionic Balance	Microbiological (E.coli)	Nutrients (ammonia, nitrate, total nitrogen, oxidised nitrogen, total phosphorus and reactive phosphorus)										Provide as much information about the sample as you can
1	MW01		10.11.23	Water	x	x	x	x	x	x										
2	MW02		10.11.23	Water	x	x	x	x	x	x										
3	MW03		10.11.23	Water	x	x	x	x	x	x										
4	RB01		10.11.23	Water			x													
5	DUP01		10.11.23	Water			x													
	TRIP01		10.11.23	Water			x													Please forward to ALS
				Sample Count	3	3	6	3	3	3										

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): Reditus	Received by (Company): Envirolab	Lab Use Only	
Print Name: Ross Kingswell	Print Name: Nancy Strang	Job number: 337552	Cooling: Ice / Ice pack / None
Date & Time: 10.11.23 4:30 PM	Date & Time: 10/11/2023 16:50	Temperature: 15°C	Security seal: Intact / Broken / None
Signature: RK	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Reditus Consulting
Attention	Natasha Pasley

Sample Login Details

Your reference	23210
Envirolab Reference	337552
Date Sample Received	10/11/2023
Date Instructions Received	10/11/2023
Date Results Expected to be Reported	17/11/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	5 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	15
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water	HM in water - dissolved	Nitrate as N in water	Ammonia as N in water	Total Nitrogen in water	NOx as N in water	Phosphate as P in water	Metals in Waters -Total	Calcium - Dissolved	Potassium - Dissolved	Sodium - Dissolved	Magnesium - Dissolved	Hardness	Hydroxide Alkalinity (OH-) as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulphate, SO4	Chloride, Cl	Ionic Balance	Microbiologocal Testing
MW01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MW02	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MW03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
RB01	✓	✓	✓	✓																			
DUP01	✓	✓	✓	✓																			

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

CERTIFICATE OF ANALYSIS

Work Order	: **ES2339232**	Page	: 1 of 6
Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Contact	: Customer Services ES
Address	: 1A/29-33 Waratah Street KIRRAWEE	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: 23210	Date Samples Received	: 13-Nov-2023 15:45
Order number	: ----	Date Analysis Commenced	: 14-Nov-2023
C-O-C number	: ----	Issue Date	: 20-Nov-2023 17:05
Sampler	: Ross Kingswell		
Site	:		
Quote number	: EN/333		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	TRIP01	----	----	----	----
			Sampling date / time	10-Nov-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2339232-001	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.004**	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.042**	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.051**	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	TRIP01	----	----	----	----
			Sampling date / time	10-Nov-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2339232-001	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	29.7	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	TRIP01	----	----	----	----
			Sampling date / time	10-Nov-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2339232-001	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
2-Chlorophenol-D4	93951-73-6	1.0	%	63.2	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	71.2	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	82.0	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%	86.4	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	81.4	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	115	----	----	----	----
Toluene-D8	2037-26-5	2	%	112	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	113	----	----	----	----

Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	72	143
Toluene-D8	2037-26-5	75	131
4-Bromofluorobenzene	460-00-4	73	137

QUALITY CONTROL REPORT

Work Order	: **ES2339232**	Page	: 1 of 6
Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Contact	: Customer Services ES
Address	: 1A/29-33 Waratah Street KIRRAWEE	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: 23210	Date Samples Received	: 13-Nov-2023
Order number	: ----	Date Analysis Commenced	: 14-Nov-2023
C-O-C number	: ----	Issue Date	: 20-Nov-2023
Sampler	: Ross Kingswell		
Site	:		
Quote number	: EN/333		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5432341)									
EW2305024-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
ES2339228-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.008	0.009	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.011	0.012	10.7	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 5432342)									
ES2339232-001	TRIP01	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EW2305024-003	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5425929)									
ES2339107-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2339121-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5425929)									
ES2339107-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5425929) - continued									
ES2339121-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 5425929)									
ES2339107-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES2339121-002	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5432341)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	95.2	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	97.0	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	94.3	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	91.3	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	84.2	83.0	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	88.9	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	90.4	81.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 5432342)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	95.1	83.0	105
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5421778)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	66.5	50.0	94.0
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	72.3	63.6	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	66.6	62.2	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	75.0	63.9	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	73.0	62.6	116
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	77.8	64.3	116
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	77.2	63.6	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	79.0	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	72.4	64.1	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	80.6	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	74.4	61.7	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	78.8	63.0	115
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	74.5	63.3	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	70.1	59.9	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	70.3	61.2	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	70.2	59.1	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5421776)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	69.6	53.7	97.0
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	73.3	63.3	107
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	98.3	58.3	120

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5425929)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	95.3	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5421776)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	64.9	53.9	95.5
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	71.6	57.8	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	69.0	50.5	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5425929)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	92.8	75.0	127
EP080: BTEXN (QCLot: 5425929)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	108	68.3	119
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	109	73.5	120
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	113	73.8	122
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	116	73.0	122
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	112	76.4	123
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	97.3	75.5	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5432341)							
EP2315892-014	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	120	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	124	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	121	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	120	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	122	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	115	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	123	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5432342)							
ES2339026-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	89.8	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5425929)							
ES2339107-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	94.5	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5425929)							

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5425929) - continued							
ES2339107-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	91.7	70.0	130
EP080: BTEXN (QCLot: 5425929)							
ES2339107-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	96.6	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	104	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	111	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	114	70.0	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	112	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	114	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2339232**	Page	: 1 of 4
Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Telephone	: +61-2-8784 8555
Project	: 23210	Date Samples Received	: 13-Nov-2023
Site	:	Issue Date	: 20-Nov-2023
Sampler	: Ross Kingswell	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)						
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	6	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	14	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)						
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	6	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	14	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
TRIP01	**10-Nov-2023**	**----**	----	**----**	**17-Nov-2023**	08-May-2024	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
TRIP01	**10-Nov-2023**	**----**	----	**----**	**20-Nov-2023**	08-Dec-2023	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
TRIP01	**10-Nov-2023**	**14-Nov-2023**	17-Nov-2023	✓	**17-Nov-2023**	24-Dec-2023	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
TRIP01	**10-Nov-2023**	**14-Nov-2023**	17-Nov-2023	✓	**17-Nov-2023**	24-Dec-2023	✓
Clear glass VOC vial - HCl (EP080)							
TRIP01	**10-Nov-2023**	**17-Nov-2023**	24-Nov-2023	✓	**17-Nov-2023**	24-Nov-2023	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
TRIP01	**10-Nov-2023**	**14-Nov-2023**	17-Nov-2023	✓	**17-Nov-2023**	24-Dec-2023	✓
Clear glass VOC vial - HCl (EP080)							
TRIP01	**10-Nov-2023**	**17-Nov-2023**	24-Nov-2023	✓	**17-Nov-2023**	24-Nov-2023	✓
EP080: BTEXN							
Clear glass VOC vial - HCl (EP080)							
TRIP01	**10-Nov-2023**	**17-Nov-2023**	24-Nov-2023	✓	**17-Nov-2023**	24-Nov-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	6	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	14	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	6	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	14	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270 Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2339232**

Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Contact	: Customer Services ES
Address	: 1A/29-33 Waratah Street KIRRAWEE	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: natashapasley@reditus.com.au	E-mail	: ALSEnviro.Sydney@ALSGlobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: 23210	Page	: 1 of 2
Order number	: ----	Quote number	: EP2023REDITUS0001 (EN/333)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	:		
Sampler	: Ross Kingswell		

Dates

Date Samples Received	: 13-Nov-2023 15:45	Issue Date	: 13-Nov-2023
Client Requested Due Date	: 20-Nov-2023	Scheduled Reporting Date	: **20-Nov-2023**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 11.3, 11.6, 13.1'C - Ice Bricks present
Receipt Detail	: HARD ESKY	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - W-26 TRH/BTEXN/PAH/8 Metals
ES2339232-001	10-Nov-2023 00:00	TRIP01	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS

- A4 - AU Tax Invoice (INV)	Email	accounts@reditusconsulting.com

Esdat Deliverables

- EDI Format - ESDAT (ESDAT)	Email	reditusconsulting@esdat.com.au

NATASHA PASLEY

- *AU Certificate of Analysis - NATA (COA)	Email	natashapasley@reditus.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	natashapasley@reditus.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	natashapasley@reditus.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	natashapasley@reditus.com.au
- Chain of Custody (CoC) (COC)	Email	natashapasley@reditus.com.au
- EDI Format - ENMRG (ENMRG)	Email	natashapasley@reditus.com.au
- EDI Format - ESDAT (ESDAT)	Email	natashapasley@reditus.com.au

CHAIN OF CUSTODY FORM - Client

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ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
02 9910 6200 | sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
08 9317 2505 | lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
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Adelaide Office - Envirolab Services
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07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 7, 17 Willes Rd, Berrimah, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Client: Reditus Consulting
Contact Person: Ross Kingswell
Project Mgr: Natasha Pasley
Sampler: Ross Kingswell
Address: Unit 1A, Level 1, 29-33 Waratah Street Kirrawee NSW
Phone: 02 9521 6567 Mob: 0426992391
Email Invoice To: accounts@reditusconsulting.com
Email Results To: natashapasley@reditus.com.au
rosskingswell@reditus.com.au

Client Project Name/Number/Site etc (ie report title): 23210
PO No.:
Envirolab Quote No. :
Date results required:
Or choose: standard
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Additional report format: esdat
Lab Comments:

Environmental Division Sydney
Work Order Reference
ES2339232
Telephone : +61-2-8784 8555

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Major Cations	Major Anions	Combo 3 (TRH, BTEX, PAHs, 8 heavy metals (dissolved))	Ionic Balance	Microbiological (E.coli)	Nutrients (ammonia, nitrate, total nitrogen, oxidised nitrogen, total phosphorus and reactive phosphorus)	Comments
1	MW01		10.11.23	Water	X	X	X	X	X	X	Provide as much information about the sample as you can
2	MW02		10.11.23	Water	X	X	X	X	X	X	
3	MW03		10.11.23	Water	X	X	X	X	X	X	
4	RB01		10.11.23	Water			X				
5	DUP01		10.11.23	Water			X				
6	TRIP01		10.11.23	Water			X				Please forward to ALS
				Sample Count	3	3	6	3	3	3	

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): Reditus
Print Name: Ross Kingswell
Date & Time: 10.11.23 4:30 PM
Signature: RK

Received by (Company): Envirolab
Print Name: Nancy Zhang
Date & Time: 10/11/2023 16:50
Signature:

Lab Use Only
Job number: 337552
Cooling: Ice / Ice pack / None
Temperature: 15°C
Security seal: Intact / Broken / None
TAT Req - SAME day / 1 / 2 / 3 / 4 / STD

Relinquished by ELS SYD
Grace Zhang
13/11/23 1100

Rec: [illegible]
13/11/23
1545

D

Borehole Logs

REDITUS

Reditus Consulting Pty Ltd

Lvl 1, Suite 1/29-33 Waratah St, Kirrawee NSW 2232, Australia

Phone: (02) 9521 6567

Environmental Log - Borehole

BH01

Easting	: 331555.53	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6259288.01	Logged By	: Ross Kingswell	Client	:
Total Depth	: 0.8 m	Date	: 03/11/2023	Project	: Detailed Site Investigation

Depth (m)	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
				M-D	Fill	Fill Clayey SAND (SC) : low to medium plasticity clay, medium dense, brown, fine to medium grained, trace fine to medium sized gravel, moist to dry, trace plastic,concrete and brick.	trace plastic,concrete and brick
	0.1	0.1-0.3					
0.3					Natural	Natural Silty CLAY (CL-CI) : stiff, low to medium plasticity, orange brown, trace fine sized gravel, moist to dry.	
	0.4						
	0.8					**BH01 Terminated at 0.8m**	
1							

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Phone: (02) 9521 6567

Environmental Log - Borehole

BH02

Easting	: 331537.21	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6259311.17	Logged By	: Ross Kingswell	Client	:
Total Depth	: 1.3 m	Date	: 03/11/2023	Project	: Detailed Site Investigation

Depth (m)	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
0.1					Non-Soil	Concrete	
	0.1	0.1-0.2		M-D	Fill	Fill Clayey SAND (SC) : low to medium plasticity clay, low to medium plasticity, loose to medium dense, firm, brown, fine to medium grained, with fine to medium sized gravel, moist to dry, trace terracotta and concrete.	trace terracotta and concrete
	0.5	0.2-0.8					
0.8	0.8				Natural	Natural Silty CLAY (CL-CI) : stiff, low to medium plasticity, orange brown, trace fine sized gravel, moist to dry.	
1							
	1.3					**BH02 Terminated at 1.3m (1.3)**	

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Phone: (02) 9521 6567

Environmental Log - Borehole

BH03

Easting	: 331547.31	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6259324.84	Logged By	: Ross Kingswell	Client	:
Total Depth	: 0.8 m	Date	: 03/11/2023	Project	: Detailed Site Investigation

Depth (m)	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
0.12					Non-Soil	Concrete	
0.25	0.15	0.15 - 0.25		M-D	Fill	Fill Silty CLAY (CL-CI) : low to medium plasticity, firm, brown, trace fine to medium sized gravel, trace fine to medium grained sand, moist to dry.	
	0.3				Natural	Natural Silty CLAY (CL-CI) : stiff, low to medium plasticity, orange brown, trace fine sized gravel, moist to dry.	
1	0.8					**BH03 Terminated at 0.8m**	

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Phone: (02) 9521 6567

Environmental Log - Borehole

BH04

Easting	: 331530.93	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6259317.34	Logged By	: Ross Kingswell	Client	:
Total Depth	: 0.2 m	Date	: 02/11/2023	Project	: Detailed Site Investigation

Depth (m)	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
		0-0.1		M-D	Fill	Fill Silty SAND (SM) : medium dense, brown, fine to medium grained, trace low to medium plasticity clay, moist to dry, grass cover.	Grass cover
0.1	0.05				Natural	Natural Silty CLAY (CL) : firm, low plasticity, orange and red brown, trace fine to medium sized gravel, moist to dry, trace of ash.	trace of ash
1	0.2					**BH04 refusal at 0.2m**	

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Phone: (02) 9521 6567

Environmental Log - Borehole

BH05

Easting	: 331505.68	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6259252.37	Logged By	: Ross Kingswell	Client	:
Total Depth	: 0.2 m	Date	: 02/11/2023	Project	: Detailed Site Investigation

Depth (m)	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
	0.1	0.1		M-D	Fill	Fill Silty SAND (SM) : medium dense, brown, fine to medium grained, trace low to medium plasticity clay, moist to dry, grass cover, trace of brick and tile.	Grass cover, trace of brick and tile
	0.2					**BH05 refusal at 0.2m**	
1							

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Phone: (02) 9521 6567

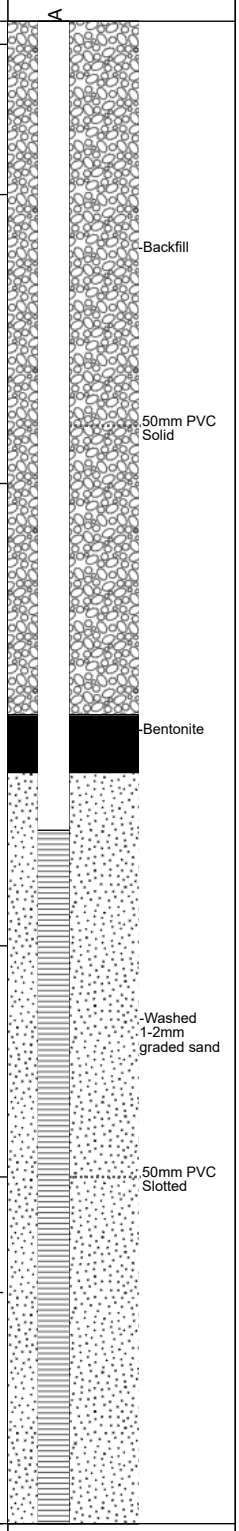
Environmental Log - Borehole

MW02

Easting	: 331514.29	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6259306.69	Logged By	: Ross Kingswell	Client	:
Total Depth	: 13 m	Date	: 02/11/2023	Project	: Detailed Site Investigation

Depth (m)	Water	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
0.2		0.1	0.1-0.2		M-D	Fill	Fill Silty SAND (SM) : medium dense, brown, fine to medium grained, trace low to medium plasticity clay, moist to dry, grass cover.	Grass cover
		0.3				Natural	Natural Silty CLAY (CL) : firm to stiff, low plasticity, orange and red brown, trace fine to medium sized gravel, moist to dry, trace of ash.	trace of ash
1		1.0						
1.5						Natural	Natural Silty CLAY (CL-CI) : stiff, low to medium plasticity, red brown mottled pale grey, moist to dry.	
2								
3								
4		4.0			D	Rock	Rock SILTSTONE: distinctly weathered, low to medium strength, red brown mottled pale grey, fine to medium grained, indistinct, dry.	
5								
6								
7								
8		8.0				Rock	Rock SILTSTONE: distinctly weathered, medium to high strength, yellow brown, fine grained, indistinct, dry.	
9								
10		10.0				Rock	Rock SHALE: highly weathered, medium strength, grey, fine grained, indistinct, dry.	
11					M-D	Rock	As above, but white, moist/dry.	
12								
13							**MW02 Terminated at 13m**	

Well Diagram



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Phone: (02) 9521 6567

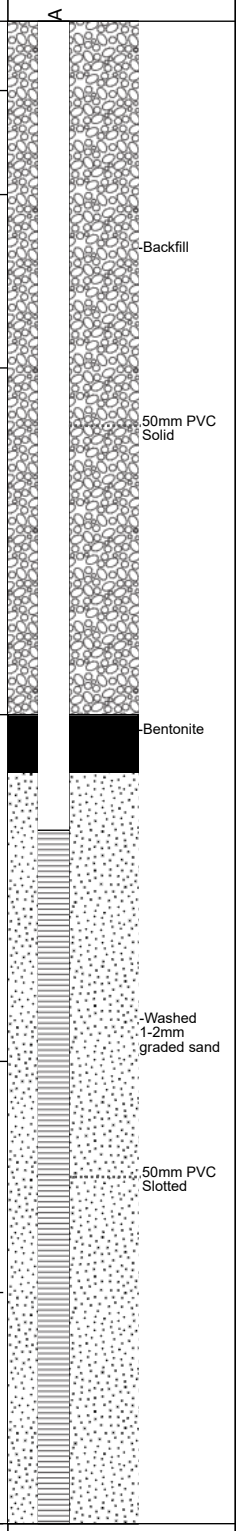
Environmental Log - Borehole

MW03

Easting	: 331498.01	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6259302.15	Logged By	: Ross Kingswell	Client	:
Total Depth	: 13 m	Date	: 02/11/2023	Project	: Detailed Site Investigation

Depth (m)	Water	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
0.6		0.1	0.1 0.1 - 0.6		M-D	Fill	Fill Silty SAND (SM) : medium dense, brown, fine to medium grained, trace low to medium plasticity clay, moist to dry, grass cover.	Grass cover
1.5		0.7				Natural	Natural Silty CLAY (CL) : firm, low plasticity, orange and red brown, trace fine to medium sized gravel, moist to dry, trace of ash.	trace of ash
3		1.5				Natural	Natural Silty CLAY (CL-CI) : stiff, low to medium plasticity, red brown mottled pale grey, moist to dry.	
6		3.0			D	Rock	Rock SILTSTONE: distinctly weathered, low to medium strength, red brown mottled grey, fine to medium grained, indistinct, dry.	
9		6				Rock	Rock SILTSTONE: distinctly weathered, medium to high strength, yellow brown, fine grained, indistinct, dry.	
11		9.0				Rock	Rock SHALE: highly weathered, medium strength, grey, fine grained, indistinct, dry.	
					M-D	Rock	As above, but moist/dry.	
13							**MW03 Terminated at 13m**	

Well Diagram



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Groundwater Field Sheets

REDITUS Groundwater Monitoring Field Sheet

Job Information

Date: 10/11/23	Time: arrive 10:00 AM depart 11:30 AM.
Project Name: Detailed Site Investigation	Project Number: 23210
Site Location: Wilson Street, Chatswood	Operator: Ross Kingswell
Well ID: MW03	Weather: Clear.

Equipment

Water quality equipment description: HANNA

Interface probe number: HERON IP

Purging equipment: (please cirlce)
Bailer type: **Plastic** **Teflon**
Pump type: **Peristaltic** **Submersible** **Micro-purge** **Amazon** **Other:**

Well Gauging and Purge Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

Volume of water in well / V = Pr x r x h
V = volume in litres
P = 3.14159
r = radius in cm
h = height of water column in cm

Total Well Depth (-) Water level (=) Water Column
12.675 m (-) 7.75 m (=) 4.925 m

Water Column (x) Conversion Factor (=) Litres per 1 Well Volume
4.926 m (x) 1.96 (=) 9.653 L

Water Quality Parameters

Beginning purge time: 10:20 Ending purge time: 11:20 AM

Litres	Time	pH	Temp C°	Cond mS/cm	DO ppm	Redox mV	Depth to water mbtoc	Comments
3	10:32	5.14	19.01	1.225	4.95	165.2	8.65	very turbid, dark brown, no odour
4.5	10:35	5.02	19.03	1.098	4.01	176.7	9.11	slightly turbid, brown, no odour.
6	10:38	5.00	19.02	1.011	3.88	183.0	9.43	"
7.5	10:41	4.97	19.02	0.906	3.86	190.6	9.79	"
9	10:44	4.93	19.02	0.866	3.77	198.8	10.18	"
11	10:49	4.93	19.02	0.926	3.64	198.8	10.70	"
12.5	10:52	4.94	19.02	0.926	3.67	198.6	10.92	"
Stabilisation Criteria		+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%		**Example Comments:** clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour

Total Well Volume
Actual amount of water prior to sampling

*pH, temp, cond readings not necessary if well is purged dry

Did field parameters stabilise? Y N NA Was the well dry purged? Y N NA

Field QC Checks

Was pre-cleaning sampling equipment used for these samples?	Y	N	NA	Sample containers:
Was pre-cleaning sampling equipment properly protected from contamination?	Y	N	NA	
Was documentation of equipment conducted?	Y	N	NA	
Were air bubbles present in vials at time of collection?	Y	N	NA	
Was sample for metals field filtered prior to preservations?	Y	N	NA	
Duplicate sample collected?	Y	N		Duplicate sample ID Dup01 & Trip01

REDITUS Groundwater Monitoring Field Sheet

Job Information

Date: 10/11/23	Time: arrive 9:00 AM depart 9:20 AM
Project Name: Detailed Site Investigation	Project Number: 23210
Site Location: Wilson Street, Chatswood	Operator: Ross Kingswell
Well ID: MW02	Weather: Clear.

Equipment

Water quality equipment description: HANNA

Interface probe number: HERON IP

Purging equipment: (please cirlce)
Bailer type: **Plastic** **Teflon**
Pump type: **Peristaltic** **Submersible** **Micro-purge** **Amazon** **Other:**

Well Gauging and Purge Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

Volume of water in well / V = Pr x r x h
V = volume in litres
P = 3.14159
r = radius in cm
h = height of water column in cm

Total Well Depth (-) Water level (=) Water Column
12.88 m (-) 11.85 m (=) 1.03 m

Water Column (x) Conversion Factor (=) Litres per 1 Well Volume
1.03 m (x) 1.96 (=) 2.0188 L

Water Quality Parameters

Beginning purge time: Ending purge time:

Litres	Time	pH*	Temp C°	Cond mS/cm	DO ppm	Redox mV	Depth to water mbtoc	Comments
	9:20AM	5.21	19.46	1.258	3.43	133.3		GRAB SAMPLE TAKEN
								Parameters measured after recharge
								~~silty~~ brown water, no odour, very turbid
Stabilisation Criteria		+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%		**Example Comments:** clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour

Total Well Volume
Actual amount of water prior to sampling

**pH, temp, cond readings not necessary if well is purged dry*

Did field parameters stabilise? Y (N) NA

Was the well dry purged? (Y) N NA

Field QC Checks

Was pre-cleaning sampling equipment used for these samples?	(Y)	N	NA	Sample containers:
Was pre-cleaning sampling equipment properly protected from contamination?	(Y)	N	NA	
Was documentation of equipment conducted?	(Y)	N	NA	
Were air bubbles present in vials at time of collection?	Y	(N)	NA	
Was sample for metals field filtered prior to preservations?	(Y)	N	NA	
Duplicate sample collected?	Y	(N)		Duplicate sample ID

F

Calibration Certificates

Hanna (HI9828)
Calibration Booklet

REDITUS

Date: 10.11.23 Time: 8:00 AM Project No: 23210 Project Name: CHATSWOOD DSI **pH** Buffer 1: 4.0 Buffer 2: 7.0 **Cond.** Zero: — Sol^n 1: 1413µS/cm **DO** Zero: — Air — **ORP** Factory Calibrated Personnel: Ross Kingswell Signed:	Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:
Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:	Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:
Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:	Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:
Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:	Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:

G

Geotest (2021) Report

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Geotest Services

ABN: 39 089 302 009
18/24 Garling Road, Kings Park NSW 2148
P (02) 9671 4443
E admin@geotestservices.com.au

Wednesday 6th October 2021

Our Ref. **33465-2**

853 Pacific Highway Pty Ltd
C/- Sanctuary Partners

Via email: nicholas@sanctuarypartners.com.au

Re: Limited Environmental Investigation, 849 – 859 Pacific Hwy & 2 Wilson Street Chatswood NSW 2067

1. INTRODUCTION

This report presents the results of a Limited Environmental Site Investigation undertaken by Geotest Services Pty Ltd (Geotest) at the Site. This report was commissioned by Sanctuary Partners to characterise environmental and geotechnical ground conditions at the Site in support the clients' acquisition of the Site. A geotechnical report (ref. 33465-1) has been prepared and should be read separately to this report.

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The Site comprises four registered lots. Their respective street identification and approximate area is within the table below:

Lot Identification	Street Identification	Approx. Area (m^2)	Site plan
SP1496	849 Pacific Hwy Chatswood	900	
SP60178	853 Pacific Hwy Chatswood	760	
SP10110	859 Pacific Hwy Chatswood	730	
SP522947	2 Wilson Street Chatswood	725	

The comprised area of investigation across the four registered lots is approximately ~3,115m^2. The lots all have a boundary to the Pacific Hwy (west), with Wilson Street and O'Brien Street (north and south) respectively. Taken from a central location within the comprised site, the following geographical coordinates were measured on the NSW Department of Lands website: -33.793027 S, 151.180245 E.

The locality of the Site and borehole locations is presented in Figure 1.

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2. OBJECTIVES

The objective of this investigation was to identify preliminary environmental contamination risks at the Site from a scope of works that included a limited desktop assessment, select intrusive site works and limited environmental sampling and analysis program.

3. SCOPE OF WORKS

The following scope of works was undertaken to address the objective:

- Limited desktop assessment
- Site inspection
- Four boreholes undertaken with drill rig
- Sample collection
- NATA laboratory analysis for broad chemical screen
- Interpretation of results and preparation of this report

4. LIMITED DESKTOP ASSESSMENT

Regional Geology

Published information indicates that the Site is underlain by rock formations of the Wianamatta Group, principally shale.

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Regional Topography and Drainage

The NSW Department of Lands Spatial Information Exchange maps (SIX Maps, http://imagery.maps.nsw.gov.au) indicates that the Site lies at an elevation of approximately 100 metres Australian Height Datum (AHD). It is expected that Site surface waters would either percolate into sub-surface soils (where permeability allows) or become run-off and generally drain off-site to the street drainage on the western and southern boundaries.

Regional Hydrogeology

A search for registered groundwater monitoring bores within a 500m radius of the Site was undertaken using the NSW Department of Primary Industries department for Water (DPI Water) online resource, 'All Groundwater Map' (http://allwaterdata.water.nsw.gov.au/) on 2nd October 2021. The results of the searches did not identify any registered groundwater bores located within the 500-metre search radius. There was insufficient data available to make a desktop assessment of likely depth to groundwater or the expected yield on the Site.

Acid Sulfate Soils

The Department of Land and Water Conservation (DLWC) has a platform for searching Acid Sulfate Soils in Australia. The National Acid Sulfate Soils Atlas was developed by the Australian government (in conjunction with Commonwealth Scientific and Industrial Research Organisation CSIRO - http://www.asris.csiro.au/).

The results of the search indicated that the Site is situated in an area where there is a very low probability of ASS and no known occurrence. The site is not likely to be affected by ASS. Furthermore, the site is situated at an approx. elevation of 100 m AHD. The presence of acid sulfate soils is generally limited to elevations less than 10m AHD.

Is it considered that ASS or potential ASS is unlikely to be present at the Site.

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NSW Office of Environment and Heritage Contaminated Land Record

Geotest conducted a search NSW Office of Environment (OEH) contaminated land record information on the 2nd October 2021. The searches did not identify any contaminated land record for the Site or for the properties located adjacent to the Site.

NSW EPA POEO Public Register Search

Geotest conducted a search of POEO records for Environment Protection licences, applications, notices, audits or pollution studies and reduction programs within vicinity of the site on 2nd October 2021. No records for the Site or within the immediately vicinity of the Site was identified.

Historical Photography

Geotest reviewed the publicly available aerial photographs for the site made available via NSW Government Department of Finance, Services and Innovation (https://portal.spatial.nsw.gov.au/portal/apps/). Geotest makes the following comments regarding land use at the site and surrounding the site:

1943	**1965**	**1970**
1986	**2005**	**2015**

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As it can be seen from the above imagery the site has been primarily used for residential purposes. The current light industrial building is present to the east since 1970. The north-shore train line is further east. O'Brien Street is to the south, and Chatswood CBD further south. The Pacific Highway and residential areas to the West and North. The Shell (Coles Express) service station is present approximately 80m to the north of the Site.

Site Walkover

A site walkover was conducted on the 20th September 2021 and the following general site observations and potential environmental contamination risks were observed:

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- All the individual lots are being used for high density residential purposes (apartments)
- The apartments present are of varying ages. 2 Wilson St appears to be most recently constructed building
    - It can be assumed that hazardous materials (eg. lead and asbestos products) were used as part of building construction and may be present in the 849 – 859 Pacific Hwy buildings
- Both 2 Wilson St & 853 Pacific Hwy had underground parking basements (no access)
- The building to the east appeared to be an at grade, light-industrial warehouse/ office. The building was occupied
- No underground or above ground storage tanks (eg. petrol or diesel) were observed
- No obvious visual or olfactory contamination indicators (eg. spills, wastes, staining or odours) were observed
- Vegetation at the site was in a good condition with no signs of extensive stress or dieback
- Some elevated gardens and landscaping were present, typical with residential land use. It is assumed that fill (in addition to other topsoils across the site) is present within these areas.

5. ENVIRONMENTAL RISK AREAS

Item	AEC	COPC	Mitigation Strategy
1	Footprints of former structures and deteriorated HAZMAT material	Asbestos, Metals (8), asbestos, elevated foreign materials in or on soils	Ensure all material picked up prior to demolition. Ensure demolition is undertaken to high standard – not cross-contaminating ground
2	Fill under building footprints, behind retaining/ structural walls or any other uncontrolled fill area	Asbestos, Metals (8), PAH, TRH, BTEX, OCP, PCB, asbestos, elevated foreign materials in soils	Following demolition of above ground structures, investigate footprint and basement areas
3	Adjacent industrial uses including light-industrial office to the east and service station further to the north	Asbestos, Metals (8), PAH, TRH, BTEX, PCB	Undertake intrusive investigation including locations nearest to boundaries of potential source

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6. FIELD WORK

Sampling

A total of four borehole locations were undertaken as part of client-guided geotechnical investigations at the Site. Due to access constraints no boreholes were conducted in 2 Wilson St. The existing building footprints occupy most of the site area across all lots. Therefore, the most accessible locations outside the footprints were utilised and to target adjoining property land uses. Based on the site history and current site features this was considered acceptable to address the objectives of the investigation.

Sampling was carried out on 24th September 2021 by a suitably experienced environmental scientist from Geotest Services. The boreholes were undertaken using a track mounted geo-probe drill rig. Samples were collected directly from the auger/ sample recovery tool. The boreholes were logged by a suitably experienced geotechnical engineer. The boreholes were terminated following confirmation of adequate investigation, discovery of natural soils, or refusal onto bedrock.

Soil samples were placed into laboratory supplied glass jars with Teflon lined seals to limit volatile loss and plastic zip locked bags. The samples were placed into an ice-brick chilled cooler. The samples were dispatched to a NATA accredited laboratory under chain of custody protocols.

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Areas not investigated

Due to the ongoing use of the Site for high-density residential occupancy, the building footprints, elevated landscaped areas, and areas surrounding underground infrastructure were not investigated. These areas should be investigated following demolition.

Laboratory Analysis

Samples were submitted to Eurofins, Lane Cove (#827443) laboratory analysis for the relevant contaminants of potential concern.

Sample Preservation and Storage

Sample storage and preservation is presented in the table below:

Analyte	Sample Volume and Container	Preservative	Storage
Organics/ inorganics (soil)	250ml glass & Teflon lined lid	Nil	Insulated container with ice
Asbestos	Sealed plastic zip lock bag	Nil	With the samples above

The sample containers were transported to the NATA accredited analytical laboratory with the Chain of Custody (COC) form, recording the following information:

- project reference;
- date of sampling;
- sample identification;
- matrix and container details;
- preservation method;
- name of sampler;
- required analysis;
- turnaround times required; and
- signatures of sender and receiving laboratory.

A copy of the COC was kept in the project file. Samples were transported to the laboratory with sufficient time to perform analysis within the applicable holding period.

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Reported Data Quality Conclusion

Based on our data quality evaluation including third-party historical data, field data and laboratory data, we consider the data in this investigation to be suitable for its intended purpose.

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7. RESULTS

Site Specific Geology

Generally, a residual clay profile overlain by a thin layer of uncontrolled fill/ topsoil (up to 0.5m) and underlain by shale bedrock was encountered. The geology at the site can be broadly described as:

Topsoil: Clayey Silt, dark grey

Silty CLAY, high plasticity, dark brown, red, light grey, some ironstone bands

SHALE, brown and grey, extremely to distinctly weathered, very low to medium strength

It is likely that encountered filling was associated with re-contouring, retaining and landscaping of the site following building construction.

Borehole locations are shown in Figure 1.

Visual and Olfactory Observations

The Site was free of widespread, significant offensive visual or olfactory contamination indicators. The table below indicates the recorded depths of fill at the site:

TABLE 10.2

Borehole ID	Total Depth of fill recorded (approx., m, bgl)	Elevated foreign materials or asbestos identified (Y / N)
BH1	0.0-0.4	N
BH2	0.0-0.6	N
BH3	0.2-0.6	N
BH4	0.11-0.31	N

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The fill was observed to be free from any visual and olfactory contamination indicators. Some asphaltic concrete fines and light concrete rubble was identified to comprise the fill in select bore holes. These foreign inclusions were observed in very low quantities and were not considered to be aesthetically unsuitable.

Groundwater

Groundwater was not encountered in any of the boreholes undertaken to a maximum depth of 7.5m bgl.

Reported Laboratory Results

The laboratory results (Eurofins Report # are summarised below including maximum concentrations. The results were compared to the most conservative published site contamination criteria under NEPM 2013 for reference.

Metals

The results for metals in soils were all less than the adopted site reference criteria for human health in a standard residential land use setting. Lead was equal to the most conservative human health criteria (HIL-A Sensitive Residential) within sample BH03-1_1.4m (300mg/kg).

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Analyte	Units	PQL	NEPM HIL A (2013) #	NEPM EIL (2013) 'aged' (Col 2)	BH01-1 0.3M	BH02-1 0.5M	BH03-1 0.4M	BH04-1 0.2M
Arsenic	mg/kg	<2	**100**	**100**	**6.2**	**5.2**	**9.5**	**7.1**
Cadmium	mg/kg	<0.4	**20**	**-**	**< 0.4**	**< 0.4**	**< 0.4**	**< 0.4**
Chromium total (Chromium VI, if relevant)	mg/kg	<5	**100**	**400**	**29**	**22**	**40**	**30**
Copper	mg/kg	<5	**6000**	**230**	**19**	**39**	**210**	**10**
Lead	mg/kg	<5	**300**	**1100**	**130**	**110**	**300**	**110**
Mercury	mg/kg	<0.1	**40**	**-**	**0.3**	**< 0.1**	**1.7**	**0.3**
Nickel	mg/kg	<5	**400**	**560**	**5.5**	**14**	**6**	**< 5**
Zinc	mg/kg	<5	**7400**	**1300**	**140**	**300**	**260**	**67**

OCP/OPP

The concentrations of aldrin, dieldrin, chlordane, DDT, DDD, DDE and heptachlor in the samples analysed were all below the laboratory LOR. All OCP concentrations were below the adopted site criteria for human and ecological health.

PCB

The concentrations of PCB were all below LOR. The LOR is less than the adopted site threshold criteria.

PAHs

The samples analysed for PAHs were generally below LOR. This is except for BH03-1_1.4m which reported PAHs as shown below.

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Analyte	Units	PQL	NEPM HIL A (2013) #	NEPM EIL (2013) 'aged' (Col 2)	BH01-1 0.3M	BH02-1 0.5M	BH03-1 0.4M	BH04-1 0.2M
Acenaphthene	mg/kg	< 0.5			< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	mg/kg	< 0.5			< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	mg/kg	< 0.5			< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	mg/kg	< 0.5			< 0.5	< 0.5	1.2	< 0.5
Benzo(a)pyrene	mg/kg	< 0.5	**3**	**0.7^**	< 0.5	< 0.5	1.2	< 0.5
Benzo(a)pyrene TEQ (lower bound)*	mg/kg	< 0.5	**3**		< 0.5	< 0.5	1.6	< 0.5
Benzo(a)pyrene TEQ (medium bound)*	mg/kg	<0.6	**3**		0.6	0.6	1.9	0.6
Benzo(a)pyrene TEQ (upper bound)*	mg/kg	<1.2	**3**		1.2	1.2	2.1	1.2
Benzo(b&j)fluoranthene	mg/kg	< 0.5			< 0.5	< 0.5	0.8	< 0.5
Benzo(g.h.i)perylene	mg/kg	< 0.5			< 0.5	< 0.5	0.9	< 0.5
Benzo(k)fluoranthene	mg/kg	< 0.5			< 0.5	< 0.5	1.3	< 0.5
Chrysene	mg/kg	< 0.5			< 0.5	< 0.5	1	< 0.5
Dibenz(a.h)anthracene	mg/kg	< 0.5			< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	mg/kg	< 0.5			< 0.5	< 0.5	1.2	< 0.5
Fluorene	mg/kg	< 0.5			< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			< 0.5	< 0.5	0.9	< 0.5
Naphthalene	mg/kg	< 0.5			< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	mg/kg	< 0.5			< 0.5	< 0.5	0.6	< 0.5

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Pyrene	mg/kg	< 0.5			< 0.5	< 0.5	1.4	< 0.5
Total PAH	mg/kg	< 0.5	**300**		< 0.5	< 0.5	10.5	< 0.5

^NEPM Column 2 2013 EIL Criteria adopting coarse grained soils

The results are all less than the adopted conservative ecological health reference criteria with exception to sample BH03-1_1.4m for B(a)P. This exceedance does not pose a risk due to the nature of asphaltic concrete material within the fill and having low bioavailability for phytotoxic uptake.

TRH & BTEX

The samples analysed for TRH and BTEX generally reported concentrations below LOR. The LOR is less than the adopted site threshold criteria.

Analyte	Units	PQL	NEPM HIL A (2013) #	NEPM EIL (2013) 'aged' (Col 2)	BH01-1 0.3M	BH02-1 0.5M	BH03-1 0.4M	BH04-1 0.2M
Benzene	mg/kg	< 0.1	**0.5**	**65^**	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	mg/kg	< 0.1	**55**	**125^**	< 0.1	< 0.1	< 0.1	< 0.1
o-Xylene	mg/kg	< 0.1	**40**	**45^**	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	mg/kg	< 0.1	**160**	**105^**	< 0.1	< 0.1	< 0.1	< 0.1
Naphthalene	mg/kg	< 0.5	**3**	**170**	< 0.5	< 0.5	< 0.5	< 0.5
TRH >C10-C16	mg/kg	< 50	**110**	**120^**	< 50	< 50	< 50	< 50
TRH >C16-C34	mg/kg	< 100		**1,300^**	130	210	290	< 100
TRH >C34-C40	mg/kg	< 100		**5,600^**	< 100	< 100	120	< 100
TRH C6-C10	mg/kg	< 20	**45**	**180^**	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)	mg/kg	< 20			< 20	< 20	< 20	< 20

^NEPM Table 1B(6) ESLs TPH fractions F1 – F4, BTEX and benzo(a)pyrene in soil adopting fine grained

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Asbestos

Asbestos was not detected at the LOR in any of the samples.

8. DISCUSSION

Soils – Human Health

The results of the laboratory analysis indicate that the chemical concentrations of the contaminants of potential concern in soils at the sampling locations did not exceed the most conservative human health assessment criteria (HIL-A). Further, no asbestos was detected in any of the samples.

Soils – Aesthetics

The field observations of all the boreholes did not display any aesthetically unsuitable soils. No visual or olfactory contamination indicators were observed.

Soils – Ecological Environments

Generally, all reported results were less than the conservative EIL and ESLs adopted for metal and volatile compounds. At BH03-1_1.4m Benzo(a)pyrene was reported above the criteria. This is likely associated with minor asphaltic concrete material

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in surface profiles. The NEPM 2013 notes that where B(a)P is present as a result of bituminous material, bioavailability of this material is low and is not considered to pose a risk to sensitive receptors.

Groundwater

Groundwater was not encountered during the field program. Groundwater monitoring was not a part of this scope of works. Based on the environmental results presented above we do not consider the requirement for groundwater investigation to be required. This report has not identified any potential significant contamination sources impacting groundwater at the site, nor the likelihood of any current or future groundwater use at the site. During further phases of investigation and remediation work at the site however, should a requirement for groundwater investigation or management be required it should be undertaken by an experienced consultant and give consideration to the results reported within this report.

9. CONCLUSION

Geotest concludes that; based on the limited desktop assessment, site walkover and field-sampling program that the site presents a low risk of contamination. The site can be considered suitable for sensitive residential land uses (HIL-A).

Further assessment of areas not previously investigated is required following the demolition of buildings at the Site.

This report should be read in conjunction with its limitations.

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10. REFERENCES

- NEPM 'National Environmental Protection (Assessment of Site Contamination) Measure 1999 (April 2013), EPHC 2013, Canberra, incorporating CRC Care 2012.
- NSW EPA 2017, 'Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd edition)' ISBN 978 1 928088 23 8, Environmental Protection Authority NSW.

11. LIMITATIONS

Geotest Services Pty Ltd works at the site is based on a specific scope of investigation and upon the program of surface and/or subsurface screening and/or laboratory testing of samples. The findings of this report are based on site conditions existing at the time of the inspection. On this basis, Geotest Services Pty Ltd cannot provide unqualified warranties or assume liability for site conditions not observed and/or not accessible during the time of its investigation. Despite all reasonable care and diligence, the conditions encountered and concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. On this basis, conclusions have been made from a limited number of observation points assuming that the geological and chemical conditions are representative. No other warranties are made or intended.

This report and associated document has been prepared solely for the use the engaging client and it's interested parties for the purpose of a limited environmental investigation. Any reliance assumed on this report shall be at each such party's own risk. Any ensuing liability resulting from use of the report by third parties cannot be transferred to Geotest Services Pty Ltd.

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12. CLOSING

Geotest trusts this report is satisfactory to your needs. Should you require further information, please do not hesitate to contact the undersigned.

For and on behalf of Geotest Services Pty Ltd.

David Spasojevic

General Manager

Attachments

1. Figure 1 - site locality and borehole locations
2. Site photographs
3. Eurofins Laboratory Certificate of Analysis #827443

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1. FIGURE 1; SITE LOCALITY & BOREHOLE LOCATIONS

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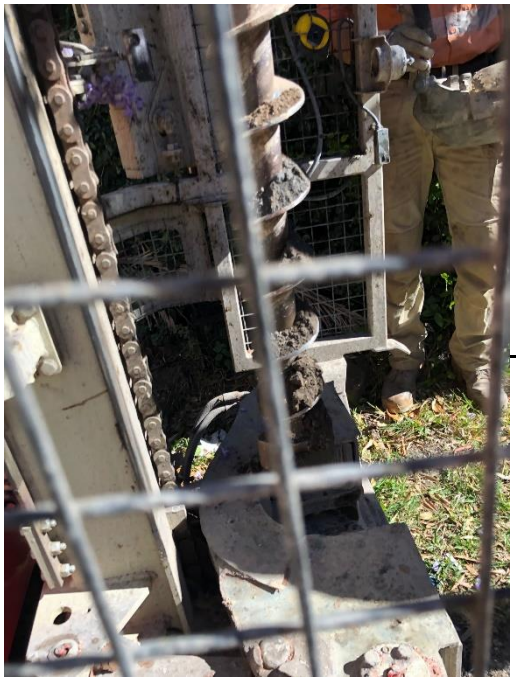
2. SITE PHOTOGRAPHS



Typical near surface topsoil/fill

Weathered shale being augered

Geoprobe drill rig at BH02

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3. LABORATORY CERTIFICATE OF ANALYSIS

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Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Geotest Services
Unit 18/24 Garling Rd
Kings Park
NSW 2148

Attention: **Alan Halpin CC Results/SRA/Invoices**

Report **827443-S**
Project name COWMAN 2 WILSON ST CHATSWOOD
Project ID 33465-2
Received Date Sep 24, 2021

Client Sample ID			**BH01-1 0.3M**	**BH02-1 0.5M**	**BH03-1 0.4M**	**BH04-1 0.2M**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S21-Se52112**	**S21-Se52113**	**S21-Se52114**	**S21-Se52115**
Date Sampled			**Sep 24, 2021**	**Sep 24, 2021**	**Sep 24, 2021**	**Sep 24, 2021**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	77	120	180	69
TRH C29-C36	50	mg/kg	110	140	180	< 50
TRH C10-C36 (Total)	50	mg/kg	187	260	360	69
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	130	210	290	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	120	< 100
TRH >C10-C40 (total)*	100	mg/kg	130	210	410	< 100
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	61	84	79	89
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	1.6	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	1.9	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	2.1	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	1.2	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	1.2	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	0.8	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	0.9	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	1.3	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	1.0	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

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Client Sample ID			BH01-1 0.3M	BH02-1 0.5M	BH03-1 0.4M	BH04-1 0.2M
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S21-Se52112	S21-Se52113	S21-Se52114	S21-Se52115
Date Sampled			Sep 24, 2021	Sep 24, 2021	Sep 24, 2021	Sep 24, 2021
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	1.2	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	0.9	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	0.6	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	1.4	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	10.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	72	57	70	82
p-Terphenyl-d14 (surr.)	1	%	66	50	64	82
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-HCH (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	59	50	60	87
Tetrachloro-m-xylene (surr.)	1	%	71	53	66	81
Polychlorinated Biphenyls						
Aroclor-1016	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1221	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1232	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1242	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1248	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1254	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1260	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Total PCB*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	59	50	60	87
Tetrachloro-m-xylene (surr.)	1	%	71	53	66	81

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Client Sample ID			BH01-1 0.3M	BH02-1 0.5M	BH03-1 0.4M	BH04-1 0.2M
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S21-Se52112	S21-Se52113	S21-Se52114	S21-Se52115
Date Sampled			Sep 24, 2021	Sep 24, 2021	Sep 24, 2021	Sep 24, 2021
Test/Reference	LOR	Unit				
Heavy Metals						
Arsenic	2	mg/kg	6.2	5.2	9.5	7.1
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	29	22	40	30
Copper	5	mg/kg	19	39	210	10
Lead	5	mg/kg	130	110	300	110
Mercury	0.1	mg/kg	0.3	< 0.1	1.7	0.3
Nickel	5	mg/kg	5.5	14	6.0	< 5
Zinc	5	mg/kg	140	300	260	67
% Moisture	1	%	14	12	22	23

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Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Sep 30, 2021	14 Days
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Sep 30, 2021	14 Days
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Sep 30, 2021	14 Days
BTEX - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Sep 30, 2021	14 Days
Polycyclic Aromatic Hydrocarbons - Method: LTM-ORG-2130 PAH and Phenols in Soil and Water	Sydney	Sep 30, 2021	14 Days
Metals M8 - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Sep 30, 2021	28 Days
Organochlorine Pesticides - Method: LTM-ORG-2220 OCP & PCB in Soil and Water	Sydney	Sep 30, 2021	14 Days
Polychlorinated Biphenyls - Method: LTM-ORG-2220 OCP & PCB in Soil and Water	Sydney	Sep 30, 2021	28 Days
% Moisture - Method: LTM-GEN-7080 Moisture	Sydney	Sep 27, 2021	14 Days

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Company Name: Geotest Services
Address: Unit 18/24 Garling Rd
Kings Park
NSW 2148

Project Name: COWMAN 2 WILSON ST CHATSWOOD
Project ID: 33465-2

Order No.:
Report #: 827443
Phone: 02 9671 4443
Fax: 02 9671 4343

Received: Sep 24, 2021 2:39 PM
Due: Oct 1, 2021
Priority: 5 Day
Contact Name: Alan Halpin CC

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Asbestos - AS4964	HOLD	Suite B13: OCP/PCB	Moisture Set	Eurofins Suite B7
Melbourne Laboratory - NATA # 1261 Site # 1254										
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X	X	X
Brisbane Laboratory - NATA # 1261 Site # 20794										
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
1	BH01-1 0.3M	Sep 24, 2021		Soil	S21-Se52112	X		X	X	X
2	BH02-1 0.5M	Sep 24, 2021		Soil	S21-Se52113	X		X	X	X
3	BH03-1 0.4M	Sep 24, 2021		Soil	S21-Se52114	X		X	X	X
4	BH04-1 0.2M	Sep 24, 2021		Soil	S21-Se52115	X		X	X	X
5	BH01-2 0.7M	Sep 24, 2021		Soil	S21-Se52116		X			
6	BH02-2 1.0M	Sep 24, 2021		Soil	S21-Se52117		X			
7	BH03-2 0.8M	Sep 24, 2021		Soil	S21-Se52118		X			
8	BH04-2 0.5M	Sep 24, 2021		Soil	S21-Se52119		X			
Test Counts						4	4	4	4	4

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

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QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs..

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

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Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total*	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4.4'-DDD	mg/kg	< 0.05			0.05	Pass	
4.4'-DDE	mg/kg	< 0.05			0.05	Pass	
4.4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-HCH	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-HCH	mg/kg	< 0.05			0.05	Pass	
d-HCH	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	

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Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-HCH (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.05			0.05	Pass	
Toxaphene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Polychlorinated Biphenyls							
Aroclor-1016	mg/kg	< 0.1			0.1	Pass	
Aroclor-1221	mg/kg	< 0.1			0.1	Pass	
Aroclor-1232	mg/kg	< 0.1			0.1	Pass	
Aroclor-1242	mg/kg	< 0.1			0.1	Pass	
Aroclor-1248	mg/kg	< 0.1			0.1	Pass	
Aroclor-1254	mg/kg	< 0.1			0.1	Pass	
Aroclor-1260	mg/kg	< 0.1			0.1	Pass	
Total PCB*	mg/kg	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons							
TRH C6-C9	%	102			70-130	Pass	
TRH C10-C14	%	100			70-130	Pass	
Naphthalene	%	106			70-130	Pass	
TRH C6-C10	%	100			70-130	Pass	
TRH >C10-C16	%	98			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	107			70-130	Pass	
Toluene	%	101			70-130	Pass	
Ethylbenzene	%	105			70-130	Pass	
m&p-Xylenes	%	106			70-130	Pass	
o-Xylene	%	106			70-130	Pass	
Xylenes - Total*	%	106			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	95			70-130	Pass	
Acenaphthylene	%	107			70-130	Pass	
Anthracene	%	95			70-130	Pass	
Benz(a)anthracene	%	95			70-130	Pass	
Benzo(a)pyrene	%	97			70-130	Pass	
Benzo(b&j)fluoranthene	%	98			70-130	Pass	
Benzo(g.h.i)perylene	%	130			70-130	Pass	
Benzo(k)fluoranthene	%	102			70-130	Pass	
Chrysene	%	97			70-130	Pass	

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Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Dibenz(a.h)anthracene			%	125			70-130	Pass	
Fluoranthene			%	91			70-130	Pass	
Fluorene			%	98			70-130	Pass	
Indeno(1.2.3-cd)pyrene			%	122			70-130	Pass	
Naphthalene			%	98			70-130	Pass	
Phenanthrene			%	92			70-130	Pass	
Pyrene			%	93			70-130	Pass	
LCS - % Recovery									
Organochlorine Pesticides									
Chlordanes - Total			%	101			70-130	Pass	
4.4'-DDD			%	117			70-130	Pass	
4.4'-DDE			%	93			70-130	Pass	
4.4'-DDT			%	100			70-130	Pass	
a-HCH			%	106			70-130	Pass	
Aldrin			%	94			70-130	Pass	
b-HCH			%	113			70-130	Pass	
d-HCH			%	108			70-130	Pass	
Dieldrin			%	113			70-130	Pass	
Endosulfan I			%	109			70-130	Pass	
Endosulfan II			%	121			70-130	Pass	
Endosulfan sulphate			%	73			70-130	Pass	
Endrin			%	82			70-130	Pass	
Endrin aldehyde			%	100			70-130	Pass	
Endrin ketone			%	88			70-130	Pass	
g-HCH (Lindane)			%	113			70-130	Pass	
Heptachlor			%	82			70-130	Pass	
Heptachlor epoxide			%	107			70-130	Pass	
Hexachlorobenzene			%	89			70-130	Pass	
Methoxychlor			%	102			70-130	Pass	
LCS - % Recovery									
Polychlorinated Biphenyls									
Aroclor-1016			%	83			70-130	Pass	
Aroclor-1260			%	100			70-130	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic			%	99			80-120	Pass	
Cadmium			%	99			80-120	Pass	
Chromium			%	100			80-120	Pass	
Copper			%	99			80-120	Pass	
Lead			%	100			80-120	Pass	
Mercury			%	97			80-120	Pass	
Nickel			%	100			80-120	Pass	
Zinc			%	99			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Total Recoverable Hydrocarbons				Result 1					
TRH C6-C9	S21-Se61600	NCP	%	95			70-130	Pass	
Naphthalene	S21-Se61600	NCP	%	94			70-130	Pass	
TRH C6-C10	S21-Se61600	NCP	%	94			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S21-Se61600	NCP	%	102			70-130	Pass	
Toluene	S21-Se61600	NCP	%	95			70-130	Pass	
Ethylbenzene	S21-Se61600	NCP	%	99			70-130	Pass	

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Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
m&p-Xylenes	S21-Se61600	NCP	%	100			70-130	Pass	
o-Xylene	S21-Se61600	NCP	%	100			70-130	Pass	
Xylenes - Total*	S21-Se61600	NCP	%	100			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S21-Se49974	NCP	%	72			70-130	Pass	
Acenaphthylene	S21-Se49974	NCP	%	76			70-130	Pass	
Anthracene	S21-Se50880	NCP	%	96			70-130	Pass	
Benz(a)anthracene	S21-Se50880	NCP	%	97			70-130	Pass	
Benzo(a)pyrene	S21-Se50880	NCP	%	100			70-130	Pass	
Benzo(b&j)fluoranthene	S21-Se50880	NCP	%	104			70-130	Pass	
Benzo(g.h.i)perylene	S21-Se49974	NCP	%	74			70-130	Pass	
Benzo(k)fluoranthene	S21-Se49974	NCP	%	73			70-130	Pass	
Chrysene	S21-Se49974	NCP	%	76			70-130	Pass	
Dibenz(a.h)anthracene	S21-Se50880	NCP	%	122			70-130	Pass	
Fluoranthene	S21-Se50880	NCP	%	92			70-130	Pass	
Fluorene	S21-Se50880	NCP	%	101			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S21-Se49974	NCP	%	70			70-130	Pass	
Naphthalene	S21-Se49974	NCP	%	79			70-130	Pass	
Phenanthrene	S21-Se50880	NCP	%	99			70-130	Pass	
Pyrene	S21-Se50880	NCP	%	94			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
Chlordanes - Total	S21-Se49974	NCP	%	80			70-130	Pass	
4.4'-DDD	S21-Se49974	NCP	%	78			70-130	Pass	
4.4'-DDE	S21-Se50880	NCP	%	87			70-130	Pass	
4.4'-DDT	S21-Se50880	NCP	%	83			70-130	Pass	
a-HCH	S21-Se50880	NCP	%	98			70-130	Pass	
Aldrin	S21-Se50880	NCP	%	84			70-130	Pass	
b-HCH	S21-Se50880	NCP	%	107			70-130	Pass	
d-HCH	S21-Se50880	NCP	%	105			70-130	Pass	
Dieldrin	S21-Se50880	NCP	%	116			70-130	Pass	
Endosulfan I	S21-Se50880	NCP	%	98			70-130	Pass	
Endosulfan II	S21-Se50880	NCP	%	114			70-130	Pass	
Endosulfan sulphate	S21-Se56583	NCP	%	70			70-130	Pass	
Endrin	S21-Se50880	NCP	%	73			70-130	Pass	
Endrin aldehyde	S21-Se49974	NCP	%	112			70-130	Pass	
Endrin ketone	S21-Se50880	NCP	%	72			70-130	Pass	
g-HCH (Lindane)	S21-Se49974	NCP	%	84			70-130	Pass	
Heptachlor	S21-Se50880	NCP	%	79			70-130	Pass	
Heptachlor epoxide	S21-Se49974	NCP	%	80			70-130	Pass	
Hexachlorobenzene	S21-Se49974	NCP	%	71			70-130	Pass	
Methoxychlor	S21-Se49974	NCP	%	78			70-130	Pass	
Spike - % Recovery									
Polychlorinated Biphenyls				Result 1					
Aroclor-1016	S21-Se49974	NCP	%	85			70-130	Pass	
Aroclor-1260	S21-Se49974	NCP	%	91			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S21-Se50896	NCP	%	93			75-125	Pass	
Cadmium	S21-Se50896	NCP	%	93			75-125	Pass	
Chromium	S21-Se50896	NCP	%	85			75-125	Pass	
Copper	S21-Se50896	NCP	%	91			75-125	Pass	
Lead	S21-Se50896	NCP	%	98			75-125	Pass	

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Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Mercury	S21-Se50896	NCP	%	93			75-125	Pass	
Nickel	S21-Se50896	NCP	%	88			75-125	Pass	
Zinc	S21-Se50896	NCP	%	95			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C6-C9	S21-Se61595	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Naphthalene	S21-Se61595	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S21-Se61595	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S21-Se61595	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S21-Se61595	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S21-Se61595	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S21-Se61595	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S21-Se61595	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total*	S21-Se61595	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Toxaphene	S21-Se50879	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S21-Se50895	NCP	mg/kg	10	7.4	29	30%	Pass	
Cadmium	S21-Se50895	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S21-Se50895	NCP	mg/kg	23	17	29	30%	Pass	
Copper	S21-Se50895	NCP	mg/kg	110	99	9.0	30%	Pass	
Lead	S21-Se50895	NCP	mg/kg	38	35	8.0	30%	Pass	
Mercury	S21-Se50895	NCP	mg/kg	0.2	0.2	14	30%	Pass	
Nickel	S21-Se50895	NCP	mg/kg	8.5	8.3	2.0	30%	Pass	
Zinc	S21-Se50895	NCP	mg/kg	180	180	1.0	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C10-C14	S21-Se52114	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S21-Se52114	CP	mg/kg	180	230	20	30%	Pass	
TRH C29-C36	S21-Se52114	CP	mg/kg	180	190	9.0	30%	Pass	
TRH >C10-C16	S21-Se52114	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S21-Se52114	CP	mg/kg	290	350	17	30%	Pass	
TRH >C34-C40	S21-Se52114	CP	mg/kg	120	120	4.0	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S21-Se52114	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S21-Se52114	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S21-Se52114	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S21-Se52114	CP	mg/kg	1.2	1.7	39	30%	Fail	Q15
Benzo(a)pyrene	S21-Se52114	CP	mg/kg	1.2	1.7	33	30%	Fail	Q15
Benzo(b&j)fluoranthene	S21-Se52114	CP	mg/kg	0.8	1.1	34	30%	Fail	Q15
Benzo(g.h.i)perylene	S21-Se52114	CP	mg/kg	0.9	1.2	34	30%	Fail	Q15
Benzo(k)fluoranthene	S21-Se52114	CP	mg/kg	1.3	1.8	34	30%	Fail	Q15
Chrysene	S21-Se52114	CP	mg/kg	1.0	1.5	38	30%	Fail	Q15
Dibenz(a.h)anthracene	S21-Se52114	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S21-Se52114	CP	mg/kg	1.2	2.2	61	30%	Fail	Q15
Fluorene	S21-Se52114	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S21-Se52114	CP	mg/kg	0.9	1.2	33	30%	Fail	Q15
Naphthalene	S21-Se52114	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

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Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Phenanthrene	S21-Se52114	CP	mg/kg	0.6	1.4	73	30%	Fail	Q15
Pyrene	S21-Se52114	CP	mg/kg	1.4	2.2	47	30%	Fail	Q15
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-HCH	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-HCH	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-HCH	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-HCH (Lindane)	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Polychlorinated Biphenyls				Result 1	Result 2	RPD			
Aroclor-1016	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1221	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1232	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1242	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1248	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1254	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1260	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Total PCB*	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S21-Se52114	CP	%	22	25	12	30%	Pass	

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Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Andrew Black	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
John Nguyen	Senior Analyst-Metal (NSW)
Roopesh Rangarajan	Senior Analyst-Volatile (NSW)

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Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025–Testing NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Geotest Services
Unit 18/24 Garling Rd
Kings Park
NSW 2148

Attention:	Alan Halpin CC Results/SRA/Invoices
Report	827443-AID
Project Name	COWMAN 2 WILSON ST CHATSWOOD
Project ID	33465-2
Received Date	Sep 24, 2021
Date Reported	Oct 05, 2021

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence NATA Accreditation does not cover the performance of this service (non-NATA results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

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Project Name COWMAN 2 WILSON ST CHATSWOOD
Project ID 33465-2
Date Sampled Sep 24, 2021
Report 827443-AID

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
BH01-1 0.3M	21-Se52112	Sep 24, 2021	Approximate Sample 46g Sample consisted of: Brown coarse-grained clayey-sandy soil, organic debris and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
BH02-1 0.5M	21-Se52113	Sep 24, 2021	Approximate Sample 99g Sample consisted of: Brown coarse-grained clayey-sandy soil, coal, bitumen and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
BH03-1 0.4M	21-Se52114	Sep 24, 2021	Approximate Sample 101g Sample consisted of: Brown coarse-grained clayey-sandy soil, coal, bitumen and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
BH04-1 0.2M	21-Se52115	Sep 24, 2021	Approximate Sample 116g Sample consisted of: Brown coarse-grained clayey soil, bitumen and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.

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Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Sydney	Sep 27, 2021	Indefinite

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Company Name:	Geotest Services	**Order No.:**		**Received:**	Sep 24, 2021 2:39 PM
Address:	Unit 18/24 Garling Rd Kings Park NSW 2148	**Report #:**	827443	**Due:**	Oct 1, 2021
		Phone:	02 9671 4443	**Priority:**	5 Day
		Fax:	02 9671 4343	**Contact Name:**	Alan Halpin CC
Project Name:	COWMAN 2 WILSON ST CHATSWOOD				
Project ID:	33465-2				

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Asbestos - AS4964	HOLD	Suite B13: OCP/PCB	Moisture Set	Eurofins Suite B7
Melbourne Laboratory - NATA # 1261 Site # 1254										
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X	X	X
Brisbane Laboratory - NATA # 1261 Site # 20794										
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
1	BH01-1 0.3M	Sep 24, 2021		Soil	S21-Se52112	X		X	X	X
2	BH02-1 0.5M	Sep 24, 2021		Soil	S21-Se52113	X		X	X	X
3	BH03-1 0.4M	Sep 24, 2021		Soil	S21-Se52114	X		X	X	X
4	BH04-1 0.2M	Sep 24, 2021		Soil	S21-Se52115	X		X	X	X
5	BH01-2 0.7M	Sep 24, 2021		Soil	S21-Se52116		X			
6	BH02-2 1.0M	Sep 24, 2021		Soil	S21-Se52117		X			
7	BH03-2 0.8M	Sep 24, 2021		Soil	S21-Se52118		X			
8	BH04-2 0.5M	Sep 24, 2021		Soil	S21-Se52119		X			
Test Counts						4	4	4	4	4

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Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
5. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Sample is dried by heating prior to analysis
LOR	Limit of Reporting
COC	Chain of Custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Reference document for the NEPM. Government of Western Australia, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009), including supporting document Recommended Procedures for Laboratory Analysis of Asbestos in Soil (2011)
NEPM	National Environment Protection (Assessment of Site Contamination) Measure, 2013 (as amended)
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded and/or sound condition. For the purposes of the NEPM, ACM is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
AF	Asbestos Fines. Asbestos containing materials, including friable, weathered and bonded materials, able to pass a 7mm x 7mm sieve. Considered under the NEPM as equivalent to “non-bonded / friable”.
FA	Fibrous Asbestos. Asbestos containing materials in a friable and/or severely weathered condition. For the purposes of the NEPM, FA is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres in the matrix.

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Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N/A	Not applicable

Asbestos Counter/Identifier:

Sayeed Abu	Senior Analyst-Asbestos (NSW)

Authorised by:

Chamath JHM Annakkage	Senior Analyst-Asbestos (NSW)

Glenn Jackson
General Manager

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Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Company Name : GEOTEST SERVICES PTY LTD	Contact Name : Alan Halpin	Purchase Order :	COC Number :
Office Address : 18/24 GARLING ROAD	Project Manager :	PROJECT Number : 33465-2	Eurofins | mgt quote ID : 180326GEO
KINGS PARK, N.S.W. 2148	Email for results : admin@geotestservices.com.au	PROJECT Name : Cowman, 2 Wilson St, Chatswood	Data output format:
PH: 9671 4443 FAX: 9671 4343			

Special Directions & Comments :

Eurofins | mgt DI water batch number:

Analytes

	Sample ID	Date	Matrix	SUITE B7*1	SUITE B13	ASBESTOS IDENTIFICATION	HOLD
1	BH01-1, 0.3m	24/09/2021	Soil	X	X	X	
2	BH01-2, 0.7m	24/09/2021	Soil				X
3	BH02-1, 0.5m	24/09/2021	Soil	X	X	X	
4	BH02-2, 1.0m	24/09/2021	Soil				X
5	BH03-1, 0.4m	24/09/2021	Soil	X	X	X	
6	BH03-2, 0.8m	24/09/2021	Soil				X
7	BH04-1, 0.2m	24/09/2021	Soil	X	X	X	
8	BH04-2, 0.5m	24/09/2021	Soil				X
9							
10							
11							
12							
13							
14							
15							
16							

Some common holding times (with correct preservation).
For further information contact the lab

Waters		Soils	
BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days
TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days
Heavy Metals	6 months	Heavy Metals	6 months
Mercury, CrVI	28 days	Mercury, CrVI	28 days
Microbiological testing	24 hours	Microbiological testing	72 hours
BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days
Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours
Ferrous iron	7 days	ASLP, TCLP	7 days

Containers:

1LP	250P	125P	1LA	40mL vial	125mL A	Jar	ZIP.BAG	Sample comments:
						X	X	
						X		
						X	X	
						X		
						X	X	
						X		
						X	X	
						X		

Laboratory Staff

Relinquished By: S.Penfold
Date & Time : 24/09/21
Signature:

Received By: Kenneth R
Date & Time:
Signature: 24/9/21 - 2:39 PM

Turn around time

1 DAY ☐ 2 DAY ☐ 3 DAY ☐
5 DAY ☑ 10 DAY ☐ Other:

Method Of Shipment

☐ Courier
☑ Hand Delivered
☐ Postal
Courier Consignment # :

Temperature on arrival: 7.1°C

Report number: 827443

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EIL Calculation

Inputs
Select contaminant from list below
As
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	Arsenic generic EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	20	40
Urban residential and open public spaces	50	100
Commercial and industrial	80	160

Inputs
Select contaminant from list below
Cr_III
Below needed to calculate fresh and aged ACLs
Enter % clay (values from 0 to 100%)
27.5
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
high

Outputs		
Land use	Cr III soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	150	190
Urban residential and open public spaces	300	570
Commercial and industrial	450	940

Inputs
Select contaminant from list below
Cu
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
12.5
Enter soil pH (calcium chloride method) (values from 1 to 14)
4.25
Enter organic carbon content (%OC) (values from 0 to 50%)
1.25
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
high

Outputs		
Land use	Cu soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	35	45
Urban residential and open public spaces	45	75
Commercial and industrial	60	100

Inputs
Select contaminant from list below
DDT
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	DDT generic EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	3	3
Urban residential and open public spaces	180	180
Commercial and industrial	640	640

Inputs
Select contaminant from list below
Naphthalene
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	Naphthalene generic EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	10	10
Urban residential and open public spaces	170	170
Commercial and industrial	370	370

Inputs
Select contaminant from list below
Ni
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
12.5
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
high

Outputs		
Land use	Ni soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	35	40
Urban residential and open public spaces	85	200
Commercial and industrial	150	340

Inputs
Select contaminant from list below
Pb
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	Lead generic EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	110	470
Urban residential and open public spaces	270	1100
Commercial and industrial	440	1800

Inputs
Select contaminant from list below
Zn
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
12.5
Enter soil pH (calcium chloride method) (values from 1 to 14)
4.25
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
high

Outputs		
Land use	Zn soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	45	140
Urban residential and open public spaces	75	220
Commercial and industrial	95	280

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Detailed Site Investigation

8 Wilson Street, Chatswood NSW 2067

Project No. 23210
Version 1

30 November 2023

Reditus Consulting Pty Ltd
ABN: 34 631 168 502

Detailed Site Investigation

8 Wilson Street, Chatswood NSW 2067

DOCUMENT CONTROL

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This report has been prepared for BB Wilson Property Pty Ltd in accordance with the terms and conditions of appointment for proposal P23210 dated 31 August 2023. Reditus Consulting Pty Ltd (ABN 34 631 168 502) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

DOCUMENT HISTORY

Report No.	23210RP02
Date	30 November 2023
Version	Version 1
Description	Original version of report

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Abbreviations

TERM	DEFINITION
° C	Degrees Celsius
ACM	Asbestos Containing Material
AEC	Area of Environmental Concern
AF/FA	Asbestos Fines / Fibrous Asbestos
AFFF	Aqueous Film Forming Foam
AHD	Australian Height Datum
ASC	Assessment of Site Contamination
BGL	Below Ground Level
BTEX	Benzene Toluene Ethylbenzene Xylene
BTOC	Below Top of Casing
C&D	Construction and Demolition
CEC	Cation Exchange Capacity
COC	Chain of Custody
COPC	Contaminants of Potential Concern
CSM	Conceptual Site Model
DO	Dissolved Oxygen
DQO	Data Quality Objective
EI	Environmental Investigation
EIL	Ecological Investigation Level
EPA	Environment Protection Authority
ESG	Environmental Services Group
ESL	Ecological Screening Level
GDE	Groundwater Dependant Ecosystem
HIL	Health Investigation Level
HSL	Health Screening Level
IBC	Intermediate Bulk Container
LGA	Local Government Area
LIR	Land Insight and Resources
LOR	Limit-Of-Reporting
ML	Management Limits
NATA	National Association of Testing Authorities

TERM	DEFINITION
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure (2013)
NPI	National Pollutant Inventory
NSW	New South Wales
PAH	Polycyclic Aromatic Hydrocarbons
OC	Organic Carbon
OCP	Organochloride Pesticides
OPP	Organophosphorus Pesticides
PACM	Potentially Asbestos Containing Material
PCB	Polychlorinated Biphenyls
PD NSW	Property Development New South Wales
PFAS	Per- and polyfluoroalkyl Substances
PID	Photoionisation Detector
PPM	Parts Per Million
PQL	Practical Quantification Limit
QA/QC	Quality Assurance / Quality Control
RAP	Remedial Action Plan
RPD	Relative Percentage Difference
SAC	Soil Assessment Criteria
SD	Standard Deviation
SDS	Safety Data Sheet
SWL	Standing Water Level
TOC	Top-of-Casing
TPH	Total Petroleum hydrocarbons
TRH	Total Recoverable Hydrocarbons
UPSS	Underground Petroleum Storage Systems
USCS	Unified Soil Classification System
UST	Underground Storage Tank
VOC	Volatile Organic Compounds

Executive Summary

Reditus Consulting Pty Ltd (Reditus) was engaged by BB Wilson Property Pty Ltd (the client) to complete a Detailed Site Investigation (DSI) to support an intended development application (DA) at 8 Wilson Street Chatswood NSW 2067 (the site). The location and layout of the site is presented in **Figure 1**, **Appendix A**.

The site is approximately 1,597 m^2 currently comprised of a large two (2) storey commercial/industrial complex with a painted brick façade.

The site is proposed to be redeveloped (in conjunction with 849, 853, 859 Pacific Highway and 2 Wilson Street) into a 27 storey mixed use development including a two storey podium with mixed commercial uses, two split residential towers and 4 level basement parking.

The objectives of the DSI were to:

- Assess whether Contaminants of Potential Concern (CoPCs) (if detected above site assessment criteria) present an unacceptable risk of exposure to human health and/or the environment, in the context of the proposed redevelopment.
- Provide advice on whether the land is suitable or could be made suitable (from a contamination perspective) for the proposed land use.
- Provide recommendations for further investigation, management, or remediation (if required).
- Conform to the requirements of the National Environmental Protection Council (Assessment of Site Contamination) National Environment Protection Measure 1999 (as amended in 2013) ('ASC NEPM, 2013') and the NSW Environmental Protection Authority (NSW EPA 2020) Contaminated Land Guideline for *Consultants Reporting on Contaminated Land*.

The objectives of this investigation were achieved by completing the following:

- A review of historical reports.
- A desktop review of the site history and setting to supplement data provided in historical reports.
- An intrusive soil and groundwater assessment.

Based on a review of the site history, observations made during fieldwork, results of laboratory analysis and the proposed land use scenario, Reditus concludes the following:

- Historical sources of potential contamination noted during the desktop investigation included fill material, weathering of potentially hazardous building materials and upgradient contamination of groundwater from the service station to the north of the site.
- Fill material was variable in composition and thickness and was found to extend between 0.3 and 1.3 m. The south east corner of the site contained a bark mulch layer overlying geofabric containing fill of variable composition.
- One (1) groundwater monitoring well was installed to a maximum depth of 13.0 metres below ground level (mbgl). Groundwater was observed to be slightly turbid, grey in colour with no odour.
- Concentrations of CoPC in soil were reported below the applicable site assessment criteria with the exception of:
  - TRH and benzo(a)pyrene at BH07 (0.3 m) and BH09 (0.1 m). Both samples were situated within the fill material and BH07 was noted to have a bituminous odour which may have attributed to the elevated concentrations.
  - Copper and zinc were reported marginally exceeding the adopted ecological assessment criteria at BH07 (0.3 m), BH08 (0.1 m) and BH09 (0.1 m) within the fill material.
  - Bonded ACM was reported at BH08 (0.1 – 0.3 m) and contained chrysotile, amosite and crocidolite asbestos.
- Previous investigations also reported asbestos at the site. The asbestos impacted fill material appears to be isolated to the south-eastern corner of the site and one area beneath the building footprint (BH10 from the Supplementary ESI (WSP, 2023)).

- Concentrations of CoPC in groundwater were reported below the site assessment criteria with the exception of copper, nickel and zinc which exceeded the ANZG 95% freshwater toxicant default guideline values (DGV).
  - These exceedances are within an order of magnitude of the site assessment criteria and are considered to be typical concentrations of metals within groundwater in an urban environment.
- Based on the proposed development of the site (commercial/residential building with 4 levels of basement parking) it is presumed that the soils within this area will likely be removed during the bulk excavation works. It is noted that a grassed easement of land exists along the eastern boundary of the Site, shared with the Sydney Trains railway line. Beneath this grassed easement or 'strip' exist underground rock anchors or soil nails which provide reinforcement to the retaining wall along the eastern site boundary and the land title contains an easement in favour of Sydney Trains which precludes excavation of the ground. The easement is approximately six metres from the eastern site boundary back towards the west or inside of the site, in which excavation is not permitted (hand excavation only to be undertaken with care).
- If the soils around BH07, BH08 and BH09 and previous WSP sample locations (BH6A-BH6E and BH10) are to remain onsite in the context of the proposed development, they will require remediation or management as they are not suitable for the proposed development.

Based on the above, Reditus considers that the <u>site can be made suitable</u> for the proposed development (mixed use residential/commercial development), subject to the following recommendations:

- Develop and implementation of a Remedial Action Plan (RAP) to make the site suitable for the proposed development. The RAP must be prepared by a certified environmental practitioner – site contamination specialist in accordance with the NSW EPA (2020) Guidelines for Consultants Reporting on Contaminated Sites.
- Preparation of a Site Validation Report following completion of the soil remediation, documenting all site contamination remediation works have been satisfactorily completed and that the site has been demonstrated to be suitable for the proposed development.
- Develop an unexpected finds protocol to be implemented during earthworks.

Reditus considers that the consent authority may be satisfied that the required considerations of Clause 4.6 of State Environmental Planning Policy (Resilience and Hazards) 2021are satisfied for the following reasons:

- This DSI (Reditus) completed on the development site has adequately assessed the site history to identify potential sources of contamination, and has suitability assessed the potential risk posed by contaminants to health and the environment. As such, Clause 4.6(1)(a) of SEPP (Resilience and Hazards) 2021 has been successfully achieved.
- This DSI has determined that the land can be made suitable in its current state for the purposes for which the development is proposed to be carried out (as a mixed use residential/commercial development). As such, Clause 4.6(1)(c) of SEPP (Resilience and Hazards) 2021 has been successfully achieved.
- The DSI has been completed in accordance with the contaminated land planning guidelines, satisfying Clause 4.6(2) and 4.6(3) of SEPP (Resilience and Hazards) 2021.

1 Introduction

Reditus Consulting Pty Ltd (Reditus) was engaged by BB Wilson Property Pty Ltd (the client) to complete a Detailed Site Investigation (DSI) to support an intended development application (DA) at 8 Wilson Street Chatswood NSW 2067 (the site). The location and layout of the site is presented in **Figure 1**, **Appendix A**.

This DSI was completed to support the intended Development Application (DA) in accordance with State Environmental Planning Policy (Resilience and Hazards) 2021 requirements. The DSI includes assessment to define the nature, extent, and degree of contamination (if any); to assess potential risk posed by contaminants to health and the environment (if any); and to obtain sufficient information to assess environmental risk and inform recommendations to render the site suitable (if required) for the proposed redevelopment.

1.1 Background

The site is approximately 1,597 m^2 currently comprised of a large two (2) storey commercial/industrial complex with a painted brick façade.

The site is proposed to be redeveloped (in conjunction with 849, 853, 859 Pacific Highway and 2 Wilson Street) into a 27-storey mixed use development which includes:

- A two-storey podium with a mix of commercial uses (showroom and live/work shop top units).
- Two split residential towers with communal open space and circa 250 apartments.
- 4 level basement parking and basement loading dock.

WSP Australia Pty Limited (WSP) completed a Combined DSI and Geotechnical Investigation at the site in March 2021 and a Supplementary Environmental Site Investigation (ESI) in October 2023. The DSI and Supplementary ESI reported concentrations of asbestos and polycyclic aromatic hydrocarbons (PAHs) in fill above the adopted site assessment criteria. WSP concluded that the site was not suitable for the ongoing current land use (commercial/industrial) nor for the future proposed land use (residential) without the implementation of appropriate mitigation measures or site management.

This DSI was completed to support the intended Development Application (DA) in accordance with State Environmental Planning Policy (Resilience and Hazards) 2021 requirements. The DSI includes assessment to define the nature, extent, and degree of contamination; to assess potential risk posed by contaminants to health and the environment (if any); and to obtain sufficient information to assess environmental risk and inform recommendations to render the site suitable (if required) for the proposed redevelopment.

Reditus notes that this report, including its conclusions and recommendations, must be read in conjunction with the Statement of Limitations provided in **Section 14.**

1.2 Objectives

The objectives of the DSI were to:

- Assess whether Contaminants of Potential Concern (CoPCs) (if detected above site assessment criteria) present an unacceptable risk of exposure to human health and/or the environment, in the context of the proposed redevelopment.
- Provide advice on whether the land is suitable or could be made suitable (from a contamination perspective) for the proposed land use.
- Provide recommendations for further investigation, management, or remediation (if required).
- Conform to the requirements of the National Environmental Protection Council (Assessment of Site Contamination) National Environment Protection Measure 1999 (as amended in 2013) ('ASC NEPM, 2013') and the NSW Environmental Protection Authority (NSW EPA 2020) Contaminated Land Guideline for *Consultants Reporting on Contaminated Land*.

1.3 Scope of Works

The following scope of works was completed by Reditus to achieve the investigation objectives.

1.3.1 DESKTOP ASSESSMENT

- A desktop evaluation of historical reports, planning documentation, surrounding land uses and environmental setting.
- Identification of areas of environmental concern (AEC) (if any) to target during the intrusive investigation.
- A site walkover to characterise the property setting, including inspection of the site surface for visual or olfactory signs of potential contamination and/or contaminant sources.

1.3.2 SOIL INVESTIGATION

- Completion of project preliminaries, including Work, Health and Safety (WHS) documentation, a review of the dial-before-you-dig search and underground service location.
- Completion of eight (8) boreholes to a minimum of 0.5 m into natural material or refusal, whichever was encountered first.
- Soil samples were collected from each borehole from near surface (0.1-0.3 m below ground level (bgl)), 0.5 m bgl and 1.0 m bgl and every metre thereafter, and, where changes in geology or gross contamination was observed.
- Screening of fill material for visual presence of potential asbestos containing materials (PACM), nominally near surface material and every metre of fill material thereafter.
- Each soil sample location was logged in general accordance with the Unified Soil Classification System (USCS) and screened in the field using a Photo-ionisation Detector (PID) to detect the potential presence of volatile organic compounds (VOCs).
- Submission of primary soil samples and collected Quality Assurance/Quality Control (QA/QC) samples to the nominated National Association of Testing Authorities (NATA) accredited laboratory under a completed Chain of Custody (CoC) for analysis of:
  - Total recoverable hydrocarbons (TRH).
  - Benzene, toluene, ethylbenzene, xylenes (BTEX).
  - PAH.
  - Eight priority metals (including arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc).
  - Organochlorine pesticides (OCP) and organophosphate pesticides (OPP) (fill samples only).
  - Asbestos quantification (fill samples only).

1.3.3 GROUNDWATER INVESTIGATION

- One (1) borehole was extended to a maximum depth of 13.0 m bgl and converted into groundwater monitoring wells. The well was installed using washed sand (surrounding the screened zone) with a bentonite plug above and backfilled to the ground surface and installed with a concreted gatic cover flush to the ground surface.
- The groundwater monitoring well was surveyed for the relative height using a RTK Rover GPS System and developed to enable groundwater sampling.
- Water level gauging and low-flow sampling was completed for the newly installed monitoring well.
- Submission of primary groundwater samples and QA/QC samples to a NATA accredited laboratory under a CoC for analysis of:
  - TRH.
  - BTEX.
  - PAH.
  - Eight priority metals.
  - Major cations/major anions and ionic balance (primary samples only).

- Nutrients (including ammonia, nitrate, total nitrogen, oxidised nitrogen, total phosphorus and reactive phosphorus).
- Microbiological organisms (E. coli).

1.3.4 REPORTING

- Preparation of this DSI report in general accordance with the NSW EPA (2020) *Contaminated Land Guidelines – Consultants Reporting on Contaminated Land*, NEPC (2013) *National Environmental Protection (Assessment of Site Contamination) Measure (NEPM)*, SEPP Resilience and Hazards (2021) and other relevant NSW EPA reporting guidelines.

2 Site Identification

The site identification details have been prepared in general accordance with the NSW EPA (2020) Consultants Reporting on Contaminated Land and the ASC NEPM (2013) Field Checklist for 'site Information'. The site identification information is summarised in Error! Reference source not found. below.

Table 1. Site Identification

ITEM	DETAIL
Address	8 Wilson Street, Chatswood NSW 2067
Title and Land Information	Lot 1 DP 1189541
Site Area	1,597 m^2
Local Government Area	Willoughby Council
Site Coordinates to the approximate centre of the site (GDA2020 MGA Zone 56)	Easting: 331567 Northing: 6259301
Zoning	SP2 – Infrastructure and B4- Mixed Use (Willoughby Local Environmental Plan 2012)
Current Land Use	Commercial – Office and workshop training centre
Future Land Use	The site is proposed to be redeveloped (in conjunction with 849, 853, 859 Pacific Highway and 2 Wilson Street) into a 27-storey mixed use development which includes a two-storey podium with a mix of commercial uses, two split residential towers with communal open space and 4 level basement parking and basement loading dock.
Trigger for Assessment	To provide advice on the site's suitability for the proposed development from a contamination perspective. Such advice will inform a development application to be submitted to Council.
Surrounding Land Uses	The land uses currently surrounding the site include: • **North:** Wilson Street, followed by a former commercial building currently being demolished) and a Shell service station. • **South:** O'Brien Street followed by several high rise mixed-use buildings and a car wash. • **West:** Four (4) medium density residential buildings and Pacific Highway, followed by medium to high density residential buildings. • **East:** The railway corridor followed by medium to low-density residential properties.
Site Layout	**Figure 2**, **Appendix A**

2.1 Site Condition

A site visit was conducted by Reditus' Environmental Scientist, Ross Kingswell on 2 November 2023. The following site observations were recorded during the site visit:

- The property consists of a two (2) storey light industrial building. The site is accessible from the north-east (Wilson Street) and the south-west (O'Brian Street). The southern portion of the site consists of two loading bays with an asphaltic concrete driveway whilst the northern entrance of the site is a concrete driveway with a small car park.
- The eastern boundary of the site consists of a vegetated corridor extending the length of the building and is adjacent to the railway corridor. The southern extent of the area consists of bark mulch overlying geofabric.
- The site follows a downwards gradient from north to south, with the southern portion of the building noticeably elevated above the natural topography. The interior of the building was vacant and consists of a concrete slab on the ground floor which is likely to contain filling material underneath for levelling purposes. The upper level of the building contains wooden floors as well as some vinyl flooring.
- No signs of current or former industrial uses were noted. No stored chemicals or signs of underground storage tanks were noted.

3 Site Setting and Surrounding Environment

A summary of the site setting surrounding environment obtained from the DSI completed by WSP (2021) is provided below in **Table 2.**

Table 2. Site Setting and Surrounding Environment

ITEM	DETAIL
Topography	The site slopes downwards to the south, from an elevation of 108 m Australian Height Datum (mAHD) in the northern portion to 105 mAHD in the southern portion.
Hydrology	The nearest surface water body is Blue Gum Creek, an ephemeral stream, located approximately 600 m west of the site, flowing westward, discharging to Lane Cove River approximately 2.17 km west of the site. The second nearest water body is Scotts Creek, located approximately 930 m east of the site and discharges to Fig Tree Cove approximately 3.42 km east of the site.
Regional geology	A review of the Sydney 1:100 000 Geological Series Sheet 9130, Edition 1, 1983, the site is underlain by the Triassic aged Wianamatta group Ashfield Shale. The lithology is characterised by black to dark grey shale and laminate.
Soil Classification	Based on a review of the eSPADE NSW Government soil database, the soil landscape of the area encompassing the site consists of Glenorie Soil Landscape. The Glenorie Soil Landscape is developed from weathering of the underlying Wianamatta group shales. The soils are described as red and brown podzolic soils on crests grading yellow and grey podzolic soils in lower slopes. These soils present a high erosion hazard, with localised impermeable highly plastic soil that is moderately reactive.
Site Soil Classification	**Fill** • Fill material was noted to be variable in depth across the site and extended between 0.3 m and 1.3 m below the current site level. • The south-east corner of the site contained a bark mulch overlying geofabric, BH07, BH08, BH09 and BH11 were all located within this area. The fill profiles identified within this area varied and were described as follows: – BH07: clayey Sand with gravels and traces of concrete and rusted metal overlying a silty sandy Gravel with a bituminous odour. – BH08: silty sand with bricks, trace gravels, concrete, fibre cement and plastic. – BH09: dry, Silty clay, traces of plastic, concrete and metal. – BH11: Reworked natural gravelly residual clay with shale gravels. • BH10 and BH12 were situated along the eastern boundary. BH10 was noted to contain a reworked natural gravelly clay with shale gravels and traces of metal. BH12 was noted to have a silty sand topsoil layer overlying a silty sandy clay containing traces of bricks which was followed by a silty clay with traces of gravels. • BH06 was within the building and the fill material underlying the concrete was a sub-base gravels overlying clayey and gravelly sands followed by silty clay. • MW01 contained a silty sand layer underlying the bitumen surface followed by reworked natural silty clay. **Natural** • Natural material was encountered in three boreholes and was identified as orange to red brown silty CLAY. Inclusions were noted to be fine to medium grained gravels and traces of ash. **Rock** Rock was encountered at 5.0 m bgl and was identified to be sandstone overlying siltstone followed by shale which was encountered at 9 metres.

ITEM	DETAIL
Acid Sulfate Soils (ASS)	Based on reviews of the Australian Soil Resource Information System and the NSW Government Acid Sulfate Soils Risk Map provided in the Sharing and Enabling Environmental Data (SEED) database (www.seed.nsw.gov.au), the site is located within an area of low probability of occurrence for acid sulphate soils. A review of the Willoughby Local Environmental Plan (2012) Acid Sulfate Soil Map, the site is in Class 5 land. Development consent is required for the carrying out of works in Class 5 land within 500 metres of adjacent Class 1,2, 3 or 4 land that is below 5 mAHD and by which the water table is likely to be lowered below 1 metre AHD on adjacent Class 1,2,3 or 4 land. Based on the above, it was deemed not necessary to assess ASS as part of this assessment.
Registered Groundwater Bore Search	A review of Bureau of Meteorology's Australian Groundwater Explorer indicated that there are 18 registered bores within a 1 km radius of the site. Sixteen bores are used for monitoring purposes and the other two (2) are used for purposes listed as "other". These bores were located 661 m and 727 m to the south of the site. The drilled depths of the wells ranged from 2.0 – 162.6 m below ground level (mbgl). The closest bore is located 500 m north of the site. Thirteen bores are located to the north of the site and five (5) located to the south east of the site.
Regional Hydrogeology	A review of hydrogeology map of Australia (Geoscience Australia) indicated the aquifer type beneath the site is porous, extensive, and of low-moderate productivity.
Site Hydrogeology	Local or perched groundwater at the site is expected to flow in a westerly direction, towards Blue Gum Creek to the west. However, it may potentially flow in an easterly direction, towards Scotts Creek, based on the local topography and the proximity and flow direction of these Creeks. It is expected that regional groundwater would be present at approximately 5.0 to 10 m depth below ground level, in the underlying shale. Groundwater in the Wianamatta shales is known to be both hard and saline.
Depth to Water Table	The depth to groundwater at the site was reported to be 9.105 mAHD (MW01).
Yield and Inferred Groundwater Quality	There is no available information for data on the yield and groundwater quality in the surrounding area
Sensitive Environments	View Street Reserve, a children's playground is located approximately 130 m south-west from the site. Beauchamp Park, a public sporting field is located approximately 480 m north-east from the site. Blue Gum Creek is located approximately 600 m north-west from the site.

4 Site History

4.1 Historical Aerial Photographs

The following historical aerial photography summary has been sourced from the WSP Combined DSI and Geotechnical Site Investigation completed in March 2021 (WSP, 2021).

The site remained largely vacant from 1930 until 1970 when the light industrial building was constructed. An extension to the light industrial building was completed circa 1986. In the 2009 aerial photograph, some potential ground disturbance was noted in the south-eastern corner of the site. The north-shore train line has been present along the eastern boundary of the site since before 1943.

4.2 Previous Investigations

The following section provides a summary of the previous investigations conducted at the site.

Table 3. Previous Investigations

ITEM	DETAIL
COMBINED DETAILED ENVIRONMENTAL AND GEOTECHNICAL INVESTIGATION (WSP, 2021)	
Document Information	Combined Detailed Environmental and Geotechnical Site Investigation – O'Brian Street, Chatswood NSW Dated 19 March 2021
Prepared by	WSP Australia Pty Limited
Prepared for	Transport for NSW
Purpose	To review existing information on the site, including its historical use and current activities, to assess subsurface conditions and provide recommendations and advice on the suitability of the site for the proposed land use (residential) and support the future divestment of the site.

ITEM	DETAIL
Findings	**Scope of Works** • Site inspection and desktop review of the environmental setting and regulatory databases. • Completion of three (3) boreholes and nine (9) hand excavated locations, including sample collection and analysis. **Results** • Historical importation of contaminated fill, poor demolition or waste management practices on-site (both historical and/or current) are considered to be the primary source of potential contamination at the site. • The geology at BH1-BH4 was reported as asphalt and concrete underlain by road-base gravels and gravelly fill to a maximum depth of 0.8 mbgl, then natural clays graded gradually to weathered shale rock to the final borehole depth (5.0 mbgl). No visual or olfactory evidence of contamination was observed and laboratory results for CoPC were generally reported below the laboratory Limit of Reporting (LOR) or at trace levels. Concentrations were below the adopted site criteria for the current (commercial/industrial) and the proposed future (residential) land use. • Fill material in the south-eastern portion of the site was identified as being contaminated with asbestos (at locations BH6A to BH6E) and PAHs (at location BH6D only) at concentrations exceeding the adopted site assessment criteria for the current and future proposed land use. • Concentrations of other CoPCs did not exceed criteria in boreholes BH5 or BH6A to BH6G. • The full extent of the impacted fill could not be determined due to site constraints (buildings footprint/easement). The impacted fill appeared to be localised to the south-eastern portion of the site, in the vicinity of boreholes BH5 and the BH6 series locations. However, the fill may extend beneath the footprint of the site buildings or other parts of the site, as such further characterisation is required.
Conclusions	The implication of the presence of asbestos on the unsealed ground surface and in the near ground surface (fill material) in the south-eastern portion of the site in the context of site suitability is as follows. The site is not considered suitable for the ongoing current land use (commercial/industrial) nor the future proposed land use (residential) while asbestos is present on the ground surface and within the shallow fill.
Recommendations	Removal of asbestos containing material (ACM) from the site ground surface and subsequent completion of a clearance inspection and issue of a clearance certificate by an independent licenced asbestos assessor (LAA) or competent person (as required) should be undertaken to confirm that no ACM remains on the site ground surface. Longer term management of the asbestos/PAH impact requires management through implementation of a remediation strategy to remove the risk of human exposure to the asbestos/PAH. Two general remediation strategies could include: capping and containment of the impact, or excavation of the impacted material, off-site disposal and reinstatement. Noting that, the subsurface within the building footprint has not been assessed and despite any remediation efforts in the accessible and assessed areas, the relative risk and suitability of the site for the proposed future residential land use cannot be commented upon with certainty until the building footprint is assessed. This is in part due to the inherently heterogeneous nature of fill material, and as such the presence of any contaminants of concern (particularly asbestos in this case) being present under the building footprint cannot be discounted. Prior to any development at the site which would disturb the existing buildings footprint further investigation is required to characterise the underlying soils.
SUPPLEMENTARY ENVIRONMENTAL SITE INVESTIGATION REPORT: GROUND SUB-SURFACE WITHIN THE FOOTPRINT OF THE SITE BUILDINGS (WSP, 2023)	
Document Information	Supplementary Environmental Site Investigation Report: Ground sub-surface within the footprint of the site building – 1 O'Brian Street, Chatswood NSW Dated 23 October 2023
Prepared by	WSP Australia Pty Limited

ITEM	DETAIL
Prepared for	Transport for NSW
Purpose	To review existing information on the site, including its historical use and current activities, to assess subsurface conditions and provide recommendations and advice on the suitability of the site for the proposed land use (residential).
Findings	**Scope of Works** • Site inspection and desktop review of the environmental setting and regulatory databases. • Completion of five (5) borehole locations, including sample collection and analysis. **Results** • Historical importation of contaminated fill, poor demolition or waste management practices on-site (both historical and/or current) are considered to be the primary source of potential contamination at the site. • A total of five (5) boreholes (BH7-BH11) were excavated using hand tools or hand auger to a maximum depth of 1.1 mbgl. The ground surface comprised of concrete/asphalt pavement underlain by a layer of fill to approximately 0.1 mbgl. Fill material consisted of cohesionless, gravelly sand, transitioning to sandy clay. Natural material was encountered in each borehole at approximately 0.15-1.1 mbgl and comprised of stiff to hard medium plasticity gravelly clay, sandy clay and silty clay. • No visual or olfactory signs of contamination were observed and the laboratory analytical results for the CoPC were below the adopted site criteria for the current land use (commercial/industrial) and the proposed future land use (residential). • During the Site inspection, no fragments of asbestos were visually observed. However, SGS reported Chrysotile asbestos found in road base material (approximately 3x2x1mm) cement sheet fragment in sample BH10: 1.0-0.15m, no respirable fibres were detected in all soil samples using trace analysis technique. • During previous investigation (WSP, 2021) fill material in the south-eastern portion of the Site was identified to have been impacted through either historical importation of fill and/or poor historical demolition and waste management practices. The fill material was found to be contaminated with asbestos (at locations BH6A to BH6E) and PAHs (at location BH6D only), concentrations exceeded the adopted site assessment criteria for the current and future proposed land use.
Conclusions	The Site is not considered suitable for the ongoing current land use (commercial/industrial) nor the future proposed land use (residential) without the implementation of appropriate mitigation measures or site management.

4.3 Regulatory Searches

A search of NSW EPA Contaminated Land Records of Notice and List of NSW Notified Sites (as of 27 November 2023) in relation to Section 58 and 60 of the Contaminated Land Management Act 1997 was undertaken for the site and surrounding area, which noted:

- The site is not listed on the NSW EPA record of notices under Section 60 of the Contaminated Land Management Act 1997.

There are two sites within a 1km radius of the site that are listed on the NSW EPA record of contaminated sites, these are detailed within **Table 4**.

Table 4. NSW EPA Notified Contaminated Sites

ADDRESS	DISTANCE FROM SITE	SITE NAME	CONTAMINATING ACTIVITY	MANAGEMENT CLASS
877-879 Pacific Highway, Chatswood	~100 m North	Coles Express Service Station Chatswood	Service Station	Regulation under CLM Act not required.

ADDRESS	DISTANCE FROM SITE	SITE NAME	CONTAMINATING ACTIVITY	MANAGEMENT CLASS
728 Pacific Highway, Chatswood	~540 m south-west	Chatswood Toyota	Service Station	Contamination formerly regulated under the CLM Act

- A search of licenced activities under the Protection of the Environment Operations Act (1997) identified that the site does not contain an Environmental Protection License.
- A search of licenced activities under the Protection of the Environment Operations Act (1997) identified the following sites which contain licenses within a 1km radius of the site:
  - The Hospitals Contribution Fund of Australia Ltd *(trading as HCF Dental Centre)* at 6/13 Spring Street, Chatswood NSW (590 m south-east) for Hazardous, Industrial or Group A Waste Generation (0-10 tonnes). Issued in 2000. No longer in force.

Considering the location of the licensed activity, the small quantity of medical waste being generated it is very unlikely that potentially contaminating activities would influence the status of the soil or groundwater on the subject site.

4.4 Potentially Contaminating Processes

Potentially contaminating processes are listed below in **Table 5**.

Table 5. Potentially Contaminating Processes

ITEM	DETAIL
Past Industrial Processes	A review of historical imagery, previous investigations as well as notes made during the site walkover conducted by Reditus indicate that industrial processes may have occurred in the past.
Manufacturing Processes	A review of historical imagery, previous investigations as well as notes made during the site walkover conducted by Reditus indicate that manufacturing processes have occurred in the past.
Hazardous Materials	A hazardous material survey was completed by WSP in 2021 which identified asbestos (friable asbestos and non-friable ACM) and lead based paints within the building.
Storage Tanks	Evidence of underground petroleum storage systems (UPSS) was not observed during the site walkover or historical imagery. As such, it is unlikely that the underground storage of fuel has occurred at the site. No above ground storage tanks (AST) were observed on site either.
Discharges to Land, Water and Air	Reditus has no records of discharges to land, water or air having historically occurred at the site.
Visible Signs of Contamination	Staining and other visible indications of contamination were not observed across the site.
Presence of Drums and Wastes	No drums or bulk storage of chemicals were observed on-site.
Odours	No olfactory indications of contamination were identified across the site.

4.5 PFAS Investigation Sites

Per- and poly-fluorinated substances (PFAS) have more recently been highlighted as a persistent and mobile contaminant, of significant toxicity. The potential risk posed by PFAS contamination has been evaluated by using available site history information with a preliminary decision tree assessment matrix. The potential risk presented by PFAS contamination is presented in **Table 6.**

Table 6. Summary of PFAS Preliminary Risk Assessment

ITEM	PROBABILITY	DETAIL
Did fire training occur on-site? [1]	Low	Historical aerial imagery deem it unlikely that fire training occurred at the site.
Is an airport or fire station up gradient of or adjacent to the site? [2]	Low	There are no airports or fire stations within 1km of the site.
Have "fuel" fires ever occurred on-site? e.g., ignition of fuel (solvent, petrol, diesel, kerosene) tanks.	Low	Historical aerial imagery deem it is unlikely that fuel fires have occurred on site.
Have PFAS been used in manufacturing or stored on-site?	Low	Site history has not reported to have stored or used substances containing PFAS.
Have any activities associated with risk of fire and broad point source uses of PFAS contamination occurred on-site? [3]	Low	There is no evidence of manufacturing having occurred at the site, nor is there evidence of PFAS containing materials historically being stored on the site.

Notes:

1. Runoff from fire training areas may impact surface water, sediment, and groundwater.
2. PFAS is used in a wide range of industrial processes and consumer products (https://www.industrialchemicals.gov.au/consumers-and-community/and-poly-fluorinated-substances-pfas

5 Preliminary Conceptual Site Model

Based on the information presented in Sections 1-4 of this report, a Conceptual site Model (CSM) has been prepared for the site. The ASC 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 essential elements of the CSM, as required by the ASC NEPM (NEPC, 2013), include an understanding of:

- Known and potential sources of contamination and contaminants of concern including the mechanism(s) of contamination (e.g., 'top down' spill or sub-surface release from corroded tank or pipe).
- Potentially affected media (soil, sediment, groundwater, surface water, indoor and ambient air) and human and ecological receptors.
- Potential and complete exposure pathways.

A tabular CSM provided in **Table 8** identifies the complete and potential pathways between the known or potential source(s) of contamination and receptor(s).

5.1 Potential Sources of Contamination

The potential sources of contamination identified during the PSI are summarised in **Table 7**.

Table 7. Potential Sources of Contamination

SOURCE	AREAS OF CONCERN	CONTAMINANTS OF POTENTIAL CONCERN
Historical Use of Fill	Importation of fill from an unknown source used for site levelling, backfilling behind retaining walls and landscaped areas.	Metals, TRH, BTEX, PAHs, OCP, OPP, Asbestos
Weathering of potentially hazardous building materials	Surface soils surrounding on-site structures.	Asbestos and lead.
EPA Notified Service Station North of the Site	Potentially contaminated groundwater migrating onsite.[1]	Metals, TRH, BTEX and PAHs.

1. Although groundwater is presumed to flow to the east, due to the proximity of the service station to the site it is deemed appropriate to assess.

5.2 Potentially Affected Media

The potentially affected media at the site includes:

- Soil.
- Groundwater.

5.3 Potential Receptors and Pathways

5.3.1 PROPOSED LAND USE SCENARIO AND POTENTIAL RECEPTORS

It is likely that the proposed development will contain a mixed-use development with limited access to soils. The most sensitive receptors will be residents within the apartments, consequently, the most relevant land-use scenario is residential with minimal access to soils.

Based on the proposed land use, the potential receptors at and near the site include the following:

- On-site receptors:
  - Current and future demolition/construction/maintenance workers.

- Current and future users and visitors of the site.
- Current and future commercial/retail workers.
- Soil and groundwater receptors.

- Off-site receptors:
  - Current and future intrusive construction/maintenance workers on adjacent properties.
  - Surrounding groundwater and surface receptors.
  - Commercial/retail workers and visitors at surrounding properties.
  - Current and future occupants and visitors of residential properties.

5.3.2 HUMAN HEALTH – DIRECT CONTACT PATHWAY

It is considered appropriate to assess whether a direct contact source may be present on the site for construction and maintenance workers and future site users. Health impacts should be taken into consideration since there are accessible soils.

5.3.3 HUMAN HEALTH – INHALATION / VAPOUR INTRUSION PATHWAY

Given the proposed development plans, there is potential for volatilisation of volatile organic compounds bound to soils/groundwater to accumulate beneath the future building footprint and become an inhalation health risk via vapour intrusion for future site users and maintenance workers. Furthermore, leaching of CoPC into the groundwater aquifer can also lead to lateral migration with similar exposure to off-site receptors.

It is therefore considered appropriate to assess whether a vapour source may be present on the site and determine if there is an unacceptable risk to future users of the site.

5.3.4 AESTHETICS

No visual evidence of widespread or significant staining was observed at the site at the time of inspection. While it is considered that the proposed site hardstand materials will prevent visual exposure to potentially aesthetically impacted sub-surface soils, an assessment of aesthetics can be made during assessment of other pathways.

Hardstand is likely to cover the majority of the site and as such, any aesthetics impacts within soil and fill materials are unlikely to preclude the proposed development.

5.3.5 ECOLOGICAL – TERRESTRIAL ECOSYSTEMS

The NEPC (2013) NEPM requires a pragmatic risk-based approach should be taken in applying ecological investigation and screening levels in residential and commercial / industrial land use settings.

The EIL and ESL guidelines are considered by Reditus to only be applicable to proposed landscaped areas for the proposed development. The proposed development comprises of four basement levels, as such, these landscaped areas will be formed by importing soil from offsite.

It is considered that further assessment of risk to terrestrial ecosystems is warranted, an assessment against the NEPC (2013) NEPM EILs/ESL will be conducted as part of the investigation.

5.3.6 ECOLOGICAL – AQUATIC ECOSYSTEMS

There is potential leaching of contaminants from historical filling into the groundwater on-site. There are no significant watercourses within the immediate vicinity of the site, the closest being Blue Gum Creek (600 m east). Surface water is likely to drain into the local stormwater network.

5.4 Potential Transport Mechanisms and Exposure Pathways

Potential transport mechanisms of contamination relevant to the site include:

- Potential historical placement of fill materials.
- Potential leaching of CoPC from fill materials into groundwater.
- Potential weathering of hazardous building materials.
- Potential upgradient contamination of groundwater migrating onto the site.

Potential exposure pathways and receptors relevant to the site may include:

- Direct contact with potentially contaminated soils/groundwater during near or sub-surface works at the site (i.e., trenching and/or excavation works during construction or by future occupants).
- Inhalation/ingestion of groundwater and disturbed soil.
- Vapour intrusion from volatilisation of VOCs.
- Lateral migration of potentially contaminated groundwater to sites hydraulically down-gradient.
- Surface water run-off discharging into stormwater.

5.5 Source, Pathway and Receptor Linkages

A preliminary tabular CSM has been prepared for the site based on the outcomes of the PSI in **Table 8** below. The tabular CSM describes potential linkages and assesses each of the linkages as probably, possible, or unlikely based on the likelihood of occurrence and availability of data.

Table 8 Exposure Pathway Assessment

SOURCE	EXPOSURE PATHWAY	RECEPTOR	EXPOSURE
Fill materials of unknown origin.	• Direct contact with potentially contaminated soils/groundwater during sub-surface works at the site (i.e., trenching and/or excavation works) or by future users of the area. • Inhalation of dust and vapours. • Ingestion of potentially contaminated soil and groundwater. • Surface water run-off.	• Construction Workers. • Site occupants. • Maintenance workers[1].	**Possible** The SPR linkage is complete. Assessment of COPCs in sub-surface soils and groundwater warranted.
Weathering of potentially hazardous building materials.	• Direct contact with potentially contaminated soils during sub-surface works at the site (i.e., trenching and/or excavation works) or by future users of the area. • Inhalation of dust. • Ingestion of potentially contaminated soil. • Surface water run-off.	• Construction Workers. • Site occupants. • Maintenance workers[1].	**Possible** The SPR linkage is complete. Assessment of COPCs in sub-surface soils and groundwater warranted.

SOURCE	EXPOSURE PATHWAY	RECEPTOR	EXPOSURE
EPA Notified Service Station North of the Site *Potential upgradient contamination of groundwater associated with fuel storage migrating onto the site*	• Direct contact with contaminated soil. • Inhalation vapours. • Ingestion or direct contact with potentially contaminated groundwater.	• Site users. • Construction workers. • Maintenance workers[1]. • Offsite users.	**Possible** Potential source-pathway-receptor linkages have been identified with relation to the off-site, upgradient land uses (historical and current fuel storage), as such assessment of these linkages is warranted.

Notes:

1. Maintenance workers attending the site, particularly if works require excavation, trenching or any activities applicable to the sub-surface of the site.

6 Data Quality Objectives

The Data Quality Objective (DQO) process is a systematic planning tool based on the scientific method for establishing criteria for data quality and for developing data collection designs. The DQO defines the experimental process required to test a hypothesis. The DQO process has been developed to ensure that efforts relating to data collection are cost effective, by eliminating unnecessary, duplicative or overly precise data whilst at the same time, ensuring the data collected is of sufficient quality and quantity to support defensible decision making.

It is recognised that the most efficient way to accomplish these goals is to establish criteria for defensible decision making before data collection begins and develop a data collection design based on these criteria. By using the DQO process to plan the investigation effort, the relevant parties can improve the effectiveness, efficiency and defensibility of a decision in a resource and cost-effective manner.

The DQO process consists of seven steps, which are designed to clarify the study objectives, define the appropriate type of data and specify tolerable levels of potential decision errors. The seven-step DQO process adopted for this DSI can be summarised as:

- **Step 1: State the Problem** – concisely describe the problem to be studied. Review prior studies and existing information to gain a sufficient understanding to define the problem.
- **Step 2: Identify the Decision** – identify what questions the study will attempt to resolve, and what actions may result.
- **Step 3: Identify the Inputs to the Decision** – identify the information that needs to be obtained and the measurements that need to be taken to resolve the decision statement.
- **Step 4: Define the Study Boundaries** – specify the time periods and spatial area to which decisions will apply. Determine when and where data should be collected.
- **Step 5: Develop a Decision Rule** – define the statistical parameter of interest, specify the action level, and integrate the previous DQO outputs into a single statement that describes the logical basis for choosing among alternative actions.
- **Step 6: Specify Tolerable Limits on Decision Errors** – define the decision maker's tolerable decision error rates based on a consideration of the consequences of making an incorrect decision; and
- **Step 7: Optimise the Design** –evaluate information from the previous steps and generate alternative data collection designs. Choose the most resource-effective design that meets all DQOs.

The DQOs are provided in **Table 9** below and were derived in accordance with Australian Standard 4482.1-2005 'Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds' (AS 4482.1-1997).

Table 9. Data Quality Objectives

ITEM	DETAIL
Step 1: State the problem	The site is proposed to be redeveloped for mixed use commercial and residential land usage. The DSI (WSP, 2021) and Supplementary ESI (WSP, 2023) identified asbestos and PAHs in soil which exceeded the adopted site criteria. A DSI is required to inform the development application (DA) to inform Chapter 4 Remediation of Land of SEPP (Resilience and Hazards) 2021 and to confirm the findings of the DSI (WSP, 2021) and Supplementary ESI (WSP, 2023).

ITEM	DETAIL
Step 2: Identify the decision/goal of the study	If elevated concentrations of COPCs are identified at the site: • Have potentially contaminating activities occurred on the site? If so, what level of site investigation is required to define the nature, extent and degree of contamination (if any); to assess potential risk posed by contaminants to health and the environment (if any)? • What is the extent of the impact? • Does any COPC at the site occur at concentrations that pose or may pose an unacceptable liability or risk to the environment and/or human health to persons who will utilise the future development? • If so, what is the order of priority to minimise the risk and what additional measures are required to mitigate, remediate, or manage the risk? • Is the site suitable for the proposed land use setting, in the context of land contamination?
Step 3: Identify the information inputs	Key data required to resolve the project problem included concentrations of COPC in the soil and groundwater collected in the study area, and the structure and depth of the underlying site geology. The COPC selected were based on the historical assessment and the current site condition observed during fieldworks. The regulatory guidelines adopted by Reditus to assess the site are presented in **Section 7** below.
Step 4: Define the boundaries of the study	This investigation was restricted to the physical site boundaries, as shown in **Figure 2, Appendix A**. The vertical extent of the study boundaries was limited to a maximum depth of 13.0 mbgl. The temporal boundaries of the study were limited to the date that the investigations were completed.
Step 5: Develop a decision rule	If the concentrations of COPC in soil and groundwater are reported to be below the relevant adopted tier 1 assessment guidelines, then the site will be deemed suitable, and no management/remediation options will be proposed for the proposed land use at the site. If, however, the concentration of one or more COPC are greater than the guidelines, then further investigation will be required to laterally and vertically delineate the extent of the impact and/or recommendations made for the remediation/management of contamination to render the site suitable for the proposed development.
Step 6: Specify tolerable limits on decision errors	The acceptable limits for samples are as follows: • % RPD for laboratory duplicates for TPH and BTEX analysis is less than 60%; and • Recovery of matrix spikes and surrogate spikes is as per the laboratory's Quality Assurance targets accepted under their National Association of Testing Authorities (NATA) accreditation. Precision is measured using the standard deviation 'SD' or Relative Percent Difference '%RPD'. Replicate data for field duplicates of organics is expected to be as follows: • RPD criteria of 50% or less, for concentrations > or = 10 times practical quantitation limits (PQL); • RPD criteria of 75% or less, for concentrations between 5 and 10 times the EQL; and • RPD criteria of 100% or less, for concentrations < 5 times PQL. Replicate data for field duplicates for inorganics, including metals is expected to be as follows: • RPD criteria of 30% or less, for concentrations > or = 10 times PQL; • RPD criteria of 75% or less, for concentrations between 5 and 10 times the EQL; and • RPD criteria of 100% or less, for concentrations < 5 times PQL. Where acceptable limits for field duplicates were not met, a discussion on low biased error will be provided. For this investigation, a decision error of 5% will be considered acceptable This error rate is in accordance with Appendix B of Schedule B(2) of the ASC NEPM. In order to achieve this level of confidence, the investigation has been designed as described below.

ITEM	DETAIL
Step 7: Optimise the design	Soil and groundwater samples were collected on a judgemental (targeted) based sampling design program, with COPC analysis based on the known site history. Soil samples were collected at relevant intervals, changes in geology or in zones of gross contamination and locations selected for efficient and representative sampling. Groundwater monitoring wells were located in a triangular formation across the site (and neighbouring sites) to ensure suitable coverage of the site. Due to the proposed basement excavation these were situated in accessible areas that were unlikely to be disturbed during bulk excavation works. Note that two (2) groundwater monitoring wells were placed upgradient on the adjacent residential site. All media sampling was completed in accordance with Reditus standard operating procedures (SOPs) and relevant industry guidelines.

6.1 Extent of Uncertainties

The sampling methodologies used by Reditus during this investigation has been designed to limit uncertainty in the results. Reditus is confident that the results of this investigation give an accurate representation of the current status of the surface soils and groundwater onsite but note that in all subsurface investigations the potential remains for variability between sampling points and for conditions to be different on site from the conditions reported herein.

7 Tier 1 Assessment Criteria

Tier 1 assessment involves the comparison of monitoring data to published guideline criteria (typically presented as screening levels). Relevant criteria are selected based on the identified viable exposure pathways and COPCs and proposed land use.

In Australia, appropriate HILs (including interim HILs for vapour intrusion and, where applicable, HSLs for petroleum hydrocarbons and assessment criteria for asbestos) are used for Tier 1 screening to provide a rapid assessment of whether the site contamination may be of concern with respect to human health. Should contaminant concentrations at a site occur at levels that are below the Tier 1 levels, this implies that for the majority of the people in the population there is no significant health risk from contamination and that remedial action may not be required to protect human health.

Exceedances of the tier 1 HILs should be identified and considered. Tier 1 HIL exceedances do not imply that a risk is necessarily present, but that further assessment may be justified. Tier 1 HILs are not intended to indicate a clear demarcation between acceptable and unacceptable. Marginal exceedances may not require quantitative Tier 2 risk assessment to conclude that further assessment is not necessary. The magnitude of the exceedance should be considered in the context of the CSM (that is, whether the exposure pathways are plausible and whether exposure will result in harm).

Tier 1 screening criteria (including HILs and HSLs) should only be used where there has been adequate characterisation of a site (that is, appropriate representative sampling has been carried out). For this investigation, the maximum reported concentrations for each sample and analyte will be compared against the tier 1 criteria. Should any individual sample exceedance of the tier 1 criteria exist, the 95% Upper Confidence Limit (UCL) of the analyte for the site data set was calculated and compared to relevant Tier 1 screening criteria. However, the implications of localised elevated values should also be considered. In order to adopt the 95% UCL result, the analyte data set must also meet the following criteria:

- The standard deviation (SD) of the results should be less than 50% of the Tier 1 screening criteria.
- No single value exceeds 250% of the relevant Tier 1 screening criteria (characterised as a 'hot-spot').

Where site data exceeds the screening levels or suitable screening levels cannot be identified, further consideration (Tier 2 assessment) is required.

7.1 Soil Assessment Criteria

Tier 1 assessment involves the comparison of monitoring data to published guideline criteria (typically presented as screening levels). Relevant criteria are selected based on the identified viable exposure routes and the available data. Where site data exceeds the screening levels or suitable screening levels cannot be identified, further consideration (Tier 2 assessment) is required.

The tier 1 assessment criteria were adopted from:

- National Environment Protection Council (NEPC) 1999, 'Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater, National Environment Protection (Assessment of site Contamination) Measure (NEPM), as amended in 2013'.

The soil assessment criteria (SAC) adopted for this assessment were:

- NEPC (2013) NEPM HIL-B criteria values have been adopted to assess concentrations of COPC in soil for site suitability and human health in a high-density residential and commercial/industrial land use scenario.
- NEPC (2013) NEPM HSL-D guidelines for vapour intrusion have been adopted to evaluate the risk posed from vapour intrusion in a high-density residential and commercial/industrial land use scenario. As outlined in the NEPM (2013) and in the context of the proposed development HSL-D guidelines due to communal basement carparking would more appropriately characterise the majority of the site. The soil HSLs are based on depth of impacts, overlying soil type and land use. After a review of subsurface conditions, the guidelines for clay were selected.
- NEPC (2013) NEPM ML residential/parkland guidelines have been adopted and are used to consider the potential formation of light non-aqueous phase liquids, fire and explosion risks and damage to buried infrastructure. A fine-

grained soil type was selected after a review of subsurface conditions encountered during investigation works completed at the site.

- NEPC (2013) NEPM ESLs and EILs were both selected to determine the risk of potential contamination to identified ecological receptors on the site, in the context of an urban residential/public open space. Both ESL and EIL criteria values are applicable for the first 2m of the soil profile.
- EIL criteria values were derived using academic values and where appropriate, using the NEPM EIL Interactive Calculation Worksheet available at http://www.nepc.gov.au/nepms/assessment-site-contamination/toolbox. The output from the EIL calculation is available in **Appendix B**. The following input parameters were adopted from the NSW Government eSpade viewer to derive EILs, noting that where a range of values were given, the average of those two values was selected as an input:
  - **Cation exchange capacity (CEC)**: 12.5 $cmol_c$/kg
  - **Clay (%)**: 27.5 %
  - **pH**: 4.25
  - **Soil organic carbon (OC %)**: 1.25 %

Soil analytical results are tabulated in **Table 1**, **Appendix C**, and guideline criteria are presented below in **Table 10**.

Table 10. Adopted Soil Assessment Criteria (mg/kg)

CHEMICAL GROUP	ANALYTE	HIL-B	HSL-D, CLAY		EIL	ESL	ML
			0-1 m	1-2 m	URBAN RES & PUBLIC OPEN SPACE	URBAN RES, FINE, 0-2 M	URBAN RES, FINE SOIL
BTEX	Naphthalene	-	NL	NL	170	-	-
	Benzene	-	4	6	-	65	-
	Toluene	-	NL	NL	-	105	-
	Ethylbenzene	-	NL	NL	-	125	-
	Xylene Total	-	NL	NL	-	45	-
TRH	C_6-C_{10} Fraction (F1)	-	-	-	-	-	800
	C_6-C_{10} (F1 minus BTEX)	-	310	480	-	180	-
	>C_{10}-C_{16} Fraction (F2)	-	-	-	-	120	1,000
	>C_{10}-C_{16} Fraction (F2 minus Naphthalene)	-	NL	NL	-	120	-
	>C_{16}-C_{34} Fraction (F3)	-	-	-	-	1,300	3,500
	>C_{34}-C_{40} Fraction (F4)	-	-	-	-	5,600	10,000
PAH	Benzo(a) pyrene	-	-	-	-	0.7	-
	Benzo(a)pyrene TEQ (LOR)	4	-	-	-	-	-
	PAHs (Sum of total)	400	-	-	-	-	-
Metals	Arsenic	500	-	-	100	-	-
	Cadmium	150	-	-	-	-	-
	Chromium (III+VI)	500 [1]	-	-	570 [2]	-	-
	Copper	30,000	-	-	75	-	-

CHEMICAL GROUP	ANALYTE	HIL-B	HSL-D, CLAY		EIL	ESL	ML
			0-1 m	1-2 m	URBAN RES & PUBLIC OPEN SPACE	URBAN RES, FINE, 0-2 M	URBAN RES, FINE SOIL
	Lead	1,200	-	-	1,100	-	-
	Mercury	120	-	-	-	-	-
	Nickel	1,200	-	-	200	-	-
	Zinc	60,000	-	-	220	-	-
OCP	Aldrin + Dieldrin	10	-	-	-	-	-
	Chlordane	90	-	-	-	-	-
	DDT	-	-	-	180	-	-
	DDT+DDE+DDD	600	-	-	-	-	-
	Endosulfan	400	-	-	-	-	-
	Endrin	20	-	-	-	-	-
	Heptachlor	10	-	-	-	-	-
	Hexachlorobenzene	15	-	-	-	-	-
	Methoxychlor	500	-	-	-	-	-
OPP	Chlorpyrifos	340	-	-	-	-	-

NL – No limit

[1] Chromium (VI) HIL criteria has been applied to concentrations of Chromium (III+VI) for conservatism.
[2] Chromium (III) EIL criteria has been applied to concentrations of Chromium (III+VI) for conservatism.

7.2 Groundwater Assessment Criteria

Selection of the groundwater assessment criteria (GAC) was based on the proximity of the site to sensitive surrounding surface water receptors, groundwater extraction in the area, and water quality of the aquifer. The groundwater analytical data were compared against the following adopted Tier 1 screening criteria:

- NEPM ASC (2013) HSLs for vapour intrusion HSL-D for commercial/industrial land use with groundwater depth between 2 and <8 m within clay.
- ANZG 2018 – 95% species protection default guideline value (DGV) (supersedes the NEPM ASC (2013) Groundwater Investigation Levels (GILs)) for marine water as Homebush Bay and Brays Bay are brackish estuarine environments.

The ANZG (2018) is a revision of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000) presented as an online platform, to improve usability and facilitate updates as new information becomes available.

Revisions to DGVs since the ANZECC & ARMCANZ (2000) guidelines have been provided for the 'aquatic ecosystem' community value. DGVs have been revised for physical and chemical (PC) stressors based on increased understanding, broader monitoring data collected since 2000.

The NEPM ASC (2013) GILs were derived using the ANZECC & ARMCANZ (2000), which were subsequently revised (superseded) in ANZG (2018). As such, the ANZG (2018) DGVs will be used as an initial screening in replace of the NEPM ASC (2013) GILs as they provide concentrations which once exceeded require further investigation into receptors and points of extraction and use.

7.2.1 HUMAN HEALTH – VAPOUR INTRUSION

The groundwater concentrations have been assessed against the NEPC (2013) NEPM HSL-A&B and HSL-D to evaluate the risk posed from vapour intrusion. The selection of HSL-A&B and HSL-D was based on the proposed residential/commercial development, the potential receptor/s onsite, and the exposure that may be experienced. HSLs for clay have been adopted after a review of subsurface conditions encountered during investigation works completed at the site.

7.2.2 HUMAN HEALTH – DRINKING WATER

The NSW DECC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination* describes the process involved in identifying the likely environmental values which must be considered to be preserved in groundwater investigations at contaminated sites. Based on the NSW DECC (2007) Guidelines, determination of environmental values follows the steps below:

- Determine whether the aquifer beneath the site is included in the NSW Department of Natural Resources (NSW DNR) list of major aquifers of drinking water quality.
- Determine the identified uses of groundwater from the aquifer.
- Assess groundwater indicators to determine whether the aquifer is suitable for use as a drinking water source. The NSW DECC has stated that "Groundwater with TDS concentrations below 2000 mg/L is suitable for potential drinking water supply, and hence should be afforded this level of protection from contamination unless other site-specific factors, such as low yield, render such use unlikely." (NSW DECC, 2007).

Reditus note the following site hydrogeological conditions:

- The site is not situated within a known drinking water groundwater management unit (GMU) protected by the NSW DNR as an actual or potential drinking water supply (NSW DECC, 2007).
- The site is located within an urban area and is connected to a potable reticulated water supply. Therefore, groundwater is unlikely to be used for exaction purposes.
- The site and surrounding area has been used for residential and commercial/industrial uses since at least the early 1940s, therefore, groundwater in the area is unlikely to be used as a drinking water resource.

Based on the known urban nature of the surrounding area, the presence of a reticulated water supply in the highly urbanised environment, the absence of registered groundwater bores nominated for drinking water use within a 1 km radius of the site it is considered highly unlikely that the groundwater in the immediate vicinity of the site will be utilised for domestic purposes (both potable and non-potable use).

As such, the Australian Drinking Water Guidelines (2011) for both human health and aesthetics were not considered when adopting the GACs.

7.2.3 HUMAN HEALTH – RECREATIONAL WATER GUIDELINES

Considering the closest recreational water body is over 2 km to the east (Lane Cove River), it is unlikely that the groundwater from this site is directly impacting the groundwater discharging into the river. As such, it is not deemed necessary to assess recreational water at this stage of the investigation.

7.2.4 ECOLOGICAL GROUNDWATER ASSESSMENT CRITERIA

Use of the 95% protection level (for the ANZECC 2000 Guidelines) assumed that the surrounding watercourses are moderately disturbed ecosystems. This is as defined in Section 3.1 of the guidelines as receiving road and storm water runoff from adjacent industry and residential properties, consistent with the setting and surrounding environment of the site.

The ANZG (2018) 95% freshwater guidelines for groundwater were adopted as screening criteria, based on the nearest surface water receptors and discharge point for groundwater leaving the site being fresh water in nature.

Groundwater analytical results are tabulated against the groundwater assessment criteria in **Table 11.**

Table 11 Adopted Groundwater Assessment Criteria (µg/L)

CHEMICAL GROUP	ANALYTE	HSL-D - CLAY			ANZG (2018) 95% PROTECTION FRESH WATER
		2-4 m	4-8 m	>8 m	
c	Naphthalene	NL	NL	NL	16
	Benzene	30,000	30,000	30,000	950
	Toluene	NL	NL	NL	180
	Ethylbenzene	NL	NL	NL	80
	Xylene (o)	NL	NL	NL	350
TRH	C_6-C_{10} Fraction (F1)	-	-	-	-
	C_6-C_{10} (F1 minus BTEX)	NL	NL	NL	-
	>C_{10}-C_{16} Fraction (F2)	-	-	-	-
	>C_{10}-C_{16} Fraction (F2 minus Naphthalene)	NL	NL	NL	-
	>C_{16}-C_{34} Fraction (F3)	-	-	-	-
	>C_{34}-C_{40} Fraction (F4)	-	-	-	-
PAH	Anthracene	-	-	-	0.4
	Benzo(a) pyrene	-	-	-	0.2
	Fluoranthene	-	-	-	1.4
	Phenanthrene	-	-	-	2
Metals	Arsenic	-	-	-	24
	Cadmium	-	-	-	0.2
	Chromium (III+VI)	-	-	-	1**

CHEMICAL GROUP	ANALYTE	HSL-D - CLAY			ANZG (2018) 95% PROTECTION FRESH WATER
		2-4 m	4-8 m	>8 m	
	Copper	-	-	-	1.4
	Lead	-	-	-	3.4
	Mercury	-	-	-	0.6
	Nickel	-	-	-	11
	Zinc	-	-	-	8

*freshwater criteria adopted in absence of marine criteria

** Cr(VI) adopted for total of Cr(III) & Cr(VI)

8 Methodology

The methods used for the collection of data are presented in the following sections.

8.1 Schedule of Works

The schedule of fieldworks completed at the site and Reditus personnel involved is provided in **Table 12** below. It is noted that all Reditus personnel involved are suitably qualified and experienced in the collection of environmental samples and environmental site investigations.

Table 12. Schedule of Works

DATE	DETAIL OF WORKS	REDITUS PERSONNEL
2, 3 & 7 November 2023	Soil Investigation, drilling and groundwater monitoring well installation and development	Ross Kingswell *Environmental Scientist*
10 November 2023	Groundwater monitoring event	Ross Kingswell *Environmental Scientist*

8.2 Sampling Analysis Plan and Sampling Rationale

The intention of the sampling plan was to attain the objectives stated in **Section 1.2**. To achieve this a judgemental (targeted) sampling design program was adopted for this DSI. The sampling plan was based on historical desktop information, previous intrusive investigations at the site, the specific design plans for the site, site observations, NSW EPA (2022) Sampling Design Guidelines, and had the goal of providing sufficient data to allow for in-situ assessment and characterisation of soil and groundwater at the site.

Sample locations are presented on **Figure 2, Appendix A**. A total of eight (8) boreholes were completed with one (1) borehole being converted into a groundwater monitoring well location. For the purpose of this investigation Reditus consider that sufficient sampling locations were conducted to adequately characterise the site. The number of sampling locations adheres to the NSW EPA (2022) Sampling Design Guidelines – Minimum sampling density for site characterisation for a 0.16 ha site.

8.3 Soil Sampling Methodology

Soil samples were collected from the eight (8) locations within the proposed development footprint. These samples were collected from accessible areas across the study area.

Based on the CSM, soil samples were collected from the near-surface (0-0.1m), at changes in lithology or zones with any visual (staining or discolouration) or olfactory signs of contamination.

The soil samples were collected directly from the auger and shovel using dedicated nitrile gloves. Efforts were made to minimise disturbance of the material being sampled to the extent practicable. Such techniques included removing the outside layer of material and collecting from the centre of the recovered auger cuttings, to prevent cross-contamination and minimise the potential for loss of VOCs.

Part of the soil sample was placed into a snap lock plastic bag for screening with a photo-ionisation detector (PID) and part being placed directly into a laboratory prepared 250 mL glass jar with the details of the sample, including the sample name, the job number, the date of the sample and the sample depth.

Sample preservation was undertaken in accordance with NEPC (2013) NEPM, with samples immediately placed and stored in an ice filled esky to keep them chilled, prior to being couriered to the laboratory under a signed chain of custody (COC) form filled out with the required analysis.

Each soil sample was described in general accordance with the Unified Soil Classification System (USCS) and details of any discolouration, staining, odours or other indicators of contamination were also noted. Borehole logs are provided in **Appendix D**.

In summary, soil samples were collected in accordance with Reditus standard operating procedures which are based on the NEPC (2013) NEPM, Australian Standard AS4482.1-2005 and AS4482.2-1999 and EPA requirements.

8.3.1 ASBESTOS IN SOIL SAMPLING METHODOLGY

Composite soil samples were collected from the surface and near-surface and every metre of fill material thereafter. Samples were collected in accordance with the NEPC (2013) NEPM methodology for asbestos gravimetric sampling and submitted for asbestos in soil quantification analysis.

500mL soil samples were placed into snap lock plastic bag (double bagged), with the details of the sample, including the sample name, the job number, the date of sample and the sample depth, for laboratory analysis of AF and FA asbestos in accordance with the NEPC (2013) NEPM, where possible.

A minimum of one (1) 10L sample from each sample location was collected from the fill material. All samples were spread over a contrast surface (i.e. tarp) and inspected for ACM. Any ACM or FA identified was collected, bagged and submitted to the laboratory for asbestos identification and weight of asbestos fragments collected.

Percentage soil asbestos from collected ACM was calculated as follows:

$$\%Soil\ Asbestos = \frac{\%Asbestos\ Content \times ACM\ (kg)}{Soil\ Volume\ (L) \times Soil\ Density\ (kg/L)}$$

where:

% Asbestos Content by weight (within asbestos cement materials) = 10% – 15% (Reditus has adopted 15% for the sake of conservatism)

Soil Density (for sand material) = 1.65 kg/L

Soil samples were couriered to the laboratory under a signed chain of custody (COC) forms filled out with the required analysis.

8.4 Monitoring Well Installation

One (1) monitoring well was drilled with solid flight auger and air hammer (through bedrock) drilling techniques to a maximum depth of 13.0 m bgl. Well construction details were recorded on the borehole logs.

Well construction, including screened intervals, were based on observations made during the drilling at each location. The well screens comprised of 50 mm internal diameter (ID), Class 18, threaded, flush jointed uPVC with machine slots of 0.4 mm width and casing comprised 50 mm ID, Class 18, threaded, flush jointed uPVC. Each groundwater monitoring well was gravel packed with 1-2mm of washed graded gravel to the top of the screen interval. A bentonite seal was installed above the gravel pack and cement grout was placed around the gatic cover.

The monitoring well was developed using a steel bailer until majority of the sediments are removed from the water column ensuring a good connection between the screened borehole interval and the surrounding aquifer. Where practicable, a minimum quantity of three casing volumes of water was removed. The wells were then left to stabilise for a minimum of one week prior to purging and sampling.

8.5 Groundwater Sampling

The newly installed monitoring well was gauged using an oil/water interface probe prior to purging and sampling. Depth to standing water level (SWL) was recorded from the top of casing (TOC).

The well was then purged utilising compressed air controlled through a micropurge controller until groundwater quality parameters stabilised to within 10% of the previous reading. The water quality parameters were measured with a calibrated water quality meter to record measurements for pH, redox potential, electrical conductivity (mS/cm), dissolved oxygen and temperature (˚C).

The interface probe was thoroughly decontaminated between gauging events with a phosphate free detergent (Liquinox) and rinsed with deionized water.

Groundwater samples were collected directly into appropriately preserved laboratory supplied sampling containers and labelled with the date, location, and project identification number. The samples for dissolved metals were field filtered using a 0.45-micron Millipore filter.

Polyethylene tubing was changed between each monitoring well and the interface probe was thoroughly decontaminated between gauging events with a phosphate free detergent (Liquinox) and rinsed with deionised water.

Field records of the groundwater monitoring event are provided in **Appendix E**. The calibration certificate of the water quality meter is provided in **Appendix F.**

8.6 Laboratory Analysis and Methods

Laboratory analytical methods and analyte PQLs are shown in the analytical certificates provided in **Appendix G**. Furthermore, the analytical suites performed during this investigation are provided in **Section 1.3**.

9 Quality Assurance and Quality Control (QAQC)

9.1 Field Quality Assurance

9.1.1 DETAILS OF SAMPLING TEAM

Fieldworks completed as part of this assessment, detailed in **Section 8.1**, were completed by Reditus staff each of whom are suitably qualified and experienced in the collection of environmental samples and environmental site investigations.

9.1.2 DECONTAMINATION PROCEDURES CARRIED OUT BETWEEN SAMPLING EVENTS

All reusable sampling equipment was decontaminated in between each use to ensure no cross contamination occurred. The stainless-steel bailer and interface probe were decontaminated between uses using a three-stage process consisting of a rinse with potable water, a thorough cleanse using a combination of deionised water and Liquinox (a phosphate free detergent), and a final rinse using deionised water. Reditus considers this to be a suitable method to prevent cross contamination during sampling.

9.1.3 CHAIN OF CUSTODY DETAILS

All samples were transported to the laboratory under a chain of custody (COC). Information on the COC included the sampler, sample identifier, sample matrix, collection date, analyses to be performed, sample preservation method, sample release date and sample received date. COCs are provided in **Appendix G** along with the laboratory reports.

9.1.4 SAMPLING SPLITTING TECHNIQUES

Soil duplicates and triplicates were collected by taking representative samples of the soil at the same depth interval. Due to the potential loss of volatiles, samples were not mixed or homogenised during collection or splitting.

Water duplicates were collected by filling the required number of sample bottles concurrently with the primary samples to ensure that the same water was being collected in each sample container.

9.1.5 TRIP BLANKS AND TRIP SPIKES

Trip blanks are used to assess contamination from field conditions at the time of the sampling event and that the sampling procedures are adequate in preventing cross contamination of VOCs during sample transport and storage.

Based on the site history and observations made during the site walkover, it was not considered likely that high concentrations of VOCs would be encountered on site and as such no trip blanks and trip spikes were collected during the investigation.

9.1.6 RINSATE BLANK

contamination procedures are adequate throughout the investigation.

One (1) rinsate blank was collected by running deionised water off the decontaminated interface probe directly into appropriately preserved laboratory containers and submitted to the laboratory for analysis of all CoPC.

Results of rinsate blank analysis is provided in **Table 5, Appendix C.**

9.1.7 STATEMENT OF DUPLICATE FREQUENCY

Field duplicates and triplicates were collected at a rate of 1:17 for soil samples. This rate is within the Australian Standard 4482.1-2005 'Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds and Reditus' QA frequency ranges.

The following soil QA/QC samples were collected:

- DUP02 and TRIP02 were respectively soil intra-laboratory and inter-laboratory duplicates of sample BH08_0.1.

It is noted that groundwater sampling was completed concurrently at the site and on the adjacent lot. A total of three (3) groundwater monitoring wells (MW01, MW02 and MW03) were sampled with field duplicate and triplicate samples collected from MW02 which is located on the adjacent lot. The results of the groundwater field duplicate and triplicate samples have not been included in this report.

9.2 Laboratory QA/QC

9.2.1 SAMPLE HOLDING TIMES

All holding times were reported as being within specified ranges.

9.2.2 LABORATORY ACCREDITATION AND ANALYTICAL METHODS USED

The primary laboratory used for samples was Envirolab Services Pty Ltd (Envirolab), while the secondary laboratory was Australian Laboratory Services Pty Ltd (ALS).

Envirolab is accredited by NATA to ISO/IEC 17025 with the accreditation number 1261, while ALS is also accredited to this standard with the accreditation number 825.

Laboratory QA/QC is provided on the laboratory reports in **Appendix G**.

9.2.3 LABORATORY CONTROL SAMPLES

Laboratory control samples were reported within acceptable ranges.

Detailed laboratory QA/QC are found in the laboratory report in **Appendix G**.

9.2.4 LABORATORY RELATIVE PERCENT DIFFERENCE (RPD)

All internal laboratory RPDs met acceptance criteria with the exception of sample 336965-29 which exceeded the criteria for copper. As such, a triplicate result was issued as laboratory sample number 336965-65.

9.3 Evaluation of the QA/QC Information Compared to the DQOs

9.3.1 DOCUMENTATION COMPLETENESS:

- Soil logs, chain-of-custody forms, calibration were complete and appropriate.

Data completeness:

- All samples were received by the laboratories and analytical results reported including laboratory QA/QC.

9.3.2 DATA COMPARABILITY:

- Reditus standard operating procedures, Australian Standards and industry best practice were followed during sampling.
- Consistent field conditions and similarly trained staff were used during sampling.
- The limits of reporting are appropriate and generally consistent from each laboratory.

9.3.3 DATA REPRESENTATIVENESS:

- Reditus is confident that cross contamination has not occurred, and primary samples are representative of actual soil conditions.
- The frequency of laboratory blanks was acceptable, and the results were within specified ranges.

9.3.4 PRECISION:

- Intra-laboratory and inter-laboratory duplicates were collected at the following rates:
  - Soil intra-laboratory and inter-laboratory duplicates frequency were collected at least 1:20.
- QA/QC sample collection rate follows the guidance provided in the Australian Standard Field procedures (AS1482.1 1997).

9.3.5 RELATIVE PERCENT DIFFERENCE

Refer to **Table 4, Appendix C** for Relative Percent Differences (RPDs) calculations. Reditus notes that RPDs were only calculated for groups of compounds with detections above the laboratory detection limits. RPDs for soil were reported within acceptable ranges.

10 Results

10.1 Field Observations

10.1.1 SOIL

Soil samples collected from the boreholes were logged in general accordance with the USCS. Borehole logs are provided as **Appendix D**. The soils encountered during the intrusive investigation are summarised below:

Fill

- Fill material was noted to be variable in depth across the site and extended between 0.3 m and 1.3 m below the current site level.
- The south-east corner of the site contained a bark mulch overlying geofabric, BH07, BH08, BH09 and BH11 were all located within this area. The fill profiles identified within this area varied and were described as follows:
  - BH07: clayey Sand with gravels and traces of concrete and rusted metal overlying a silty sandy Gravel with a bituminous odour.
  - BH08: silty sand with bricks, trace gravels, concrete, fibre cement and plastic.
  - BH09: dry, Silty clay, traces of plastic, concrete and metal.
  - BH11: Reworked natural gravelly residual clay with shale gravels.
- BH10 and BH12 were situated along the eastern boundary. BH10 was noted to contain a reworked natural gravelly clay with shale gravels and traces of metal. BH12 was noted to have a silty sand topsoil layer overlying a silty sandy clay containing traces of bricks which was followed by a silty clay with traces of gravels.
- BH06 was within the building and the fill material underlying the concrete was a sub-base gravels overlying clayey and gravelly sands followed by silty clay.
- MW01 contained a silty sand layer underlying the bitumen surface followed by reworked natural silty clay.

Natural

- Natural material was encountered in three boreholes and was identified as orange to red brown silty CLAY. Inclusions were noted to be fine to medium grained gravels and traces of ash.

Rock

- Rock was encountered at 5.0 m bgl and was identified to be sandstone overlying siltstone followed by shale which was encountered at 9 metres.

10.1.2 GROUNDWATER

The groundwater monitoring well was gauged for standing water level (SWL) and total depth on 10 November 2023 prior to commencing purging and sampling. groundwater gauging data is summarised in **Table 13.**

Table 13. Groundwater Gauging Data

Well ID	LOCATION	DEPTH (mbTOC)	SWL (mbTOC)	TOC (mAHD)	SWL (mAHD)
MW01	Offsite (approx. 10 m south-east of south-eastern corner of site).	12.75	9.105	106.168	97.063
MW02	Front garden of 849 Pacific Highway.	12.88	11.85	111.331	99.481
MW03	Front garden of 853 Pacific Highway.	12.675	7.75	111.041	103.291

The monitoring well was purged until stabilised physiochemical parameters were obtained, which is summarised in

Table 14 below. MW02 and MW03 was sampled on the adjacent lot and the results are not discussed in this report.

Table 14. Stabilised Groundwater Physiochemical Properties

WELL ID	PH	TEMP (ºC)	EC (MS/CM)	DO (PPM)	REDOX (MV)	COMMENTS
MW01	4.55	19.74	0.391	2.42	460.4*	Slightly turbid, grey, no odour

Note: 199mV have been added to redox field values to adjust to Standard Hydrogen Electrode (SHE) results.

Based on the physico-chemical parameters recorded during the groundwater monitoring event the following observations have been made:

- pH indicates a slightly acidic environment in the groundwater underlying the site.
- Electrical conductivity readings indicated a moderately fresh groundwater.
- Dissolved oxygen indicates moderate levels of dissolved oxygen in the groundwater.
- ORP indicates an oxidising environment is present in the groundwater.

10.2 Analytical Results

10.2.1 SOIL

A summary of the soil analytical results can be found in **Table 1, Appendix C**. The following section outlines the key findings of the comparison between laboratory results and the site assessment criteria. Discussion of analytical results is provided in **Section 11.1**.

Soil sample locations are presented on **Figure 2, Appendix A**.

BTEX

Concentrations of BTEX were reported below the adopted soil assessment criteria in all soil samples submitted for analysis.

TRH

Concentrations of TRH were reported below the adopted soil assessment criteria in all soil samples submitted for analysis with the exception of:

- BH07_0.3 (640 mg/kg) exceeded the ESL criteria for TRH C_{10}-C_{16} (120 mg/kg).
- BH07_0.3 (640 mg/kg) exceeded the ESL criteria for TRH C_{10}-C_{16} (F2 minus naphthalene) (120 mg/kg).
- BH07_0.3 (13,000 mg/kg) exceeded the Management Limit criteria for TRH C_{16}-C_{34} (3,500 mg/kg) and the ESL criteria for TRH C_{16}-C_{34} (300 mg/kg). BH09_0.1 (510mg/kg) exceeded the ESL criteria for TRH C_{16}-C_{34} (300 mg/kg).
- BH07_0.3 (2,900 mg/kg) exceeded the ESL criteria for TRH C_{34}-C_{40} (2,800 mg/kg).

PAH

Concentrations of PAHs were reported below the adopted soil assessment criteria in all soil samples submitted for analysis with the exception of:

- BH07_0.3 (85 mg/kg) and BH09_0.1 (2.4 mg/kg) exceeded the ESL criteria for benzo(a)pyrene (0.7 mg/kg).
- BH07_0.3 (120 mg/kg) exceeded the HIL-B criteria for benzo(a)pyrene TEQ (4 mg/kg).

Heavy Metals

Concentration of heavy metals were reported below the adopted soil assessment criteria in all soil samples submitted for analysis with the exception of:

- BH07_0.3 (120 mg/kg) and BH09_0.1 (81 mg/kg) exceeded the EIL criteria for copper (75 mg/kg).
- BH08_0.1 (490 mg/kg) and BH09_0.1 (240 mg/kg) exceeded the EIL criteria for zinc (220 mg/kg).

OCP & OPP

Concentrations of OCP/OPP were reported below the laboratory LOR and hence below the adopted soil assessment criteria in all soil samples submitted for analysis.

Asbestos

No asbestos was detected in the soil samples submitted for identification analysis with the exception of BH08 (0.1-0.3 m) which was reported to be chrysotile, amosite and crocidolite asbestos. Asbestos fines and friable asbestos (AF/FA) was reported below the LOR in all soil samples submitted for analysis.

10.2.2 PRELIMINARY WASTE CLASSIFICATION

The results of the preliminary waste classification have highlighted contamination of near surface soils at BH07, BH08 and BH09. As the proposed development will result in the disposal of these soils to a licensed waste facility, proper classification under the NSW EPA NSW (2014) Waste Classification guidelines is required. All soil samples were compared to CT1 & CT2 criteria for preliminary waste classification without Toxicity Characteristic Leaching Procedure (TCLP).

Laboratory analysis indicate that concentrations of TRH C_{10}-C_{36} at BH07_0.3 and lead at BH08_0.1 did not meet the general solid waste (GSW) criteria from a chemical perspective. Concentrations of benzo(a)pyrene did not meet the restricted solid waste criteria from a chemical perspective. Bonded ACM was reported at sample location BH08 (0.1-0.3 m). Based on the field observations and the analytical results, the preliminary in-situ waste classification for the contaminated shallow fill material can be classified as HAZARDOUS SOLID WASTE (Non-Putrescible) – special waste (asbestos).

It is inferred that this material will have low leachability and therefore at the time material is stockpiled in preparation for offsite disposal Toxicity Characteristic Leaching Procedure (TCLP) will potentially reduce the waste classification of select material onsite.

Results of the preliminary waste classification can be found in **Table 2, Appendix C**.

10.2.3 GROUNDWATER

A summary of the groundwater analytical results compared to the site assessment criteria can be found in **Table 3, Appendix C**. This section outlines the key findings of the comparison between laboratory results and the site assessment criteria as summarised in the subsections below.

Metals

Concentrations of metals were reported below the adopted assessment criteria in all groundwater samples submitted for analysis except for the following:

- Copper within MW01 (6 µg/L) exceeded the ANZG 95% Freshwater Toxicant DGV of 1.4 µg/L.
- Nickel within MW01 (14 µg/L) exceeded the ANZG 95% Freshwater Toxicant DGV of 11 µg/L.
- Zinc within MW01 (44 µg/L) exceeded the ANZG 95% Freshwater Toxicant DGV of 8 µg/L.

TRH

Concentrations of TRHs were reported below the adopted assessment criteria in all groundwater samples submitted for analysis.

BTEXN

Concentrations of BTEXN were reported below the adopted assessment criteria in all groundwater samples submitted for analysis.

PAH

Concentrations of PAHs were reported below the adopted assessment criteria in all groundwater samples submitted for analysis.

10.3 Extent of Uncertainties in the Results

The sampling methodologies used by Reditus during this investigation has been designed to limit uncertainty in the results. Reditus is confident that the results of this investigation give an accurate representation of the current status of the site but note that in all subsurface investigations the potential remains for variability between sampling points and for conditions to be different onsite from the conditions reported herein.

11 Discussion

11.1 Soil

Concentrations of TRH and benzo(a)pyrene were reported exceeding the adopted human health and ecological assessment criteria at BH07 (0.3 m) and BH09 (0.1 m). Both samples were situated within the fill material and BH07 was noted to have a bituminous odour which may have attributed to the elevated concentrations.

Copper and zinc were reported marginally exceeding the adopted ecological assessment criteria at BH07 (0.3 m), BH08 (0.1 m) and BH09 (0.1 m) within the fill material. The boreholes were unable to be advanced into natural material due to refusal from the stiff clay material however, as the reported exceedances are within an order of magnitude of the adopted ESL, it is unlikely to preclude the proposed development.

Bonded ACM was reported at BH08 (0.1 – 0.3 m) and contained chrysotile, amosite and crocidolite asbestos. The DSI (WSP, 2021) reported asbestos on the unsealed ground surface and in the near ground surface (fill material) in the south eastern portion of the site. The presence of asbestos in the south eastern portion of the site (BH08) is consistent with the findings of the DSI (WSP, 2021). The Supplementary ESI (WSP, 2023) reported asbestos in soil beneath one (1) location within the building footprint. The asbestos fragment was present in the fill material at a depth of between 0.1-0.15 m and was approximately 3 x 2 x 1 mm and is unlikely to have exceeded the HSL-B bonded ACM guideline of 0.04% w/w. The asbestos impacted fill material appears to be isolated to the south-eastern corner of the site and one area beneath the building footprint (BH10 from the Supplementary ESI (WSP, 2023)).

Based on the proposed development of the site (mixed use residential and commercial with 4 levels of basement parking) it is presumed that the soils within this area will likely be removed during the bulk excavation works. It is noted that a grassed easement of land exists along the eastern boundary of the Site, shared with the Sydney Trains railway line. Beneath this grassed easement or 'strip' exist underground rock anchors or soil nails which provide reinforcement to the retaining wall along the eastern site boundary and the land title contains an easement in favour of Sydney Trains which precludes excavation of the ground. The easement is approximately six metres from the eastern site boundary back towards the west or inside of the site, in which excavation is not permitted (hand excavation only to be undertaken with care).

If the soils around BH07, BH08 and BH09 and previous WSP sample locations (BH6A-BH6E and BH10) are to remain onsite in the context of the proposed development, they will require remediation or management as they are not suitable for the proposed development.

11.2 Groundwater

Copper, nickel and zinc concentrations were reported above the ANZG 95% Freshwater Toxicant DGVs at MW01. All concentrations are noted to be within an order of magnitude of the adopted criteria. Reditus considers that these marginal heavy metal exceedances are representative of groundwater quality in an urban environment, and they are not considered to represent an unacceptable risk to the proposed development or surrounding environment.

12 Refined Conceptual Site Model

Based on the results of the investigation and the preliminary CSM presented in **Section 5** has been refined to identify complete and potential pathways between the known or potential source(s) and the receptor(s).

Table 15. Refined Conceptual Site Model

SOURCE	EXPOSURE PATHWAY	RECEPTOR	EXPOSURE
Fill materials of unknown origin.	• Direct contact with potentially contaminated soils/groundwater during sub-surface works at the site (i.e., trenching and/or excavation works) or by future users of the area. • Inhalation of dust and vapours. • Ingestion of potentially contaminated soil and groundwater. • Surface water run-off.	• Construction Workers. • Site occupants. • Maintenance workers[1].	**Possible** Exceedances of health and ecological screening criteria were noted onsite within shallow soils at BH07, BH08 and BH09.
Weathering of potentially hazardous building materials.	• Direct contact with potentially contaminated soils during sub-surface works at the site (i.e., trenching and/or excavation works) or by future users of the area. • Inhalation of dust. • Ingestion of potentially contaminated soil. • Surface water run-off.	• Construction Workers. • Site occupants. • Maintenance workers[1].	**Possible** Asbestos was noted in shallow soils at BH08 and during the previous DSI (WSP, 2021) and Supplementary ESI (WSP, 2023).
Service Station North of the Site ***Potential upgradient contamination of groundwater associated with fuel storage migrating onto the site***	• Direct contact with contaminated soil. • Inhalation vapours. • Ingestion or direct contact with potentially contaminated groundwater.	• Site users. • Construction workers. • Maintenance workers[1]. • Offsite users.	**Unlikely** Concentrations of CoPC indicate that no significant groundwater contamination is migrating on the site.

13 Conclusions and Recommendations

The following conclusions and recommendations are made based on the key findings of the DSI.

13.1 Conclusions

Based on a review of the site history, observations made during fieldwork, results of laboratory analysis and the proposed land use scenario, Reditus concludes the following:

- Historical sources of potential contamination noted during the desktop investigation included fill material, weathering of potentially hazardous building materials and upgradient contamination of groundwater from the service station to the north of the site.
- Fill material was variable in composition and thickness and was found to extend between 0.3 and 1.3 m. The south east corner of the site contained a bark mulch layer overlying geofabric containing fill of variable composition.
- One (1) groundwater monitoring well was installed to a maximum depth of 13.0 mbgl. Groundwater was observed to be slightly turbid, grey in colour with no odour.
- Concentrations of CoPC in soil were reported below the applicable site assessment criteria with the exception of
  - TRH and benzo(a)pyrene at BH07 (0.3 m) and BH09 (0.1 m). Both samples were situated within the fill material and BH07 was noted to have a bituminous odour which may have attributed to the elevated concentrations.
  - Copper and zinc were reported marginally exceeding the adopted ecological assessment criteria at BH07 (0.3 m), BH08 (0.1 m) and BH09 (0.1 m) within the fill material.
  - Bonded ACM was reported at BH08 (0.1 – 0.3 m) and contained chrysotile, amosite and crocidolite asbestos.
- Previous investigations also reported asbestos at the site. The asbestos impacted fill material appears to be isolated to the south-eastern corner of the site and one area beneath the building footprint (BH10 from the Supplementary ESI (WSP, 2023)).
- Concentrations of CoPC in groundwater were reported below the site assessment criteria with the exception of copper, nickel and zinc which exceeded the ANZG 95% freshwater toxicant DGV.
  - These exceedances are within an order of magnitude of the site assessment criteria and are considered to be typical concentrations of metals within groundwater in an urban environment.
- Based on the proposed development of the site (mixed use residential and commercial with 4 levels of basement parking) it is presumed that the soils within this area will likely be removed during the bulk excavation works. It is noted that a grassed easement of land exists along the eastern boundary of the Site, shared with the Sydney Trains railway line. Beneath this grassed easement or 'strip' exist underground rock anchors or soil nails which provide reinforcement to the retaining wall along the eastern site boundary and the land title contains an easement in favour of Sydney Trains which precludes excavation of the ground. The easement is approximately six metres from the eastern site boundary back towards the west or inside of the site, in which excavation is not permitted (hand excavation only to be undertaken with care).
- If the soils around BH07, BH08 and BH09 and previous WSP sample locations (BH6A-BH6E and BH10) are to remain onsite in the context of the proposed development, they will require remediation or management as they are not suitable for the proposed development.

Based on the above, Reditus considers that the <u>site can be made suitable</u> for the proposed development (mixed use residential/commercial development), subject to the following recommendations:

- Develop and implementation of a Remedial Action Plan (RAP) to make the site suitable for the proposed development. The RAP must be prepared by a certified environmental practitioner – site contamination specialist in accordance with the NSW EPA (2020) Guidelines for Consultants Reporting on Contaminated Sites.
- Preparation of a Site Validation Report following completion of the soil remediation, documenting all site contamination remediation works have been satisfactorily completed and that the site has been demonstrated to be suitable for the proposed development.
- Develop an unexpected finds protocol to be implemented during earthworks.

Reditus considers that the consent authority may be satisfied that the required considerations of Clause 4.6 of State Environmental Planning Policy (Resilience and Hazards) 2021are satisfied for the following reasons:

- This DSI (Reditus) completed on the development site has adequately assessed the site history to identify potential sources of contamination, and has suitability assessed the potential risk posed by contaminants to health and the environment. As such, Clause 4.6(1)(a) of SEPP (Resilience and Hazards) 2021 has been successfully achieved.
- This DSI has determined that the land can be made suitable in its current state for the purposes for which the development is proposed to be carried out (as a mixed use residential/commercial development). As such, Clause 4.6(1)(c) of SEPP (Resilience and Hazards) 2021 has been successfully achieved.
- The DSI has been completed in accordance with the contaminated land planning guidelines, satisfying Clause 4.6(2) and 4.6(3) of SEPP (Resilience and Hazards) 2021.

14 Limitations

This report has been prepared in accordance with the scope of services described in the **Section 1.3**. The letter has been prepared for the sole use of the client and has been prepared in accordance with a scope of work agreed by the client.

The report or document does not purport to provide legal advice and any conclusions or recommendations made should not be relied upon as a substitute for such advice.

The report does not constitute a recommendation by Reditus for the client or any other party to engage in any commercial or financial transaction and any decision by the client or other party to engage in such activities is strictly a matter for the client.

The report relies upon data, surveys, measurements and results taken at or under the Site at particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the client. Furthermore, the report has been prepared solely for use by the client and Reditus accepts no responsibility for its use by other parties. The client agrees that Reditus' report or associated correspondence will not be used or reproduced in full or in part for promotional purposes and cannot be used or relied upon by any other individual, party, group or company in any prospectus or offering. Any individual, party, group or company seeking to rely on this report cannot do so and should seek their own independent advice.

No warranties, express or implied, are made. Subject to the scope of work undertaken, Reditus assessment is limited strictly to identifying typical environmental conditions associated with the subject property based on the scope of work and testing undertaken and does not include and evaluation of the structural conditions of any buildings on the subject property or any other issues that relate to the operation of the Site and operational compliance of the Site with state or federal laws, guidelines, standards or other industry recommendations or best practice. Scope of work undertaken for assessments are agreed in advance with the client and may not necessarily comply with state or federal laws or industry guidelines for the type of assessment conducted.

Additionally, unless otherwise stated Reditus did not conduct soil, air or wastewater analyses including asbestos or perform contaminated sampling of any kind. Nor did Reditus investigate any waste material from the property that may have been disposed off-site or undertake and assessment or review of related site waste management practices.

The results of this assessment are based upon (if undertaken as part of the scope work) a site inspection conducted by Reditus personnel and/or information from interviews with people who have knowledge of site conditions and/or information provided by regulatory agencies. All conclusions and recommendations regarding the property are the professional opinions of the Reditus personnel involved with the project, subject to the qualifications made above.

While normal assessments of data reliability have been made, Reditus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Reditus, or developments resulting from situations outside the scope of this project/assessment.

Reditus is not engaged in environmental auditing and/or reporting of any kind for the purpose of advertising sales promoting, or endorsement of any client's interests, including raising investment capital, recommending investment decisions, or other publicity purposes. Reditus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Reditus, or developments resulting from situations outside the scope of this project.

In relation the conduct of asbestos inspections or the preparation of hazardous materials reports Reditus has conducted inspections and the identification of hazardous material within the constraints presented by the property. Whilst efforts are made to access areas not normally accessed during normal use of the Site to identify the presence of asbestos or other hazardous material, unless explicitly tested no guarantee can be provided that such material is or is not present.

Reditus' professional opinions are based upon its professional judgment, experience, and training. These opinions are also based upon data derived from the limited testing and analysis described in this report or reports reviewed. It is possible that additional testing and analysis might produce different results and/or different opinions or other opinions. Reditus has limited its investigation(s) to the scope agreed upon with its client. Reditus believes that its opinions are reasonably supported by the testing and analysis that has been undertaken (if any), and that those opinions have been developed according to the professional standard of care for the environmental consulting

profession in this area at this time. Other opinions and interpretations may be possible. That standard of care may change and new methods and practices of exploration, testing and analysis may develop in the future, which might produce different results.

15 References

Site Specific

WSP (2021) Combined Detailed Environmental and Geotechnical Site Investigation, O'Brian Street, Chatswood NSW (ref: PS123618-CLM-REP-2410 Rev1).

WSP (2023) Supplementary Environmental Site Investigation Report, 1 O'Brian Street, Chatswood NSW (ref: PS205540-CLM-REP-7842 Rev1).

Environmental Planning

NSW Environmental Planning and Assessment Act (the EP&A Act 1979).

NSW State Environmental Planning Policy Number (SEPP) Resilience and Hazards 2021. Superseding SEPP55 – Remediation of Land, 1998.

Site Contamination

CRC Care (2011) Health screening levels for petroleum hydrocarbons in soil and groundwater. Part 1: Technical development document.

NSW Contaminated Land Management Act (the CLM Act 1997).

NSW EPA statutory guidelines made or approved under section 105 of the CLM Act, including:

- *NSW EPA Guidelines for the NSW Site Auditor Scheme (3rd Edition), 2017.*
- *NSW EPA Guidelines for Consultants Reporting on Contaminated Land, 2020.*
- *NSW EPA Sampling Design Guidelines, August 2022.*
- *NSW EPA Guidelines for the Assessment and Management of Groundwater Contamination, 2007.*
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Acid Sulfate Soils

The Acid Sulfate Soil Management Advisory Committee (ASSMAC) Acid Sulfate Soils Assessment Guidelines 1998 (Also referred to as the "Acid Sulfate Soils Manual").

Waste

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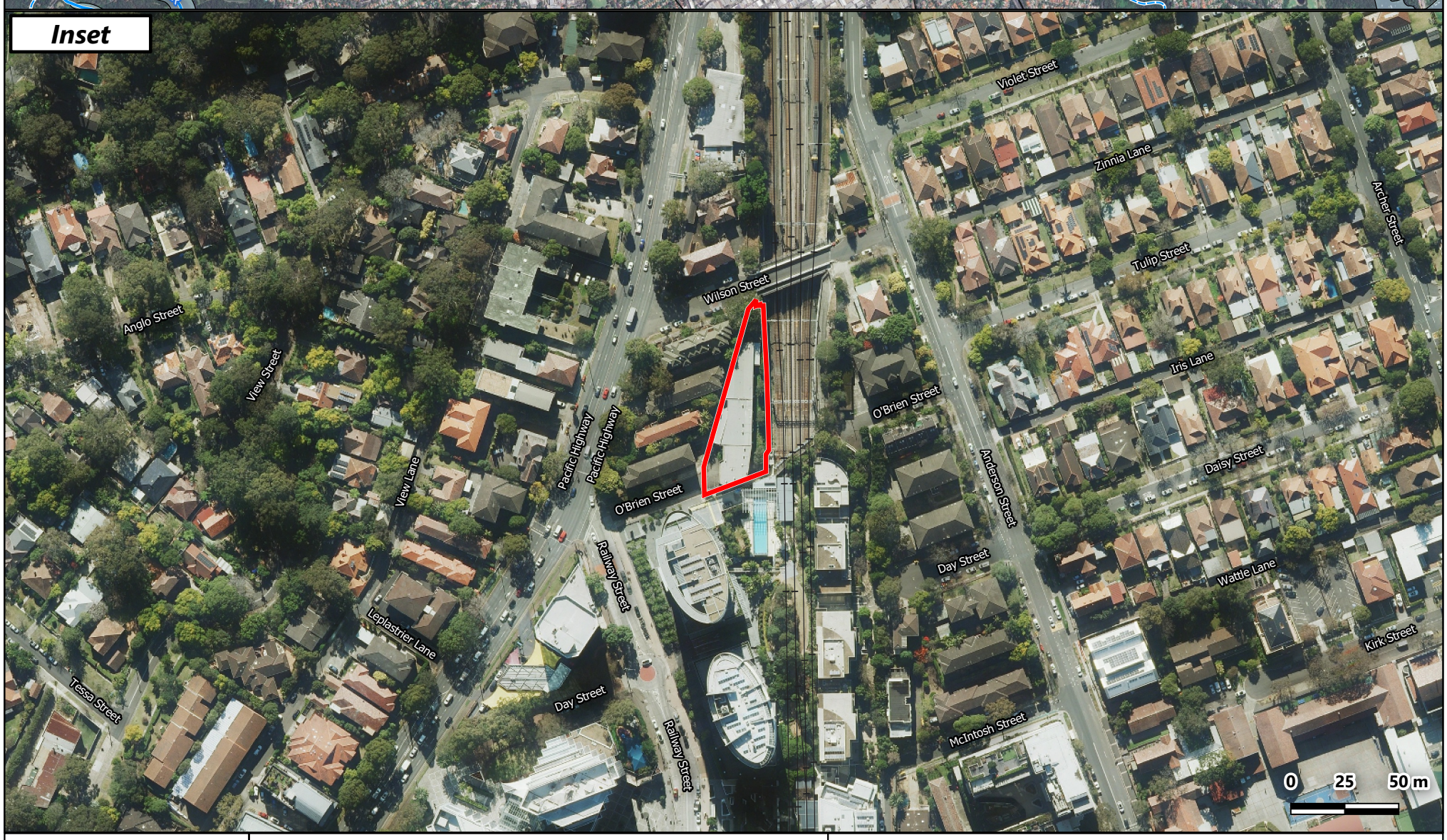
A

Figures

REDITUS



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Date of Export	
28/11/2023	
Author	**Approver**
RK	TP
Data Source	
Metromap, Google Maps, Open Street Map, NSW Government	

Legend

- Site Boudary
- Major Roads
- Railways
- Surface Water

Watercourses

- Rivers
- Stream (Perennial)
- Stream (Non-Perennial)
- Unnamed Stream (Non-Perennial)
- Other Channels

Figure 1 - Site Location

Wilson Street, Chatswood NSW

23210 - Detailed Site Investigation

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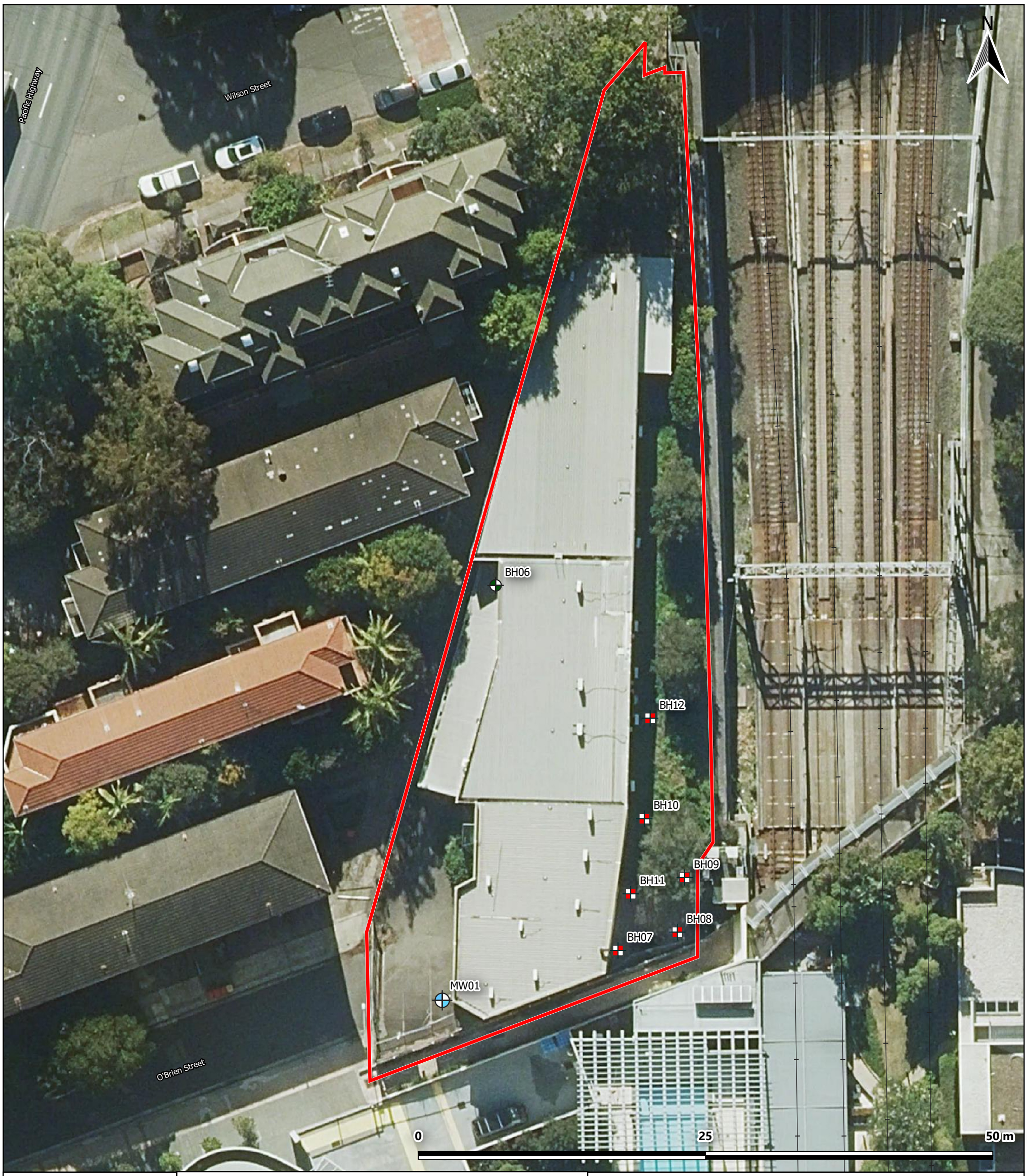

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RK	TP
Data Source	
Metromap, Google Maps, Open Street Map, Geoscience Australia	

Legend

- Site Boundary
- Hand Auger
- Groundwater Monitoring Well
- Testpit

Figure 2 - Sample Locations

8 Wilson Street, Chatswood NSW

23210 - Detailed Site Investigation

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Date of Export	**Map Scale (approx. at A3)**
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Author	**Approver**
RK	TP
Data Source	
Metromap, Google Maps, Open Street Map, Geoscience Australia	

Legend

- Site Boundary
- Groundwater Monitoring Well
- Groundwater Contours (0.5 m)
- Groundwater Flow Direction

Figure 3 - Groundwater Contours

8 Wilson Street, Chatswood NSW

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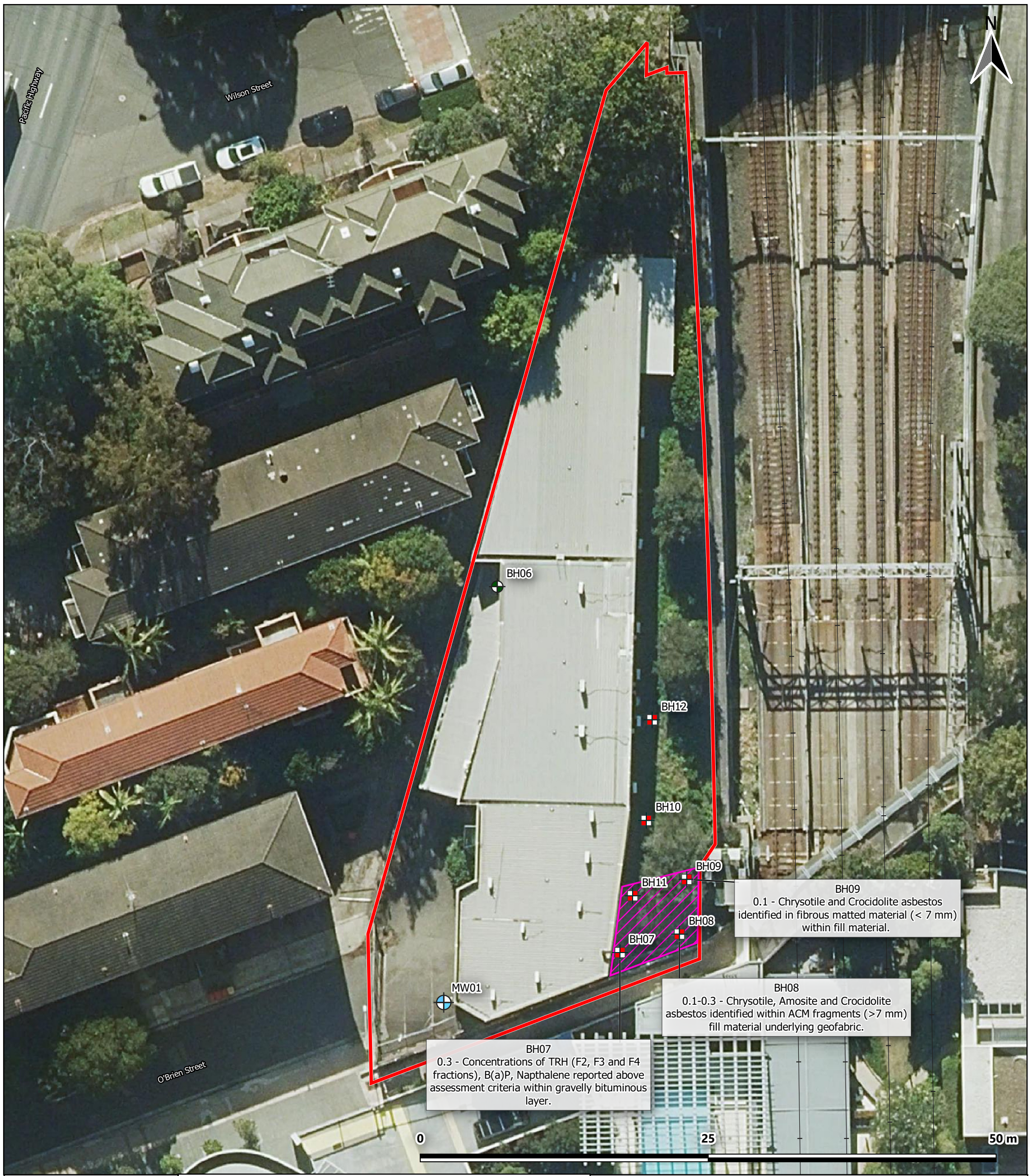

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Author	**Approver**
RK	TP
Data Source	
Metromap, Google Maps, Open Street Map, Geoscience Australia	

Legend

- Site Boundary
- Hand Auger
- Groundwater Monitoring Well
- Testpit
- Aproximate Area with Geofabric Cover

Figure 4 - Exceedances

8 Wilson Street, Chatswood NSW

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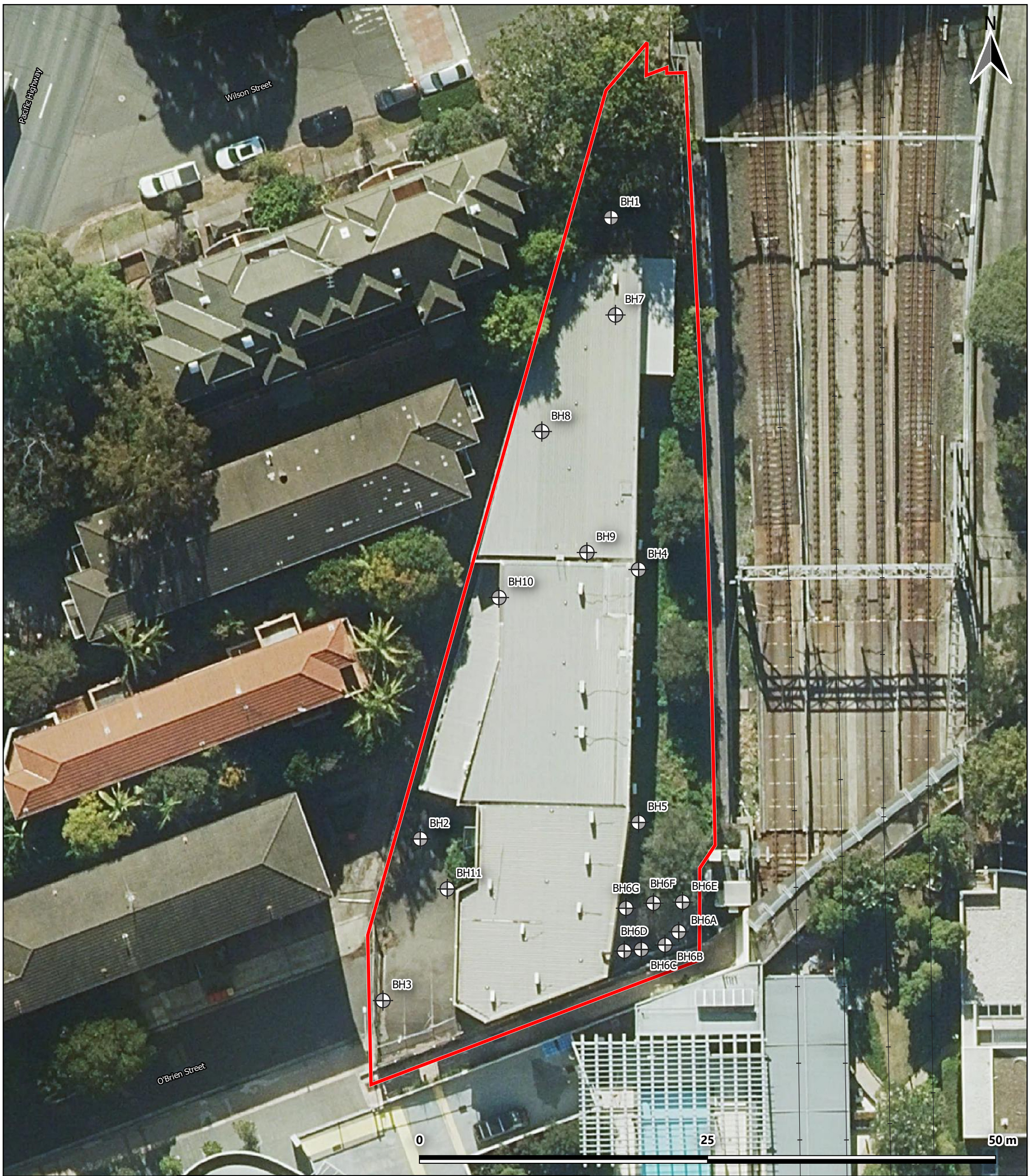

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Date of Export	**Map Scale (approx. at A3)**
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Author	**Approver**
RK	TP
Data Source	
Metromap, Google Maps, Open Street Map, Geoscience Australia	

Legend

- Site Boundary
- Previous WSP Sample Locations

Figure 5 - Previous Sample Locations

8 Wilson Street, Chatswood NSW

23210 - Detailed Site Investigation

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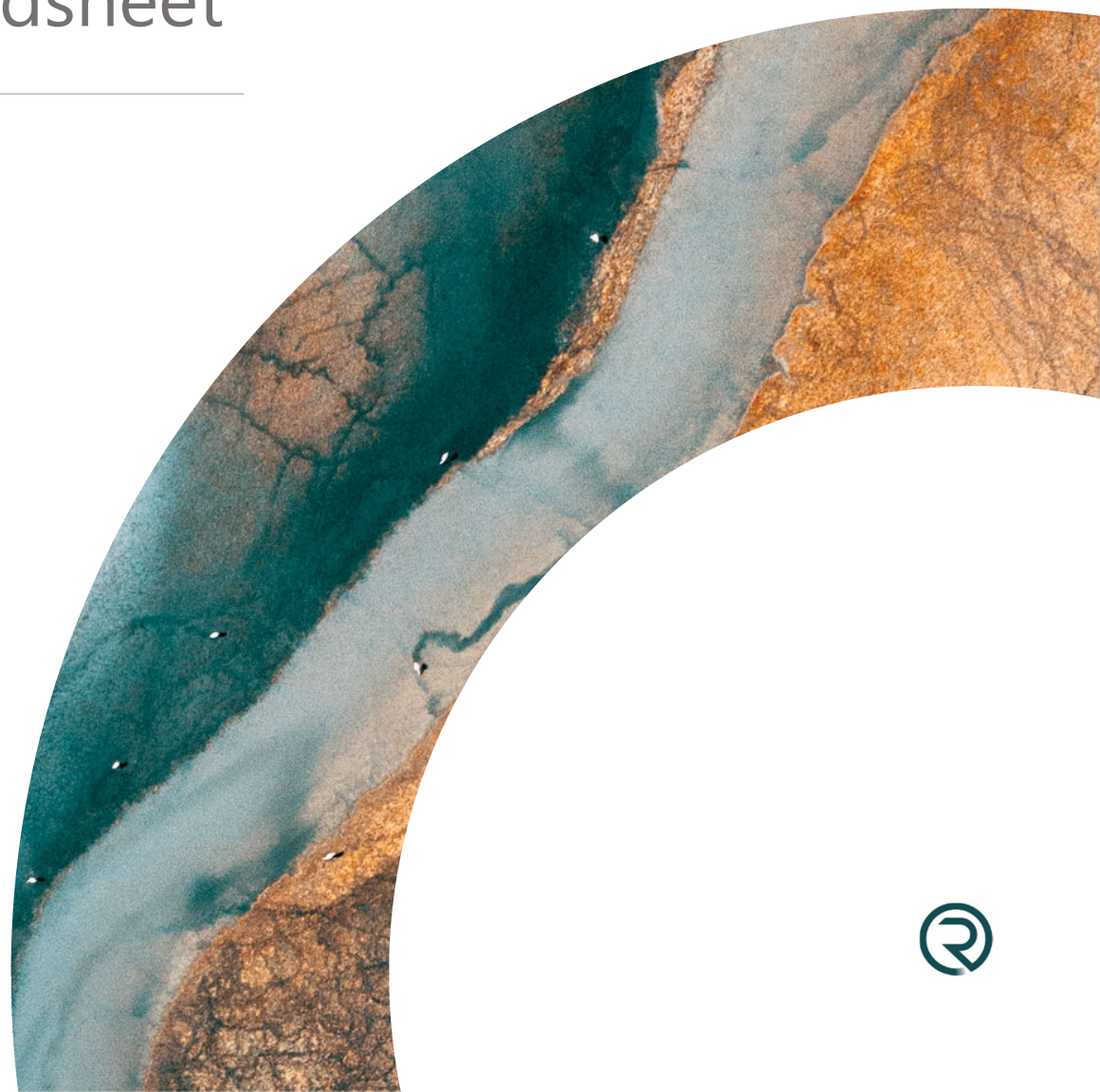
B

EIL Calculation Spreadsheet



Inputs
Select contaminant from list below
As
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	Arsenic generic EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	20	40
Urban residential and open public spaces	50	100
Commercial and industrial	80	160

Inputs
Select contaminant from list below
Cr_III
Below needed to calculate fresh and aged ACLs
Enter % clay (values from 0 to 100%)
27.5
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
high

Outputs		
Land use	Cr III soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	150	190
Urban residential and open public spaces	300	570
Commercial and industrial	450	940

Inputs
Select contaminant from list below
Cu
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
12.5
Enter soil pH (calcium chloride method) (values from 1 to 14)
4.25
Enter organic carbon content (%OC) (values from 0 to 50%)
1.25
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
high

Outputs		
Land use	Cu soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	35	45
Urban residential and open public spaces	45	75
Commercial and industrial	60	100

Inputs
Select contaminant from list below
DDT
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	DDT generic EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	3	3
Urban residential and open public spaces	180	180
Commercial and industrial	640	640

Inputs
Select contaminant from list below
Naphthalene
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	Naphthalene generic EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	10	10
Urban residential and open public spaces	170	170
Commercial and industrial	370	370

Inputs
Select contaminant from list below
Ni
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
12.5
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
high

Outputs		
Land use	Ni soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	35	40
Urban residential and open public spaces	85	200
Commercial and industrial	150	340

Inputs
Select contaminant from list below
Pb
Below needed to calculate fresh and aged ACLs
Below needed to calculate fresh and aged ABCs
or for fresh ABCs only
or for aged ABCs only

Outputs		
Land use	Lead generic EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	110	470
Urban residential and open public spaces	270	1100
Commercial and industrial	440	1800

Inputs
Select contaminant from list below
Zn
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
12.5
Enter soil pH (calcium chloride method) (values from 1 to 14)
4.25
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
high

Outputs		
Land use	Zn soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	45	140
Urban residential and open public spaces	75	220
Commercial and industrial	95	280

C

Analytical Result Summary Table

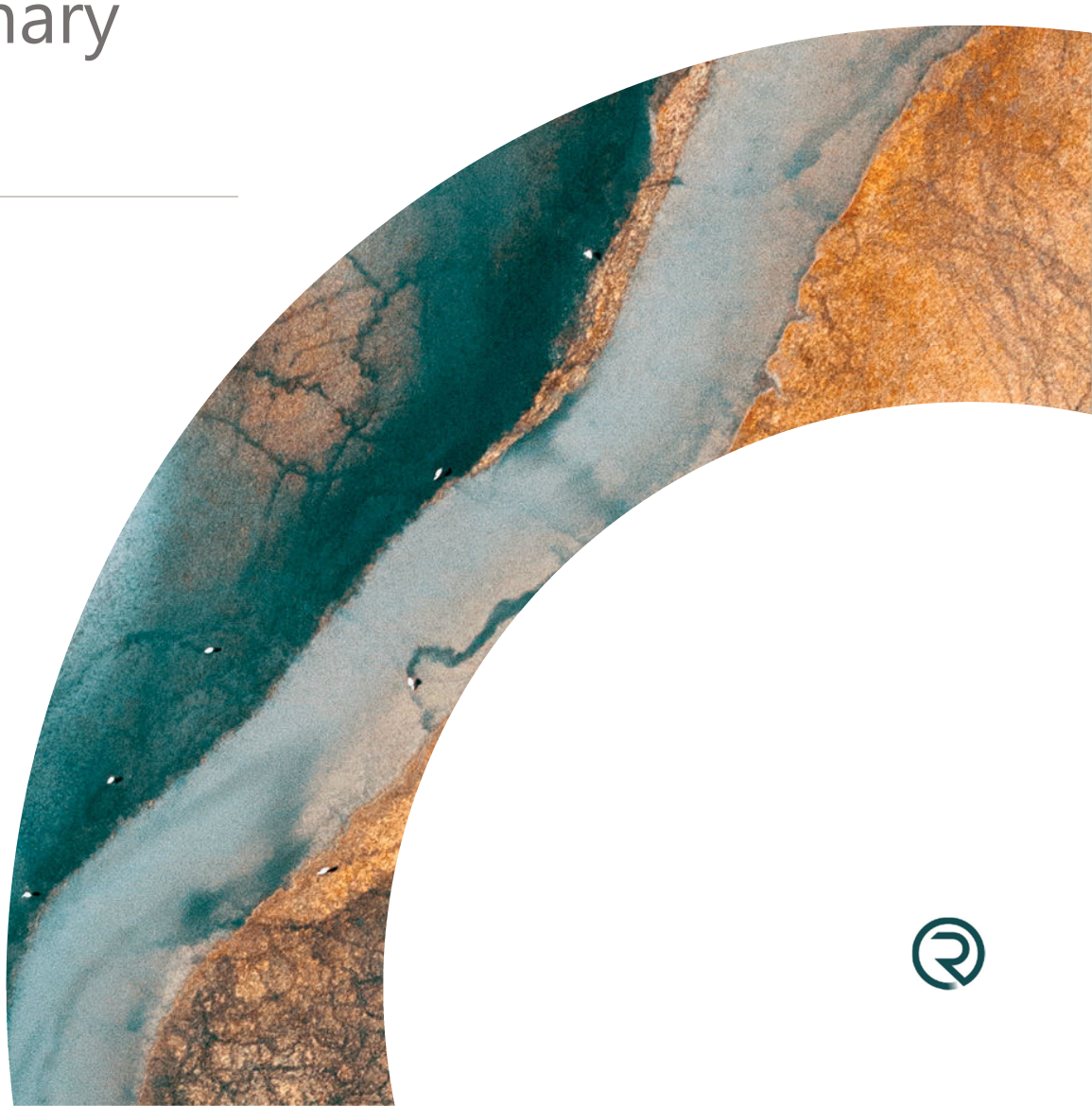


Table 1 - Soil Results Summary

				Asbestos			BTEX								TRH							Metals							
				Asbestos (<2mm AF/FA)	Asbestos Identification - Soil	Asbestos Identification - Material	Naphthalene (BTEX)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
				%w/w	Commenn	Comment	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							1	0.2	0.5	0.5	0.5	0.5	0.5	0.2	10	10	50	50	100	100	50	4	0.4	1	1	1	0.1	1	1
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Fine Soil															800		1,000		3,500	10,000									
NEPM 2013 Table 1A(3)Comm/Ind D Soil HSL for Vapour Intrusion, Clay																													
>=0m, <1m								4								310													
>=1m, <2m								6								480													
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space							170															100		570	75	1,100		200	220
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil																													
>=0m, <2m								50	85	70			105			180	120	120	300	2,800									
NEPM 2013 Table 1A(1) HILs Res B Soil																						500	150		30,000	1,200	120	1,200	60,000
Field ID	**Location Code**	**Depth (m)**	**Date**																										
BH06	**BH06**	**0.15**	**07 Nov 2023**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	<100	<100	<50	<4	<0.4	5	19	5	0.3	8	10
BH06	**BH06**	**0.15 - 0.25**	**07 Nov 2023**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**BH07**	**0.2 - 0.3**	**03 Nov 2023**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**BH07**	**0.3**	**03 Nov 2023**	-	-	-	3	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	640	640	13,000	2,900	16,000	<4	<0.4	6	120	64	<0.1	17	170
BH08	**BH08**	**0.1**	**03 Nov 2023**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	150	<100	150	6	0.9	11	41	250	0.3	6	490
BH08	**BH08**	**0.1 - 0.3**	**03 Nov 2023**	<0.001	AD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08-0.1-0.3_PACM	**BH08**	**0.1 - 0.3**	**03 Nov 2023**	-	-	AD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	**BH09**	**0.1**	**03 Nov 2023**	<0.001	ND	-	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	59	59	510	180	750	11	<0.4	19	81	68	0.1	8	240
BH10	**BH10**	**0.1**	**03 Nov 2023**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	130	<100	130	<4	<0.4	9	19	28	<0.1	4	180
BH10	**BH10**	**0.1 - 0.3**	**03 Nov 2023**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10	**BH10**	**0.4**	**03 Nov 2023**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	<100	<100	<50	19	<0.4	17	12	100	<0.1	3	75
BH11	**BH11**	**0.1**	**03 Nov 2023**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	<100	<100	<50	8	7.3	9	45	34	0.1	6	49
BH11	**BH11**	**0.1 - 0.2**	**03 Nov 2023**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**BH12**	**0.2 - 0.7**	**03 Nov 2023**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**BH12**	**0.4**	**03 Nov 2023**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	<100	<100	<50	13	<0.4	10	27	31	<0.1	4	47
MW01	**MW01**	**0.2 - 1.3**	**02 Nov 2023**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW01	**MW01**	**0.5**	**02 Nov 2023**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	<100	<100	<50	6	<0.4	22	17	25	<0.1	8	13
MW01	**MW01**	**1.4**	**02 Nov 2023**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	<100	<100	<50	11	<0.4	38	4	25	<0.1	6	7
				-																									

AD - Asbestos Detected

Table 1 - Soil Results Summary

REDITUS

				PAH																			SVOCs	
				Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ calc (Half)	Benzo(a)pyrene TEQ (LOR)	PAHs (Sum of positives)	Fenamiphos	Phosalone
				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	0.1	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.05	0.05	0.1
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Fine Soil																								
NEPM 2013 Table 1A(3)Comm/Ind D Soil HSL for Vapour Intrusion, Clay																								
>=0m, <1m																								
>=1m, <2m																								
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space																170								
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil																								
>=0m, <2m									0.7															
NEPM 2013 Table 1A(1) HILs Res B Soil																			4	4				
Field ID	**Location Code**	**Depth (m)**	**Date**																					
BH06	**BH06**	**0.15**	**07 Nov 2023**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.05	<0.1	<0.1
BH06	**BH06**	**0.15 - 0.25**	**07 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**BH07**	**0.2 - 0.3**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**BH07**	**0.3**	**03 Nov 2023**	110	12	13	61	83	85	35	81	11	220	14	29	3.1	240	200	120	120	1,200	<1	<1
BH08	**BH08**	**0.1**	**03 Nov 2023**	0.4	<0.1	<0.1	<0.1	0.2	0.3	0.2	0.2	<0.1	0.4	<0.1	0.1	<0.1	0.1	0.4	<0.5	<0.5	2.4	<0.1	<0.1
BH08	**BH08**	**0.1 - 0.3**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08-0.1-0.3_PACM	**BH08**	**0.1 - 0.3**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	**BH09**	**0.1**	**03 Nov 2023**	3.3	0.4	0.3	1.4	2.4	2.4	1.4	2.3	0.3	6.4	0.6	1.1	0.1	6.2	5.4	3.4	3.4	34	<0.1	<0.1
BH10	**BH10**	**0.1**	**03 Nov 2023**	<0.2	<0.1	<0.1	<0.1	<0.1	0.05	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.5	<0.5	0.3	<0.1	<0.1
BH10	**BH10**	**0.1 - 0.3**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10	**BH10**	**0.4**	**03 Nov 2023**	<0.2	<0.1	<0.1	<0.1	<0.1	0.07	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.1	<0.5	<0.5	0.4	-	-
BH11	**BH11**	**0.1**	**03 Nov 2023**	<0.2	<0.1	<0.1	<0.1	<0.1	0.09	<0.1	0.1	<0.1	0.3	<0.1	<0.1	<0.1	0.2	0.3	<0.5	<0.5	1	<0.1	<0.1
BH11	**BH11**	**0.1 - 0.2**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**BH12**	**0.2 - 0.7**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**BH12**	**0.4**	**03 Nov 2023**	<0.2	<0.1	<0.1	<0.1	<0.1	0.06	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.5	<0.5	0.3	<0.1	<0.1
MW01	**MW01**	**0.2 - 1.3**	**02 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW01	**MW01**	**0.5**	**02 Nov 2023**	0.6	<0.1	0.1	0.4	0.3	0.4	0.2	0.4	<0.1	0.8	<0.1	0.2	<0.1	0.4	0.8	0.6	0.6	4.7	<0.1	<0.1
MW01	**MW01**	**1.4**	**02 Nov 2023**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	0.1	-	-

AD - Asbestos Detected

Table 1 - Soil Results Summary

REDITUS

				Organochlorine Pesticides																				
				4,4-DDE	a-BHC	Aldrin	Dieldrin	b-BHC	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	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
EQL				0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Fine Soil																								
NEPM 2013 Table 1A(3)Comm/Ind D Soil HSL for Vapour Intrusion, Clay																								
>=0m, <1m																								
>=1m, <2m																								
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space													180											
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil																								
>=0m, <2m																								
NEPM 2013 Table 1A(1) HILs Res B Soil														600				20			10		15	500
Field ID	**Location Code**	**Depth (m)**	**Date**																					
BH06	**BH06**	**0.15**	**07 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH06	**BH06**	**0.15 - 0.25**	**07 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**BH07**	**0.2 - 0.3**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**BH07**	**0.3**	**03 Nov 2023**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH08	**BH08**	**0.1**	**03 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH08	**BH08**	**0.1 - 0.3**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08-0.1-0.3_PACM	**BH08**	**0.1 - 0.3**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	**BH09**	**0.1**	**03 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH10	**BH10**	**0.1**	**03 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH10	**BH10**	**0.1 - 0.3**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10	**BH10**	**0.4**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH11	**BH11**	**0.1**	**03 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH11	**BH11**	**0.1 - 0.2**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**BH12**	**0.2 - 0.7**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**BH12**	**0.4**	**03 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW01	**MW01**	**0.2 - 1.3**	**02 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW01	**MW01**	**0.5**	**02 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW01	**MW01**	**1.4**	**02 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

AD - Asbestos Detected

Table 1 - Soil Results Summary

				Organophosphorous Pesticides																			Pesticides
				Azinophos methyl	Bromophos-ethyl	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Diazinon	Dichlorvos	Dimethoate	Disulfoton	Ethion	Fenitrothion	Fenthion	Malathion	Methidathion	Methyl parathion	Mevinphos (Phosdrin)	Parathion	Phorate	Ronnel	Mirex
				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	0.1	0.05	0.05	0.05	0.1	0.05	0.1	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Fine Soil																							
NEPM 2013 Table 1A(3)Comm/Ind D Soil HSL for Vapour Intrusion, Clay																							
>=0m, <1m																							
>=1m, <2m																							
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space																							
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil																							
>=0m, <2m																							
NEPM 2013 Table 1A(1) HILs Res B Soil						340																	20
Field ID	**Location Code**	**Depth (m)**	**Date**																				
BH06	**BH06**	**0.15**	**07 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH06	**BH06**	**0.15 - 0.25**	**07 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**BH07**	**0.2 - 0.3**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**BH07**	**0.3**	**03 Nov 2023**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH08	**BH08**	**0.1**	**03 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH08	**BH08**	**0.1 - 0.3**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08-0.1-0.3_PACM	**BH08**	**0.1 - 0.3**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	**BH09**	**0.1**	**03 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH10	**BH10**	**0.1**	**03 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH10	**BH10**	**0.1 - 0.3**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10	**BH10**	**0.4**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH11	**BH11**	**0.1**	**03 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH11	**BH11**	**0.1 - 0.2**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**BH12**	**0.2 - 0.7**	**03 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**BH12**	**0.4**	**03 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW01	**MW01**	**0.2 - 1.3**	**02 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW01	**MW01**	**0.5**	**02 Nov 2023**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW01	**MW01**	**1.4**	**02 Nov 2023**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

AD - Asbestos Detected

Table 2 - Preliminary Waste Classification

			Asbestos			BTEX							TRH						TPH				
			Asbestos (<2mm AF/FA)	Asbestos Identification - Soil	Asbestos Identification - Material	Naphthalene (BTEX)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)
			%w/w	Commenn	Comment	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL						1	0.2	0.5	0.5	0.5	0.5	0.5	10	50	50	100	100	50	10	50	100	100	50
NSW 2014 General Solid Waste CT1 (No Leaching)							10	288	600			1,000							650				10,000
NSW 2014 Restricted Solid Waste CT2 (No Leaching)							40	1,152	2,400			4,000							2,600				40,000
Field ID	**Date**	**Depth (m)**																					
BH06	**07 Nov 2023**	**0.15**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH06	**07 Nov 2023**	**0.15 - 0.25**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**03 Nov 2023**	**0.2 - 0.3**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**03 Nov 2023**	**0.3**	-	-	-	3	<0.2	<0.5	<1	<2	<1	<1	<25	640	640	13,000	2,900	16,000	<25	210	8,500	4,700	13,000
BH08	**03 Nov 2023**	**0.1**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	150	<100	150	<25	<50	<100	<100	<50
BH08	**03 Nov 2023**	**0.1 - 0.3**	<0.001	AD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08-0.1-0.3_PACM	**03 Nov 2023**	**0.1 - 0.3**	-	-	AD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	**03 Nov 2023**	**0.1**	<0.001	ND	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	59	59	510	180	750	<25	<50	320	230	550
BH10	**03 Nov 2023**	**0.1**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	130	<100	130	<25	<50	<100	<100	<50
BH10	**03 Nov 2023**	**0.1 - 0.3**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10	**03 Nov 2023**	**0.4**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH11	**03 Nov 2023**	**0.1**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
BH11	**03 Nov 2023**	**0.1 - 0.2**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**03 Nov 2023**	**0.2 - 0.7**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**03 Nov 2023**	**0.4**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50
MW03	**02 Nov 2023**	**0.1**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	170	<100	170	<25	<50	120	<100	120
MW03	**02 Nov 2023**	**0.1 - 0.6**	<0.001	ND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW03	**02 Nov 2023**	**0.7**	-	-	-	<1	<0.2	<0.5	<1	<2	<1	<1	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50

AD - Asbestos Detected

Table 2 - Preliminary Waste Classification

REDITUS

				PAH																		Metals							
			Asbestos (<2mm AF/FA)	Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ calc (Half)	Benzo(a)pyrene TEQ (LOR)	PAHs (Sum of positives)	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
			%w/w	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	0.1	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.05	4	0.4	1	1	1	0.1	1	1
NSW 2014 General Solid Waste CT1 (No Leaching)									0.8													100	20			100	4	40	
NSW 2014 Restricted Solid Waste CT2 (No Leaching)									3.2													400	80			400	16	160	
Field ID	**Date**	**Depth (m)**																											
BH06	**07 Nov 2023**	**0.15**	-	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.05	<4	<0.4	5	19	5	0.3	8	10
BH06	**07 Nov 2023**	**0.15 - 0.25**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**03 Nov 2023**	**0.2 - 0.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**03 Nov 2023**	**0.3**	-	110	12	13	61	83	85	35	81	11	220	14	29	3.1	240	200	120	120	1,200	<4	<0.4	6	120	64	<0.1	17	170
BH08	**03 Nov 2023**	**0.1**	-	0.4	<0.1	<0.1	<0.1	0.2	0.3	0.2	0.2	<0.1	0.4	<0.1	0.1	<0.1	0.1	0.4	<0.5	<0.5	2.4	6	0.9	11	41	250	0.3	6	490
BH08	**03 Nov 2023**	**0.1 - 0.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08-0.1-0.3_PACM	**03 Nov 2023**	**0.1 - 0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	**03 Nov 2023**	**0.1**	<0.001	3.3	0.4	0.3	1.4	2.4	2.4	1.4	2.3	0.3	6.4	0.6	1.1	0.1	6.2	5.4	3.4	3.4	34	11	<0.4	19	81	68	0.1	8	240
BH10	**03 Nov 2023**	**0.1**	-	<0.2	<0.1	<0.1	<0.1	<0.1	0.05	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.5	<0.5	0.3	<4	<0.4	9	19	28	<0.1	4	180
BH10	**03 Nov 2023**	**0.1 - 0.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10	**03 Nov 2023**	**0.4**	-	<0.2	<0.1	<0.1	<0.1	<0.1	0.07	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.1	<0.5	<0.5	0.4	19	<0.4	17	12	100	<0.1	3	75
BH11	**03 Nov 2023**	**0.1**	-	<0.2	<0.1	<0.1	<0.1	<0.1	0.09	<0.1	0.1	<0.1	0.3	<0.1	<0.1	<0.1	0.2	0.3	<0.5	<0.5	1	8	7.3	9	45	34	0.1	6	49
BH11	**03 Nov 2023**	**0.1 - 0.2**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**03 Nov 2023**	**0.2 - 0.7**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**03 Nov 2023**	**0.4**	-	<0.2	<0.1	<0.1	<0.1	<0.1	0.06	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.5	<0.5	0.3	13	<0.4	10	27	31	<0.1	4	47
MW03	**02 Nov 2023**	**0.1**	-	0.5	<0.1	0.1	0.1	0.3	0.3	0.2	0.3	<0.1	0.7	<0.1	0.2	<0.1	0.4	0.6	<0.5	0.5	3.7	7	<0.4	29	18	64	<0.1	4	130
MW03	**02 Nov 2023**	**0.1 - 0.6**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW03	**02 Nov 2023**	**0.7**	-	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.05	5	<0.4	25	<1	22	<0.1	2	10

AD - Asbestos Detected

Table 2 - Preliminary Waste Classification

				SVOCs		Organochlorine Pesticides																				
			Asbestos (<2mm AF/FA)	Fenamiphos	Phosalone	4,4-DDE	a-BHC	Aldrin	Dieldrin	b-BHC	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor
			%w/w	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	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1
NSW 2014 General Solid Waste CT1 (No Leaching)																										
NSW 2014 Restricted Solid Waste CT2 (No Leaching)																										
Field ID	**Date**	**Depth (m)**																								
BH06	**07 Nov 2023**	**0.15**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH06	**07 Nov 2023**	**0.15 - 0.25**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**03 Nov 2023**	**0.2 - 0.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**03 Nov 2023**	**0.3**	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH08	**03 Nov 2023**	**0.1**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH08	**03 Nov 2023**	**0.1 - 0.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08-0.1-0.3_PACM	**03 Nov 2023**	**0.1 - 0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	**03 Nov 2023**	**0.1**	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH10	**03 Nov 2023**	**0.1**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH10	**03 Nov 2023**	**0.1 - 0.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10	**03 Nov 2023**	**0.4**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH11	**03 Nov 2023**	**0.1**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH11	**03 Nov 2023**	**0.1 - 0.2**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**03 Nov 2023**	**0.2 - 0.7**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**03 Nov 2023**	**0.4**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW03	**02 Nov 2023**	**0.1**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW03	**02 Nov 2023**	**0.1 - 0.6**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW03	**02 Nov 2023**	**0.7**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

AD - Asbestos Detected

Table 2 - Preliminary Waste Classification

				Organophosphorous Pesticides																			
			Asbestos (<2mm AF/FA)	Azinophos methyl	Bromophos-ethyl	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Diazinon	Dichlorvos	Dimethoate	Disulfoton	Ethion	Fenitrothion	Fenthion	Malathion	Methidathion	Methyl parathion	Mevinphos (Phosdrin)	Parathion	Phorate	Ronnel	Mirex
			%w/w	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	0.1	0.05	0.05	0.05	0.1	0.05	0.1	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NSW 2014 General Solid Waste CT1 (No Leaching)						4																	
NSW 2014 Restricted Solid Waste CT2 (No Leaching)						16																	
Field ID	**Date**	**Depth (m)**																					
BH06	**07 Nov 2023**	**0.15**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH06	**07 Nov 2023**	**0.15 - 0.25**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**03 Nov 2023**	**0.2 - 0.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	**03 Nov 2023**	**0.3**	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH08	**03 Nov 2023**	**0.1**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH08	**03 Nov 2023**	**0.1 - 0.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08-0.1-0.3_PACM	**03 Nov 2023**	**0.1 - 0.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	**03 Nov 2023**	**0.1**	<0.001	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH10	**03 Nov 2023**	**0.1**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH10	**03 Nov 2023**	**0.1 - 0.3**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10	**03 Nov 2023**	**0.4**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH11	**03 Nov 2023**	**0.1**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH11	**03 Nov 2023**	**0.1 - 0.2**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**03 Nov 2023**	**0.2 - 0.7**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12	**03 Nov 2023**	**0.4**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW03	**02 Nov 2023**	**0.1**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW03	**02 Nov 2023**	**0.1 - 0.6**	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW03	**02 Nov 2023**	**0.7**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

AD - Asbestos Detected

Table 3 - Groundwater Results Summary

REDITUS

			BTEX								TRH							Metals										
			Naphthalene (BTEX)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	Arsenic (filtered)	Cadmium (filtered)	Calcium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Lead (filtered)	Magnesium (filtered)	Mercury (filtered)	Nickel (filtered)	Potassium (filtered)	Zinc (filtered)
			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
EQL			1	1	1	1	2	1	2	1	10	10	50	50	100	100	50	1	0.1	500	1	1	1	500	0.05	1	500	1
ANZG Freshwater Toxicant DGVs LOSP 95% (July 2023)			16	950	180	80		350										24	0.2		1	1.4	3.4		0.6	11		8
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Clay																												
>=2m, <4m				30,000																								
>=4m, <8m				30,000																								
>=8m				35,000																								
Field ID	**Location Code**	**Date**																										
MW01	**MW01**	**10 Nov 2023**	<1	<1	<1	<1	<2	<1	-	-	<10	<10	<50	<50	<100	<100	<50	3	0.2	2,000	<1	6	<1	1,000	<0.05	14	3,000	44

Table 3 - Groundwater Results Summary

REDITUS

			PAH																				
			Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ	Benzo(a)pyrene TEQ calc (Zero)	PAHs (Sum of total)	PAHs (Sum of positives)
			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
EQL			0.2	0.1	0.1	0.1	0.1	0.1	1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.5	0.1
ANZG Freshwater Toxicant DGVs LOSP 95% (July 2023)						0.4		0.2						1.4			16	2					
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Clay																							
>=2m, <4m																							
>=4m, <8m																							
>=8m																							
Field ID	**Location Code**	**Date**																					
MW01	**MW01**	**10 Nov 2023**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	-	<0.1

Table 3 - Groundwater Results Summary

REDITUS

			Inorganics															Biological
			Hardness (filtered)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N (filtered)	Chloride	Ionic Balance	Nitrate (as N) (filtered)	Nitrogen (Total Oxidised)	Nitrogen (Total)	Total Phosphorus (Organic Phosphate)	Reactive Phosphorus as P (Orthophosphate as P) (filtered)	Sodium (filtered)	Sulphate	E. Coli
			ngCaCO3/	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	%	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	cfu/100 ml
EQL			3	5,000	5,000	5,000	5,000	5	1,000		5	5	100	50	5	500	1,000	1
ANZG Freshwater Toxicant DGVs LOSP 95% (July 2023)								900										
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Clay																		
>=2m, <4m																		
>=4m, <8m																		
>=8m																		
Field ID	**Location Code**	**Date**																
MW01	**MW01**	**10 Nov 2023**	9.6	10,000	<5,000	<5,000	10,000	18	45,000	-1	10	10	<100	200	30	73,000	98,000	<18

Table 4 - Soil RPD Summary

REDITUS

					BTEX								TRH						TPH				
					Naphthalene (BTEX)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	Benzo(b+j+k)fluoranthene
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					1	0.2	0.5	0.5	0.5	0.5	0.5	0.2	10	10	50	50	100	100	10	50	100	100	0.2
Field ID	**Depth**	**Date**	**Lab Report Number**	**Matrix Type**																			
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	**150**	<100	<25	<50	<100	<100	**0.4**
DUP02		**03 Nov 2023**	**336965**	**Soil**	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	**160**	<100	<25	<50	<100	<100	**0.3**
RPD					0	0	0	0	0	0	0	-	0	0	0	0	6	0	0	0	0	0	29
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	<1	<0.2	<0.5	<1	<2	<1	<1	-	<25	<25	<50	<50	**150**	<100	<25	<50	<100	<100	**0.4**
TRIP02		**03 Nov 2023**	**ES2338272**	**Soil**	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<10	<50	<50	<100	<100	<10	<50	<100	<100	-
RPD					0	0	0	0	0	0	0	-	0	0	0	0	40	0	0	0	0	0	-

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 100 (0 - 5 x EQL); 75 (5 - 10 x EQL); 30 (> 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**

Table 4 - Soil RPD Summary

REDITUS

					PAH																	
					Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ calc (Half)	Benzo(a)pyrene TEQ (LOR)	PAHs (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
EQL					0.1	0.1	0.1	0.1	0.05	0.5	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.5
Field ID	**Depth**	**Date**	**Lab Report Number**	**Matrix Type**																			
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	<0.1	<0.1	<0.1	**0.2**	**0.3**	-	**0.2**	-	**0.2**	<0.1	**0.4**	<0.1	**0.1**	<0.1	**0.1**	**0.4**	<0.5	<0.5	-
DUP02		**03 Nov 2023**	**336965**	**Soil**	<0.1	<0.1	<0.1	**0.2**	**0.2**	-	**0.2**	-	**0.2**	<0.1	**0.3**	<0.1	**0.1**	<0.1	**0.1**	**0.3**	<0.5	<0.5	-
RPD					0	0	0	0	40	-	0	-	0	0	29	0	0	0	0	29	0	0	-
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	<0.1	<0.1	<0.1	**0.2**	**0.3**	-	**0.2**	-	**0.2**	<0.1	**0.4**	<0.1	**0.1**	<0.1	**0.1**	**0.4**	<0.5	<0.5	-
TRIP02		**03 Nov 2023**	**ES2338272**	**Soil**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	<0.5	<0.5	<0.5	<0.5	**0.6**	**0.6**	**1.2**	**1.2**
RPD					0	0	0	0	0	-	0	-	0	0	40	0	0	0	0	40	18	82	-

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 100 (0 - 5 x EQL); 75**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header**

Table 4 - Soil RPD Summary

REDITUS

					Metals								SVOCs										
					Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Fenamiphos	Phosalone	4,4-DDE	a-BHC	Aldrin	Dieldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					4	0.4	1	1	1	0.1	1	1	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Field ID	**Depth**	**Date**	**Lab Report Number**	**Matrix Type**																			
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	**6**	**0.9**	**11**	**41**	**250**	**0.3**	**6**	**490**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1
DUP02		**03 Nov 2023**	**336965**	**Soil**	**5**	**0.9**	**13**	**38**	**280**	**0.3**	**6**	**490**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1
RPD					18	0	17	8	11	0	0	0	0	0	0	0	0	0	-	0	-	0	0
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	**6**	**0.9**	**11**	**41**	**250**	**0.3**	**6**	**490**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1
TRIP02		**03 Nov 2023**	**ES2338272**	**Soil**	**5**	<1	**12**	**43**	**289**	**0.2**	**5**	**494**	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
RPD					18	0	9	5	14	40	18	1	0	-	0	0	0	0	-	0	-	0	0

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 100 (0 - 5 x EQL); 75**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header**

Table 4 - Soil RPD Summary

REDITUS

					Organochlorine Pesticides																		
					d-BHC	DDD	DDT	DDT+DDE+DDD	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	Azinophos methyl	Bromophos-ethyl	Carbophenothion
					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	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05
Field ID	**Depth**	**Date**	**Lab Report Number**	**Matrix Type**																			
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
DUP02		**03 Nov 2023**	**336965**	**Soil**	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
RPD					0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	0	0	-
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
TRIP02		**03 Nov 2023**	**ES2338272**	**Soil**	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05
RPD					0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	0	0	-

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 100 (0 - 5 x EQL); 75**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header**

Table 4 - Soil RPD Summary

REDITUS

					Organophosphorous Pesticides																		
					Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Diazinon	Dichlorvos	Dimethoate	Disulfoton	Ethion	Fenitrothion	Fenthion	Malathion	Methidathion	Methyl parathion	Mevinphos (Phosdrin)	Monocrotophos	Parathion	Phorate	Prothiofos
					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	0.1	0.05	0.05	0.05	0.1	0.05	0.1	0.05	0.05	0.1	0.1	0.1	0.2	0.1	0.1	0.05
Field ID	**Depth**	**Date**	**Lab Report Number**	**Matrix Type**																			
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-
DUP02		**03 Nov 2023**	**336965**	**Soil**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-
RPD					-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	-
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-
TRIP02		**03 Nov 2023**	**ES2338272**	**Soil**	<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
RPD					-	0	0	-	0	0	0	-	0	-	0	0	-	0	-	-	0	-	-

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 100 (0 - 5 x EQL); 75**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header**

Table 4 - Soil RPD Summary

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						Pesticides		
					Ronnel	Demeton-S-methyl	Mirex	Pirimphos-ethyl
					mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.1	0.05	0.1	0.05
Field ID	**Depth**	**Date**	**Lab Report Number**	**Matrix Type**				
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	<0.1	-	<0.1	-
DUP02		**03 Nov 2023**	**336965**	**Soil**	<0.1	-	<0.1	-
RPD					0	-	0	-
BH08	**0.1**	**03 Nov 2023**	**336965**	**Soil**	<0.1	-	<0.1	-
TRIP02		**03 Nov 2023**	**ES2338272**	**Soil**	-	<0.05	-	<0.05
RPD					-	-	-	-

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 100 (0 - 5 x EQL); 75**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header**

Table 5 - Rinsate Summary

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				BTEX						TRH							TPH					Metals							
				Naphthalene (BTEX)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)	Arsenic (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Lead (filtered)	Mercury (filtered)	Nickel (filtered)	Zinc (filtered)
				ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
EQL				1	1	1	1	2	1	10	10	50	50	100	100	50	10	50	100	100	50	1	0.1	1	1	1	0.05	1	1
Field ID	**Depth**	**Date**	**Lab Report Number**																										
RB01		**10 Nov 2023**	**337552**	<1	<1	<1	<1	<2	<1	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<1	<0.1	<1	<1	<1	<0.05	<1	**2**

Table 5 - Rinsate Summary

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				PAH																
				Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ	PAHs (Sum of positives)
				ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
EQL				0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.1
Field ID	**Depth**	**Date**	**Lab Report Number**																	
RB01		**10 Nov 2023**	**337552**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1

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Borelogs

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Environmental Log - Borehole

BH06

Easting	: 331053.67	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6257286.63	Logged By	: Ross Kingswell	Client	:
Total Depth	: 0.8 m	Date	: 07/11/2023	Project	: Detailed Site Investigation

Depth (m)	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
0.15					Non-Soil	Concrete	
0.25	0.15	0.15-0.25		M-D	Fill	Fill Silty to sandy GRAVEL angular to sub-angular (GM) : loose, dark grey, fine to medium sized, fine to medium grained sand, moist to dry.	
0.3		0.25-0.6			Fill	Fill Clayey SAND (SC) : low plasticity clay, loose to medium dense, brown, fine to medium grained, trace fine to medium sized gravel, moist to dry.	
0.45					Fill	Fill Gravelly SAND (SW) : loose to medium dense, yellow, fine to coarse grained, fine to medium sized gravel, moist to dry, crushed sandstone.	crushed sandstone
0.6	0.5				Fill	Fill Silty CLAY (CL) : low plasticity, firm to stiff, brown, moist to dry, traces of ash.	traces of ash
				M	Natural	Natural Silty CLAY (CL-CI) : stiff, low to medium plasticity, orange brown, moist.	
1	0.8					**BH06 refusal at 0.8m**	

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Environmental Log - Borehole

BH07

Easting	: 331567.49	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6259266.40	Logged By	: Ross Kingswell	Client	:
Total Depth	: 0.3 m	Date	: 03/11/2023	Project	: Detailed Site Investigation

Depth (m)	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
0.1					Non-Soil	Bark Mulch	
0.2	0.1	0.1-0.2		M-D	Fill	Fill Clayey SAND (SC) : low plasticity clay, loose, brown, fine to medium grained, with fine to medium sized gravel, moist to dry, trace concrete and rusted metal.	trace concrete and rusted metal
		0.2-0.3			Fill	Fill Silty to sandy GRAVEL angular to sub-angular (GM) : dense, dark grey, fine to coarse sized, fine to medium grained sand, moist to dry, slight bituminous odour.	slight bituminous odour
1	0.3					**BH07 Terminated at 0.3m**	

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Environmental Log - Borehole

BH08

Easting	: 331566.67	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6259277.48	Logged By	: Ross Kingswell	Client	:
Total Depth	: 0.3 m	Date	: 03/11/2023	Project	: Detailed Site Investigation

Depth (m)	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
0.1					Non-Soil	Bark Mulch	
	0.1	0.1-0.3		M-D	Fill	Fill Silty SAND (SM) : loose, brown, fine to medium grained, trace medium to coarse sized gravel, trace low plasticity clay, moist to dry, with bricks, trace concrete, fibre cement, plastic.	with bricks, trace concrete, fibre cement, plastic
1						**BH08 refusal at 0.3m**	

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Environmental Log - Borehole

BH09

Easting	: 331570.24	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6259285.13	Logged By	: Ross Kingswell	Client	:
Total Depth	: 0.2 m	Date	: 03/11/2023	Project	: Detailed Site Investigation

Depth (m)	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
0.1					Non-Soil	Bark Mulch	
	0.1	0.1		D	Fill	Fill Silty CLAY (CL) : low plasticity, loose, stiff to very stiff, brown, trace fine to medium sized gravel, trace fine to medium grained sand, dry, trace plastic and concrete, metal object running through centre.	trace plastic and concrete, metal object running through centre
1						**BH09 refusal at 0.2m**	

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Environmental Log - Borehole

BH10

Easting	: 331572.01	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6259281.28	Logged By	: Ross Kingswell	Client	:
Total Depth	: 0.5 m	Date	: 03/11/2023	Project	: Detailed Site Investigation

Depth (m)	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
				M-D	Fill	Fill Gravelly CLAY (CL) : low plasticity, stiff, brown, fine to coarse sized gravel, trace fine to medium grained sand, moist to dry, reworked natural, shale gravels, metal bolt, grass cover.	reworked Natural, shale gravels, metal bolt, grass cover
	0.1	0.1-0.3					
0.3					Natural	Natural Silty CLAY (CL-CI) : firm, low to medium plasticity, red brown, moist to dry.	
	0.4						
1						**BH10 refusal at 0.5m**	

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Environmental Log - Borehole

BH11

Easting	: 331562.08	**Location**	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	**Job Number**	: 23210
Northing	: 6259284.24	**Logged By**	: Ross Kingswell	**Client**	:
Total Depth	: 0.4 m	**Date**	: 03/11/2023	**Project**	: Detailed Site Investigation

Depth (m)	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
0.1					Non-Soil	Bark Mulch	
0.2	0.1	0.1-0.2		M-D	Fill	Fill Gravelly CLAY (CL) : low plasticity, stiff, brown, fine to coarse sized gravel, trace fine to medium grained sand, moist to dry, reworked natural, shale gravels.	reworked Natural, shale gravels
		0.2-0.4			Fill	Fill Sandy to gravelly CLAY (CL) : low plasticity, stiff to very stiff, grey, fine to coarse sized gravel, fine to medium grained sand, moist to dry, reworked natural.	reworked natural
1	0.4					**BH11 refusal at 0.4m**	

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Environmental Log - Borehole

BH12

Easting	: 331560.05	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6259294.38	Logged By	: Ross Kingswell	Client	:
Total Depth	: 0.7 m	Date	: 03/11/2023	Project	: Detailed Site Investigation

Depth (m)	Samples: Discrete	Samples: NEPM Asbestos	Graphic Log	Moisture	Soil Origin	Material Description	Comments
				M-D	Fill	Fill Silty SAND (SM) : loose, dark grey, fine to medium grained, trace fine sized gravel, moist to dry, grass cover.	Grass cover
	0.1	0.1-0.2					
0.2					Fill	Fill Silty to sandy CLAY (CL) : low plasticity, stiff, brown and grey, fine to medium grained sand, with fine to medium sized gravel, moist to dry, traces of bricks.	traces of bricks
	0.4	0.2-0.7					
0.5					Fill	Fill Silty CLAY (CL) : low plasticity, stiff, brown, trace fine to medium sized gravel, moist to dry.	
	0.7					**BH12 refusal at 0.7m**	
1							

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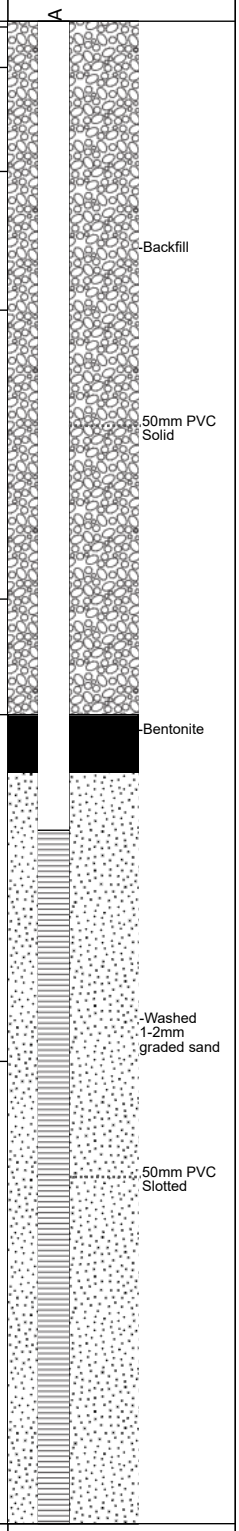
Environmental Log - Borehole

MW01

Easting	: 331525.96	Location	: Cnr Wilson Street and Pacific Highway, Chatswood NSW	Job Number	: 23210
Northing	: 6259275.28	Logged By	: Ross Kingswell	Client	:
Total Depth	: 13 m	Date	: 02/11/2023	Project	: Detailed Site Investigation

Depth (m)	Water	Samples: Discrete	Graphic Log	Moisture	Soil Origin	Material Description	Comments
0.05							
0.4		0.1		M-D	Non-Soil	Bitumen	
		0.5			Fill	Fill Silty SAND (SM) : medium dense, brown, fine to medium grained, trace low to medium plasticity clay, moist to dry.	trace of ash, reworked Natural
1.3		1.0			Fill	Fill Silty CLAY (CL) : low plasticity, firm, brown, trace fine to medium sized gravel, organic, moist to dry, trace of ash, reworked natural.	
2.5		1.4			Natural	Natural Silty CLAY (CL-CI) : stiff, low to medium plasticity, red brown, moist to dry.	
5		3.0			Natural	Natural Silty CLAY (CL-CI) : firm, low to medium plasticity, red brown mottled grey, moist to dry.	
6		5.0			Rock	Rock SANDSTONE: distinctly weathered, medium to high strength, red brown and grey, fine to medium grained, indistinct, moist/dry.	
9		9.0			Rock	Rock SILTSTONE: highly weathered, medium strength, orange brown and pale grey, fine grained, indistinct, moist/dry.	
					Rock	Rock SHALE: highly weathered, medium to high strength, grey, fine grained, indistinct, moist/dry, slightly more moisture at 12.	slightly more moisture at 12
13						**MW01 Terminated at 13m**	

Well Diagram



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Groundwater Field Sheets

REDITUS Groundwater Monitoring Field Sheet

Job Information

Date: 10/11/23	Time: arrive 12:30 depart 1:20 PM
Project Name: Detailed Site Investigation	Project Number: 23210
Site Location: Wilson Street, Chatswood	Operator: Ross Kingswell
Well ID: MW01	Weather: Clear.

Equipment

Water quality equipment description: HANNA

Interface probe number: HERON IP

Purging equipment: (please cirlce)

Bailer type: **Plastic** **Teflon**

Pump type: **Peristaltic** **Submersible** **Micro-purge** **Amazon** **Other:**

Well Gauging and Purge Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

Volume of water in well / V = Pr x r x h
V = volume in litres
P = 3.14159
r = radius in cm
h = height of water column in cm

Total Well Depth (-) Water level (=) Water Column
12.75 m (-) 9.105 m (=) 3.645 m

Water Column (x) Conversion Factor (=) Litres per 1 Well Volume
3.645 m (x) 1.96 (=) 7.1442 L

Water Quality Parameters

Beginning purge time: 12:40 Ending purge time: 1.00PM

Litres	Time	pH	Temp C°	Cond mS/cm	DO ppm	Redox mV	Depth to water mbtoc	Comments
2	12:46	4.76	19.78	0.389	2.49	247.2	10.01	~~very~~ turbid, grey, no odour.
5	12:50	4.58	19.80	0.402	2.52	258.9	10.71	slightly turbid, grey no odour.
6.5	12:53	4.57	19.72	0.394	2.45	260.1	11.03	"
7.5	12:55	4.55	19.74	0.391	2.42	261.4	11.18	"
Stabilisation Criteria		+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%		**Example Comments:** clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour

Total Well Volume
Actual amount of water prior to sampling

**pH, temp, cond readings not necessary if well is purged dry*

Did field parameters stabilise? Y N NA Was the well dry purged? Y N NA

Field QC Checks

Was pre-cleaning sampling equipment used for these samples?	Y	N	NA	Sample containers:
Was pre-cleaning sampling equipment properly protected from contamination?	Y	N	NA	
Was documentation of equipment conducted?	Y	N	NA	
Were air bubbles present in vials at time of collection?	Y	N	NA	
Was sample for metals field filtered prior to preservations?	Y	N	NA	
Duplicate sample collected?	Y	N		Duplicate sample ID

F

Calibration Certificate

Hanna (HI9828)
Calibration Booklet

REDITUS

Date: 10.11.23 Time: 8:00 AM Project No: 23210 Project Name: CHATSWOOD DSI **pH** Buffer 1: 4.0 Buffer 2: 7.0 **Cond.** Zero: — Sol^n 1: 1413µS/cm **DO** Zero: — Air — **ORP** Factory Calibrated Personnel: Ross Kingswell Signed:	Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:
Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:	Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:
Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:	Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:
Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:	Date: Time: Project No: Project Name: **pH** Buffer 1: Buffer 2: **Cond.** Zero: Sol^n 1: **DO** Zero: Air **ORP** Factory Calibrated Personnel: Signed:

G

Laboratory Reports

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CERTIFICATE OF ANALYSIS 336965

Client Details

Client	Reditus Consulting
Attention	Natasha Pasley
Address	Shop 1, 29-33 Waratah St, KIRRAWEE, NSW, 2232

Sample Details

Your Reference	**23210**
Number of Samples	63 Soil, 1 Material
Date samples received	03/11/2023
Date completed instructions received	03/11/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	10/11/2023
Date of Issue	10/11/2023

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Asbestos Approved By
Analysed by Asbestos Approved Analyst: Lucy Zhu, Nyovan Moonean
Authorised by Asbestos Approved Signatory: Lucy Zhu, Nyovan Moonean

Results Approved By
Dragana Tomas, Senior Chemist
Liam Timmins, Organics Supervisor
Loren Bardwell, Development Chemist
Lucy Zhu, Asbestos Supervisor
Nyovan Moonean, Asbestos Approved Identifier/Counter

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		336965-2	336965-4	336965-10	336965-11	336965-17
Your Reference	UNITS	MW01	MW01	MW02	MW02	MW03
Depth		0.5	1.4	0.1	0.3	0.1
Date Sampled		2/11/2023	2/11/2023	2/11/2023	2/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	92	124	88	87	91

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		336965-18	336965-24	336965-26	336965-29	336965-30
Your Reference	UNITS	MW03	BH01	BH01	BH02	BH02
Depth		0.7	0.1	0.8	0.5	0.8
Date Sampled		2/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	91	87	82	92	89

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		336965-34	336965-36	336965-38	336965-41	336965-44
Your Reference	UNITS	BH03	BH03	BH04	BH05	BH07
Depth		0.15	0.8	0.05	0.1	0.3
Date Sampled		3/11/2023	3/11/2023	2/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	3
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	87	88	92	92	91

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		336965-47	336965-50	336965-51	336965-52	336965-54
Your Reference	UNITS	BH08	BH09	BH10	BH10	BH11
Depth		0.1	0.1	0.1	0.4	0.1
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	09/11/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	90	88	89	90	91

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		336965-59	336965-63	336965-64
Your Reference	UNITS	BH12	DUP01	DUP02
Depth		0.4	-	-
Date Sampled		3/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	09/11/2023	09/11/2023	09/11/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	87	93	91

svTRH (C10-C40) in Soil						
Our Reference		336965-2	336965-4	336965-10	336965-11	336965-17
Your Reference	UNITS	MW01	MW01	MW02	MW02	MW03
Depth		0.5	1.4	0.1	0.3	0.1
Date Sampled		2/11/2023	2/11/2023	2/11/2023	2/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	52	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	160	<100	120
TRH C_{29} - C_{36}	mg/kg	<100	<100	200	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	410	<50	120
TRH >C_{10} -C_{16}	mg/kg	<50	<50	64	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	64	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	330	<100	170
TRH >C_{34} -C_{40}	mg/kg	<100	<100	140	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	540	<50	170
Surrogate o-Terphenyl	%	126	121	128	119	122

svTRH (C10-C40) in Soil						
Our Reference		336965-18	336965-24	336965-26	336965-29	336965-30
Your Reference	UNITS	MW03	BH01	BH01	BH02	BH02
Depth		0.7	0.1	0.8	0.5	0.8
Date Sampled		2/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	118	123	124	123	125

svTRH (C10-C40) in Soil						
Our Reference		336965-34	336965-36	336965-38	336965-41	336965-44
Your Reference	UNITS	BH03	BH03	BH04	BH05	BH07
Depth		0.15	0.8	0.05	0.1	0.3
Date Sampled		3/11/2023	3/11/2023	2/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	210
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	160	8,500
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	120	4,700
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	280	13,000
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	640
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	640
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	260	13,000
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	2,900
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	260	16,000
Surrogate o-Terphenyl	%	124	122	119	133	#

svTRH (C10-C40) in Soil						
Our Reference		336965-47	336965-50	336965-51	336965-52	336965-54
Your Reference	UNITS	BH08	BH09	BH10	BH10	BH11
Depth		0.1	0.1	0.1	0.4	0.1
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	320	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	230	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	550	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	59	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	59	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	150	510	130	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	180	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	150	750	130	<50	<50
Surrogate o-Terphenyl	%	127	123	130	125	123

svTRH (C10-C40) in Soil				
Our Reference		336965-59	336965-63	336965-64
Your Reference	UNITS	BH12	DUP01	DUP02
Depth		0.4	-	-
Date Sampled		3/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	110	<100
TRH C_{29} - C_{36}	mg/kg	<100	120	<100
Total +ve TRH (C10-C36)	mg/kg	<50	230	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	210	160
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	210	160
Surrogate o-Terphenyl	%	124	131	125

PAHs in Soil						
Our Reference		336965-2	336965-4	336965-10	336965-11	336965-17
Your Reference	UNITS	MW01	MW01	MW02	MW02	MW03
Depth		0.5	1.4	0.1	0.3	0.1
Date Sampled		2/11/2023	2/11/2023	2/11/2023	2/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	<0.1	<0.1	0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.4	<0.1	0.2	<0.1	0.4
Anthracene	mg/kg	0.4	<0.1	<0.1	<0.1	0.1
Fluoranthene	mg/kg	0.8	0.1	0.5	<0.1	0.7
Pyrene	mg/kg	0.8	<0.1	0.5	<0.1	0.6
Benzo(a)anthracene	mg/kg	0.3	<0.1	0.2	<0.1	0.3
Chrysene	mg/kg	0.4	<0.1	0.3	<0.1	0.3
Benzo(b,j+k)fluoranthene	mg/kg	0.6	<0.2	0.5	<0.2	0.5
Benzo(a)pyrene	mg/kg	0.4	<0.05	0.3	<0.05	0.3
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	<0.1	0.1	<0.1	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.2	<0.1	0.2	<0.1	0.2
Total +ve PAH's	mg/kg	4.7	0.1	2.7	<0.05	3.7
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.6	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.6	<0.5	<0.5	<0.5	0.5
Surrogate p-Terphenyl-d14	%	93	92	93	92	93

PAHs in Soil						
Our Reference		336965-18	336965-24	336965-26	336965-29	336965-30
Your Reference	UNITS	MW03	BH01	BH01	BH02	BH02
Depth		0.7	0.1	0.8	0.5	0.8
Date Sampled		2/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.1	<0.1	0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	0.3	<0.1	0.4	<0.1
Pyrene	mg/kg	<0.1	0.3	<0.1	0.4	<0.1
Benzo(a)anthracene	mg/kg	<0.1	0.2	<0.1	0.2	<0.1
Chrysene	mg/kg	<0.1	0.2	<0.1	0.2	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	0.3	<0.2	0.3	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.2	<0.05	0.2	0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.1	<0.1	0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.1	<0.1	0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	1.9	<0.05	1.9	0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	93	91	89	92	94

PAHs in Soil						
Our Reference		336965-34	336965-36	336965-38	336965-41	336965-44
Your Reference	UNITS	BH03	BH03	BH04	BH05	BH07
Depth		0.15	0.8	0.05	0.1	0.3
Date Sampled		3/11/2023	3/11/2023	2/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	3.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	0.3	13
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	12
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	14
Phenanthrene	mg/kg	<0.1	<0.1	0.1	0.8	240
Anthracene	mg/kg	<0.1	<0.1	<0.1	0.3	61
Fluoranthene	mg/kg	0.1	<0.1	0.3	2.4	220
Pyrene	mg/kg	0.1	<0.1	0.3	2.5	200
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.1	1.4	83
Chrysene	mg/kg	<0.1	<0.1	0.2	1.4	81
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	0.3	2.4	110
Benzo(a)pyrene	mg/kg	0.05	<0.05	0.2	1.7	85
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	0.1	0.9	29
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	0.3	11
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	0.1	1.0	35
Total +ve PAH's	mg/kg	0.3	<0.05	1.7	15	1,200
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	2.5	120
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	2.5	120
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	2.5	120
Surrogate p-Terphenyl-d14	%	92	96	96	93	90

PAHs in Soil						
Our Reference		336965-47	336965-50	336965-51	336965-52	336965-54
Your Reference	UNITS	BH08	BH09	BH10	BH10	BH11
Depth		0.1	0.1	0.1	0.4	0.1
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Naphthalene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.3	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	0.4	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	0.6	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	6.2	<0.1	<0.1	0.2
Anthracene	mg/kg	<0.1	1.4	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.4	6.4	0.1	0.2	0.3
Pyrene	mg/kg	0.4	5.4	0.1	0.1	0.3
Benzo(a)anthracene	mg/kg	0.2	2.4	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.2	2.3	<0.1	<0.1	0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.4	3.3	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.3	2.4	0.05	0.07	0.09
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	1.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.3	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.2	1.4	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	2.4	34	0.3	0.4	1.0
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	3.4	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	3.4	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	3.4	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	93	90	94	90	89

PAHs in Soil				
Our Reference		336965-59	336965-63	336965-64
Your Reference	UNITS	BH12	DUP01	DUP02
Depth		0.4	-	-
Date Sampled		3/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.4	0.1
Anthracene	mg/kg	<0.1	0.1	<0.1
Fluoranthene	mg/kg	0.1	1.1	0.3
Pyrene	mg/kg	0.1	1.0	0.3
Benzo(a)anthracene	mg/kg	<0.1	0.5	0.2
Chrysene	mg/kg	<0.1	0.5	0.2
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	0.9	0.3
Benzo(a)pyrene	mg/kg	0.06	0.58	0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.3	0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.4	0.2
Total +ve PAH's	mg/kg	0.3	5.9	2.0
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	0.8	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	0.8	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	0.9	<0.5
Surrogate p-Terphenyl-d14	%	93	90	88

Organochlorine Pesticides in soil						
Our Reference		336965-2	336965-10	336965-17	336965-24	336965-29
Your Reference	UNITS	MW01	MW02	MW03	BH01	BH02
Depth		0.5	0.1	0.1	0.1	0.5
Date Sampled		2/11/2023	2/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	98	91	90	91	90

Organochlorine Pesticides in soil						
Our Reference		336965-34	336965-38	336965-41	336965-44	336965-47
Your Reference	UNITS	BH03	BH04	BH05	BH07	BH08
Depth		0.15	0.05	0.1	0.3	0.1
Date Sampled		3/11/2023	2/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Surrogate TCMX	%	96	96	93	90	94

Organochlorine Pesticides in soil						
Our Reference		336965-50	336965-51	336965-54	336965-59	336965-63
Your Reference	UNITS	BH09	BH10	BH11	BH12	DUP01
Depth		0.1	0.1	0.1	0.4	-
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	10/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	102	94	92	94	91

Organochlorine Pesticides in soil		
Our Reference		336965-64
Your Reference	UNITS	DUP02
Depth		-
Date Sampled		3/11/2023
Type of sample		Soil
Date extracted	-	06/11/2023
Date analysed	-	08/11/2023
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Mirex	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	92

Organophosphorus Pesticides in Soil						
Our Reference		336965-2	336965-10	336965-17	336965-24	336965-29
Your Reference	UNITS	MW01	MW02	MW03	BH01	BH02
Depth		0.5	0.1	0.1	0.1	0.5
Date Sampled		2/11/2023	2/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	98	91	90	91	90

Organophosphorus Pesticides in Soil						
Our Reference		336965-34	336965-38	336965-41	336965-44	336965-47
Your Reference	UNITS	BH03	BH04	BH05	BH07	BH08
Depth		0.15	0.05	0.1	0.3	0.1
Date Sampled		3/11/2023	2/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Surrogate TCMX	%	96	96	93	90	94

Organophosphorus Pesticides in Soil						
Our Reference		336965-50	336965-51	336965-54	336965-59	336965-63
Your Reference	UNITS	BH09	BH10	BH11	BH12	DUP01
Depth		0.1	0.1	0.1	0.4	-
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	93	94	92	94	91

Organophosphorus Pesticides in Soil		
Our Reference		336965-64
Your Reference	UNITS	DUP02
Depth		-
Date Sampled		3/11/2023
Type of sample		Soil
Date extracted	-	06/11/2023
Date analysed	-	08/11/2023
Dichlorvos	mg/kg	<0.1
Mevinphos	mg/kg	<0.1
Phorate	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Disulfoton	mg/kg	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1
Parathion-Methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Fenthion	mg/kg	<0.1
Parathion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Methidathion	mg/kg	<0.1
Fenamiphos	mg/kg	<0.1
Ethion	mg/kg	<0.1
Phosalone	mg/kg	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1
Coumaphos	mg/kg	<0.1
Surrogate TCMX	%	92

Acid Extractable metals in soil						
Our Reference		336965-2	336965-4	336965-10	336965-11	336965-17
Your Reference	UNITS	MW01	MW01	MW02	MW02	MW03
Depth		0.5	1.4	0.1	0.3	0.1
Date Sampled		2/11/2023	2/11/2023	2/11/2023	2/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Arsenic	mg/kg	6	11	5	6	7
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	22	38	20	30	29
Copper	mg/kg	17	4	32	1	18
Lead	mg/kg	25	25	270	37	64
Mercury	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Nickel	mg/kg	8	6	6	2	4
Zinc	mg/kg	13	7	160	28	130

Acid Extractable metals in soil						
Our Reference		336965-18	336965-24	336965-26	336965-29	336965-30
Your Reference	UNITS	MW03	BH01	BH01	BH02	BH02
Depth		0.7	0.1	0.8	0.5	0.8
Date Sampled		2/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Arsenic	mg/kg	5	8	9	7	9
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	25	15	49	34	43
Copper	mg/kg	<1	41	1	9	<1
Lead	mg/kg	22	110	26	170	35
Mercury	mg/kg	<0.1	0.1	<0.1	0.3	<0.1
Nickel	mg/kg	2	12	3	4	3
Zinc	mg/kg	10	240	16	59	7

Acid Extractable metals in soil						
Our Reference		336965-34	336965-36	336965-38	336965-41	336965-44
Your Reference	UNITS	BH03	BH03	BH04	BH05	BH07
Depth		0.15	0.8	0.05	0.1	0.3
Date Sampled		3/11/2023	3/11/2023	2/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Arsenic	mg/kg	7	7	<4	6	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	26	33	9	15	6
Copper	mg/kg	29	<1	16	36	120
Lead	mg/kg	160	31	48	360	64
Mercury	mg/kg	0.2	<0.1	<0.1	0.2	<0.1
Nickel	mg/kg	8	2	3	7	17
Zinc	mg/kg	130	9	81	180	170

Acid Extractable metals in soil						
Our Reference		336965-47	336965-50	336965-51	336965-52	336965-54
Your Reference	UNITS	BH08	BH09	BH10	BH10	BH11
Depth		0.1	0.1	0.1	0.4	0.1
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Arsenic	mg/kg	6	11	<4	19	8
Cadmium	mg/kg	0.9	<0.4	<0.4	<0.4	7.3
Chromium	mg/kg	11	19	9	17	9
Copper	mg/kg	41	81	19	12	45
Lead	mg/kg	250	68	28	100	34
Mercury	mg/kg	0.3	0.1	<0.1	<0.1	0.1
Nickel	mg/kg	6	8	4	3	6
Zinc	mg/kg	490	240	180	75	49

Acid Extractable metals in soil					
Our Reference		336965-59	336965-63	336965-64	336965-65
Your Reference	UNITS	BH12	DUP01	DUP02	BH02 - [TRIPLICATE]
Depth		0.4	-	-	0.5
Date Sampled		3/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Arsenic	mg/kg	13	<4	5	11
Cadmium	mg/kg	<0.4	<0.4	0.9	<0.4
Chromium	mg/kg	10	13	13	32
Copper	mg/kg	27	22	38	16
Lead	mg/kg	31	190	280	170
Mercury	mg/kg	<0.1	0.1	0.3	0.3
Nickel	mg/kg	4	4	6	4
Zinc	mg/kg	47	100	490	71

Moisture						
Our Reference		336965-2	336965-4	336965-10	336965-11	336965-17
Your Reference	UNITS	MW01	MW01	MW02	MW02	MW03
Depth		0.5	1.4	0.1	0.3	0.1
Date Sampled		2/11/2023	2/11/2023	2/11/2023	2/11/2023	2/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Moisture	%	21	24	9.6	20	4.9

Moisture						
Our Reference		336965-18	336965-24	336965-26	336965-29	336965-30
Your Reference	UNITS	MW03	BH01	BH01	BH02	BH02
Depth		0.7	0.1	0.8	0.5	0.8
Date Sampled		2/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Moisture	%	21	13	27	19	24

Moisture						
Our Reference		336965-34	336965-36	336965-38	336965-41	336965-44
Your Reference	UNITS	BH03	BH03	BH04	BH05	BH07
Depth		0.15	0.8	0.05	0.1	0.3
Date Sampled		3/11/2023	3/11/2023	2/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Moisture	%	24	24	5.7	9.4	6.2

Moisture						
Our Reference		336965-47	336965-50	336965-51	336965-52	336965-54
Your Reference	UNITS	BH08	BH09	BH10	BH10	BH11
Depth		0.1	0.1	0.1	0.4	0.1
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023
Moisture	%	19	19	21	20	24

Moisture				
Our Reference		336965-59	336965-63	336965-64
Your Reference	UNITS	BH12	DUP01	DUP02
Depth		0.4	-	-
Date Sampled		3/11/2023	2/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil
Date prepared	-	06/11/2023	06/11/2023	06/11/2023
Date analysed	-	07/11/2023	07/11/2023	07/11/2023
Moisture	%	13	13	15

Asbestos ID - soils NEPM						
Our Reference		336965-9	336965-16	336965-23	336965-27	336965-33
Your Reference	UNITS	MW01	MW02	MW03	BH01	BH02
Depth		0.2-1.3	0.1-0.2	0.1-0.6	0.1-0.3	0.2-0.8
Date Sampled		2/11/2023	2/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	09/11/2023	09/11/2023	09/11/2023	09/11/2023	09/11/2023
Sample mass tested	g	519.11	633.43	586.53	633.33	528.79
Sample Description	-	Brown coarse-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos[#1]	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM						
Our Reference		336965-37	336965-40	336965-41	336965-46	336965-48
Your Reference	UNITS	BH03	BH04	BH05	BH07	BH08
Depth		0.15-0.25	0-0.1	0.1	0.2-0.3	0.1-0.3
Date Sampled		3/11/2023	2/11/2023	2/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	09/11/2023	09/11/2023	09/11/2023	09/11/2023	09/11/2023
Sample mass tested	g	510.37	679.37	690.93	652.97	557.47
Sample Description	-	Brown coarse-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Black coarse-grained soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	Chrysotile asbestos detected Amosite asbestos detected Crocidolite asbestos detected Organic fibre detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos#1	g/kg	<0.1	<0.1	<0.1	<0.1	0.5190
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	See Above
ACM >7mm Estimation*	g	–	–	–	–	0.2894
FA and AF Estimation*	g	–	–	–	–	–
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM					
Our Reference		336965-50	336965-53	336965-56	336965-62
Your Reference	UNITS	BH09	BH10	BH11	BH12
Depth		0.1	0.1-0.3	0.1-0.2	0.2-0.7
Date Sampled		3/11/2023	3/11/2023	3/11/2023	3/11/2023
Type of sample		Soil	Soil	Soil	Soil
Date analysed	-	09/11/2023	09/11/2023	09/11/2023	09/11/2023
Sample mass tested	g	572.17	601.19	606.21	716.06
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos#1	g/kg	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	Chrysotile Crocidolite	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–
FA and AF Estimation*	g	0.0017	–	–	–
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001

Asbestos ID - materials		
Our Reference		336965-49
Your Reference	UNITS	BH08-0.1-0.3_PACM
Depth		0.1-0.3
Date Sampled		3/11/2023
Type of sample		Material
Date analysed	-	06/11/2023
Mass / Dimension of Sample	-	50x40x5mm
Sample Description	-	Grey fibre cement material
Asbestos ID in materials	-	Chrysotile asbestos detected
Trace Analysis	-	[NT]

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. **NOTE** #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) **NOTE** #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	336965-10
Date extracted	-			06/11/2023	2	06/11/2023	06/11/2023		06/11/2023	06/11/2023
Date analysed	-			09/11/2023	2	08/11/2023	08/11/2023		08/11/2023	08/11/2023
TRH C_6 - C_9	mg/kg	25	Org-023	<25	2	<25	<25	0	110	106
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	2	<25	<25	0	110	106
Benzene	mg/kg	0.2	Org-023	<0.2	2	<0.2	<0.2	0	110	107
Toluene	mg/kg	0.5	Org-023	<0.5	2	<0.5	<0.5	0	108	102
Ethylbenzene	mg/kg	1	Org-023	<1	2	<1	<1	0	105	102
m+p-xylene	mg/kg	2	Org-023	<2	2	<2	<2	0	114	110
o-Xylene	mg/kg	1	Org-023	<1	2	<1	<1	0	113	110
Naphthalene	mg/kg	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	85	2	92	96	4	94	89

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date extracted	-			[NT]	29	06/11/2023	06/11/2023		06/11/2023	[NT]
Date analysed	-			[NT]	29	08/11/2023	08/11/2023		09/11/2023	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	29	<25	<25	0	108	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	29	<25	<25	0	108	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	29	<0.2	<0.2	0	107	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	29	<0.5	<0.5	0	107	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	29	<1	<1	0	104	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	29	<2	<2	0	112	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	29	<1	<1	0	111	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	29	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	29	92	87	6	92	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	44	06/11/2023	08/11/2023		[NT]	[NT]
Date analysed	-			[NT]	44	08/11/2023	09/11/2023		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	44	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	44	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	44	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	44	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	44	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	44	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	44	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	44	3	4	29	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	44	91	91	0	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	336965-10
Date extracted	-			06/11/2023	2	06/11/2023	06/11/2023		06/11/2023	06/11/2023
Date analysed	-			07/11/2023	2	07/11/2023	07/11/2023		07/11/2023	08/11/2023
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	2	<50	<50	0	115	112
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	2	<100	<100	0	119	92
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	2	<100	<100	0	86	114
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	2	<50	<50	0	115	112
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	2	<100	<100	0	119	92
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	2	<100	<100	0	86	114
Surrogate o-Terphenyl	%		Org-020	114	2	126	123	2	126	138

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date extracted	-			[NT]	29	06/11/2023	06/11/2023		06/11/2023	[NT]
Date analysed	-			[NT]	29	08/11/2023	08/11/2023		08/11/2023	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	29	<50	<50	0	127	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	29	<100	<100	0	127	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	29	<100	<100	0	100	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	29	<50	<50	0	127	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	29	<100	<100	0	127	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	29	<100	<100	0	100	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	29	123	123	0	136	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	336965-10
Date extracted	-			06/11/2023	2	06/11/2023	06/11/2023		06/11/2023	06/11/2023
Date analysed	-			08/11/2023	2	08/11/2023	08/11/2023		08/11/2023	08/11/2023
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	93	92
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	2	0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	95	93
Fluorene	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	88	86
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	2	0.4	0.1	120	94	92
Anthracene	mg/kg	0.1	Org-022/025	<0.1	2	0.4	<0.1	120	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	2	0.8	0.3	91	98	93
Pyrene	mg/kg	0.1	Org-022/025	<0.1	2	0.8	0.2	120	97	98
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	2	0.3	0.1	100	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	2	0.4	0.2	67	85	81
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	2	0.6	0.2	100	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	2	0.4	0.2	67	88	87
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	2	0.2	<0.1	67	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	2	0.2	0.1	67	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	88	2	93	92	1	93	91

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date extracted	-			[NT]	29	06/11/2023	06/11/2023		06/11/2023	[NT]
Date analysed	-			[NT]	29	08/11/2023	08/11/2023		08/11/2023	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	90	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	93	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	86	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	29	0.1	<0.1	0	92	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	29	0.4	0.3	29	94	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	29	0.4	0.3	29	93	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	29	0.2	0.2	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	29	0.2	0.2	0	81	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	29	0.3	0.3	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	29	0.2	0.2	0	92	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	29	0.1	0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	29	0.1	0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	29	92	97	5	89	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	336965-10
Date extracted	-			06/11/2023	2	06/11/2023	06/11/2023		06/11/2023	06/11/2023
Date analysed	-			08/11/2023	2	08/11/2023	08/11/2023		08/11/2023	08/11/2023
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	100	96
HCB	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	98	98
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	93	95
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	85	87
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	96	102
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	105	109
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	116	118
Endrin	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	86	98
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	86	93
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	120	140
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	95	2	98	94	4	99	92

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date extracted	-			[NT]	29	06/11/2023	06/11/2023		06/11/2023	[NT]
Date analysed	-			[NT]	29	08/11/2023	08/11/2023		08/11/2023	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	96	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	96	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	89	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	83	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	96	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	103	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	112	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	84	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	84	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	100	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	29	90	94	4	96	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	50	06/11/2023	06/11/2023		[NT]	[NT]
Date analysed	-			[NT]	50	10/11/2023	10/11/2023		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	50	102	100	2	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	336965-10
Date extracted	-			06/11/2023	2	06/11/2023	06/11/2023		06/11/2023	06/11/2023
Date analysed	-			08/11/2023	2	08/11/2023	08/11/2023		08/11/2023	08/11/2023
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	101	113
Mevinphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	91	97
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	87	107
Malathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	83	105
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	94	100
Fenthion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	84	100
Bromophos-ethyl	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	68	91
Phosalone	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	95	2	98	94	4	99	92

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date extracted	-			[NT]	29	06/11/2023	06/11/2023		06/11/2023	[NT]
Date analysed	-			[NT]	29	08/11/2023	08/11/2023		08/11/2023	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	103	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	91	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	89	[NT]
Malathion	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	83	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	92	[NT]
Fenthion	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	80	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	72	[NT]
Phosalone	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	[NT]	29	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	29	90	94	4	96	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	336965-10
Date prepared	-			06/11/2023	2	06/11/2023	06/11/2023		06/11/2023	06/11/2023
Date analysed	-			07/11/2023	2	07/11/2023	07/11/2023		07/11/2023	07/11/2023
Arsenic	mg/kg	4	Metals-020	<4	2	6	7	15	110	96
Cadmium	mg/kg	0.4	Metals-020	<0.4	2	<0.4	<0.4	0	104	87
Chromium	mg/kg	1	Metals-020	<1	2	22	21	5	107	91
Copper	mg/kg	1	Metals-020	<1	2	17	13	27	104	93
Lead	mg/kg	1	Metals-020	<1	2	25	28	11	109	73
Mercury	mg/kg	0.1	Metals-021	<0.1	2	<0.1	<0.1	0	101	101
Nickel	mg/kg	1	Metals-020	<1	2	8	9	12	106	91
Zinc	mg/kg	1	Metals-020	<1	2	13	12	8	109	77

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date prepared	-			[NT]	29	06/11/2023	06/11/2023		06/11/2023	[NT]
Date analysed	-			[NT]	29	07/11/2023	07/11/2023		07/11/2023	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	29	7	5	33	113	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	29	<0.4	<0.4	0	104	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	29	34	26	27	111	[NT]
Copper	mg/kg	1	Metals-020	[NT]	29	9	16	56	105	[NT]
Lead	mg/kg	1	Metals-020	[NT]	29	170	190	11	112	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	29	0.3	0.3	0	99	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	29	4	4	0	107	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	29	59	68	14	110	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

TRH Soil C10-C40 NEPM - # Percent recovery for the surrogate is not possible to report as the high concentration of analytes in sample 336965-44 have caused interference.

PAHs in Soil - The RPD for duplicate results is accepted due to the non homogenous nature of sample 336965-2.

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 336965-29 for Cu. Therefore a triplicate result has been issued as laboratory sample number 336965-65.

OCP_S_MSMS:The PQL has been raised due to interferences from analytes (other than those being tested) in sample/s 336965-44.

OP_S_MSMS:The PQL has been raised due to interferences from analytes (other than those being tested) in sample/s 336965-44.

Asbestos-ID in soil: NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

Factual description of asbestos identified in the soil samples: NEPM
Sample 336965-48; Chrysotile, Amosite & Crocidolite asbestos identified in 1.9290g of fibre cement material >7mm

Sample 336965-50; Chrysotile & Crocidolite asbestos identified in 0.0021g of fibrous matted material

COC 3/11/23 1504

CHAIN OF CUSTODY FORM - Client

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Client: Reditus Consulting
Contact Person: Natasha Pasley
Project Mgr: Natasha Pasley
Sampler: Ross Kingswell
Address: Unit 1A, Level 1, 29-33 Waratah Street Kirrawee NSW
Phone: 02 9521 8567 Mob:
Email Invoice To: accounts@reditusconsulting.com
Email Results To: natashapasley@reditus.com.au, rosskingswell@reditus.com.au

Client Project Name/Number/Site etc (ie report title): 23210
PO No.:
Envirolab Quote No.:
Date results required:
Or choose: standard
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Additional report format: esdat
Lab Comments:

Envirolab Sample ID	Client Sample ID or Information	Depth	Date sampled	Type of sample	Combo 3	Combo 5b	Combo 5bAN	Asbestos NEPM	Asbestos ID	Hold	Comments (Provide as much information about the sample as you can)
1	MW01	0.1	2/11/2023	Soil						x	
2	MW01	0.5	2/11/2023	Soil		x					
3	MW01	1	2/11/2023	Soil						x	
4	MW01	1.4	2/11/2023	Soil	x						
5	MW01	3	2/11/2023	Soil						x	
6	MW01	5	2/11/2023	Soil						x	
7	MW01	9	2/11/2023	Soil						x	
8	MW01	0.1-0.2	2/11/2023	Soil						x	
9	MW01	0.2-1.3	2/11/2023	Soil				x			
10	MW02	0.1	2/11/2023	Soil		x					
11	MW02	0.3	2/11/2023	Soil	x						
12	MW02	1	2/11/2023	Soil						x	
13	MW02	4	2/11/2023	Soil						x	
14	MW02	8	2/11/2023	Soil						x	
15	MW02	10	2/11/2023	Soil						x	
16	MW02	0.1-0.2	2/11/2023	Soil				x			
17	MW03	0.1	2/11/2023	Soil		x					
18	MW03	0.7	2/11/2023	Soil	x						
19	MW03	1.5	2/11/2023	Soil						x	
20	MW03	3	2/11/2023	Soil						x	
21	MW03	6	2/11/2023	Soil						x	
22	MW03	9	2/11/2023	Soil						x	
23	MW03	0.1-0.6	2/11/2023	Soil				x			
24	BH01	0.1	3/11/2023	Soil		x					
25	BH01	0.4	3/11/2023	Soil						x	
26	BH01	0.8	3/11/2023	Soil	x						
27	BH01	0.1-0.3	3/11/2023	Soil				x			
28	BH02	0.1	3/11/2023	Soil						x	
29	BH02	0.5	3/11/2023	Soil		x					
30	BH02	0.8	3/11/2023	Soil	x						
31	BH02	1.3	3/11/2023	Soil						x	
32	BH02	0.1-0.2	3/11/2023	Soil						x	
33	BH02	0.2-0.8	3/11/2023	Soil				x			
34	BH03	0.15	3/11/2023	Soil		x					
35	BH03	0.3	3/11/2023	Soil						x	
36	BH03	0.8	3/11/2023	Soil	x						
37	BH03	0.15-0.25	3/11/2023	Soil				x			
38	BH04	0.05	2/11/2023	Soil		x					
39	BH04	0.2	2/11/2023	Soil						x	
40	BH04	0-0.1	2/11/2023	Soil				x			
41	BH05	0.1	2/11/2023	Soil			x				
42	BH05	0.2	2/11/2023	Soil						x	
43	BH07	0.1	3/11/2023	Soil						x	
44	BH07	0.3	3/11/2023	Soil		x					
45	BH07	0.1-0.2	3/11/2023	Soil						x	
46	BH07	0.2-0.3	3/11/2023	Soil				x			
47	BH08	0.1	3/11/2023	Soil		x					
48	BH08	0.1-0.3	3/11/2023	Soil				x			
49	BH08-0.1-0.3_PACM	0.1-0.3	3/11/2023	Soil					x		
50	BH09	0.1	3/11/2023	Soil			x				
51	BH10	0.1	3/11/2023	Soil		x					
52	BH10	0.4	3/11/2023	Soil	x						
53	BH10	0.1-0.3	3/11/2023	Soil				x			
54	BH11	0.1	3/11/2023	Soil		x					
55	BH11	0.4	3/11/2023	Soil						x	
56	BH11	0.1-0.2	3/11/2023	Soil				x			
57	BH11	0.2-0.4	3/11/2023	Soil						x	
58	BH12	0.1	3/11/2023	Soil						x	
59	BH12	0.4	3/11/2023	Soil		x					
60	BH12	0.7	3/11/2023	Soil						x	
61	BH12	0.1-0.2	3/11/2023	Soil						x	
62	BH12	0.2-0.7	3/11/2023	Soil				x			
63	DUP01		2/11/2023	Soil		x					
~~64~~	TRIP01		2/11/2023	Soil		x					Please forward to ALS
64 ~~65~~	DUP02		3/11/2023	Soil		x					
~~66~~	TRIP02		3/11/2023	Soil		x					Please forward to ALS
				Sample Count	7	16	2	12	1	23	

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): Reditus	Received by (Company):	Lab Use Only	
Print Name: Ross Kingswell	Print Name:	Job number:	Cooling: Ice / Ice pack / None
Date & Time: 3/11/2023	Date & Time:	Temperature:	Security seal: Intact / Broken / None
Signature:	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 336965
Date Received: 3/11
Time Received: 1340
Received By: Paul
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

65: 13+09 = Oct-0.2 Extra

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Reditus Consulting
Attention	Natasha Pasley

Sample Login Details

Your reference	23210
Envirolab Reference	336965
Date Sample Received	03/11/2023
Date Instructions Received	03/11/2023
Date Results Expected to be Reported	10/11/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	63 Soil, 1 Material
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	18
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	sVTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM	Asbestos ID - materials	On Hold
MW01-0.1									✓
MW01-0.5	✓	✓	✓	✓	✓	✓			
MW01-1									✓
MW01-1.4	✓	✓	✓			✓			
MW01-3									✓
MW01-5									✓
MW01-9									✓
MW01-0.1-0.2									✓
MW01-0.2-1.3							✓		
MW02-0.1	✓	✓	✓	✓	✓	✓			
MW02-0.3	✓	✓	✓			✓			
MW02-1									✓
MW02-4									✓
MW02-8									✓
MW02-10									✓
MW02-0.1-0.2							✓		
MW03-0.1	✓	✓	✓	✓	✓	✓			
MW03-0.7	✓	✓	✓			✓			
MW03-1.5									✓
MW03-3									✓
MW03-6									✓
MW03-9									✓
MW03-0.1-0.6							✓		
BH01-0.1	✓	✓	✓	✓	✓	✓			
BH01-0.4									✓
BH01-0.8	✓	✓	✓			✓			
BH01-0.1-0.3							✓		
BH02-0.1									✓
BH02-0.5	✓	✓	✓	✓	✓	✓			
BH02-0.8	✓	✓	✓			✓			
BH02-1.3									✓
BH02-0.1-0.2									✓

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	sVTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM	Asbestos ID - materials	On Hold
BH02-0.2-0.8							✓		
BH03-0.15	✓	✓	✓	✓	✓	✓			
BH03-0.3									✓
BH03-0.8	✓	✓	✓			✓			
BH03-0.15-0.25							✓		
BH04-0.05	✓	✓	✓	✓	✓	✓			
BH04-0.2									✓
BH04-0-0.1							✓		
BH05-0.1	✓	✓	✓	✓	✓	✓	✓		
BH05-0.2									✓
BH07-0.1									✓
BH07-0.3	✓	✓	✓	✓	✓	✓			
BH07-0.1-0.2									✓
BH07-0.2-0.3							✓		
BH08-0.1	✓	✓	✓	✓	✓	✓			
BH08-0.1-0.3							✓		
BH08-0.1-0.3_PACM-0.1-0.3								✓	
BH09-0.1	✓	✓	✓	✓	✓	✓	✓		
BH10-0.1	✓	✓	✓	✓	✓	✓			
BH10-0.4	✓	✓	✓			✓			
BH10-0.1-0.3							✓		
BH11-0.1	✓	✓	✓	✓	✓	✓			
BH11-0.4									✓
BH11-0.1-0.2							✓		
BH11-0.2-0.4									✓
BH12-0.1									✓
BH12-0.4	✓	✓	✓	✓	✓	✓			
BH12-0.7									✓
BH12-0.1-0.2									✓
BH12-0.2-0.7							✓		
DUP01	✓	✓	✓	✓	✓	✓			
DUP02	✓	✓	✓	✓	✓	✓			

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

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Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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CERTIFICATE OF ANALYSIS 337219

Client Details

Client	Reditus Consulting
Attention	Ross Kingswell
Address	Shop 1, 29-33 Waratah St, KIRRAWEE, NSW, 2232

Sample Details

Your Reference	**23210**
Number of Samples	5 Soil
Date samples received	07/11/2023
Date completed instructions received	07/11/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	14/11/2023
Date of Issue	14/11/2023

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Asbestos Approved By
Analysed by Asbestos Approved Analyst: Stuart Chen
Authorised by Asbestos Approved Signatory: Matt Mansfield

Results Approved By
Dragana Tomas, Senior Chemist
Loren Bardwell, Development Chemist
Matt Mansfield, QHSE manager
Steven Luong, Senior Chemist
Tim Toll, Chemist (FAS)

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date extracted	-	08/11/2023
Date analysed	-	09/11/2023
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
Naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	82

svTRH (C10-C40) in Soil		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date extracted	-	08/11/2023
Date analysed	-	09/11/2023
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
Total +ve TRH (C10-C36)	mg/kg	<50
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	82

PAHs in Soil		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date extracted	-	08/11/2023
Date analysed	-	08/11/2023
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	93

Organochlorine Pesticides in soil		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date extracted	-	08/11/2023
Date analysed	-	08/11/2023
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Mirex	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	105

Organophosphorus Pesticides in Soil		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date extracted	-	08/11/2023
Date analysed	-	08/11/2023
Dichlorvos	mg/kg	<0.1
Mevinphos	mg/kg	<0.1
Phorate	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Disulfoton	mg/kg	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1
Parathion-Methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Fenthion	mg/kg	<0.1
Parathion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Methidathion	mg/kg	<0.1
Fenamiphos	mg/kg	<0.1
Ethion	mg/kg	<0.1
Phosalone	mg/kg	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1
Coumaphos	mg/kg	<0.1
Surrogate TCMX	%	105

Acid Extractable metals in soil		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date prepared	-	08/11/2023
Date analysed	-	09/11/2023
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	5
Copper	mg/kg	19
Lead	mg/kg	5
Mercury	mg/kg	0.3
Nickel	mg/kg	8
Zinc	mg/kg	10

Moisture		
Our Reference		337219-3
Your Reference	UNITS	BH06
Depth		0.15
Date Sampled		07/11/2023
Type of sample		Soil
Date prepared	-	08/11/2023
Date analysed	-	09/11/2023
Moisture	%	26

Asbestos ID - soils NEPM - ASB-001		
Our Reference		337219-1
Your Reference	UNITS	BH06
Depth		0.15-0.25
Date Sampled		07/11/2023
Type of sample		Soil
Date analysed	-	13/11/2023
Sample mass tested	g	361.24
Sample Description	-	Grey coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected Synthetic mineral fibres detected
Trace Analysis	-	No asbestos detected
Total Asbestos#1	g/kg	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected
ACM >7mm Estimation*	g	–
FA and AF Estimation*	g	–
ACM >7mm Estimation*	%(w/w)	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. **NOTE** #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) **NOTE** #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Date analysed	-			09/11/2023	[NT]	[NT]	[NT]	[NT]	09/11/2023	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	105	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	105	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	[NT]	[NT]	[NT]	[NT]	107	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	[NT]	[NT]	[NT]	[NT]	101	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	107	[NT]
o-Xylene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Naphthalene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	101	[NT]	[NT]	[NT]	[NT]	109	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Date analysed	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	09/11/2023	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	111	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	111	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	111	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	111	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate o-Terphenyl	%		Org-020	83	[NT]	[NT]	[NT]	[NT]	90	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Date analysed	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	109	[NT]
Fluorene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	87	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	87	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	98	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	94	[NT]	[NT]	[NT]	[NT]	96	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Date analysed	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
HCB	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	87	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	111	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	135	[NT]
Endrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	84	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	110	[NT]	[NT]	[NT]	[NT]	111	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Date analysed	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	75	[NT]
Malathion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	89	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Fenthion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	76	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	74	[NT]
Phosalone	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	110	[NT]	[NT]	[NT]	[NT]	111	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			08/11/2023	[NT]	[NT]	[NT]	[NT]	08/11/2023	[NT]
Date analysed	-			09/11/2023	[NT]	[NT]	[NT]	[NT]	09/11/2023	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	89	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	88	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	121	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Asbestos-ID in soil: NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

CHAIN OF CUSTODY FORM - Client

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08 8967 1201 | darwin@envirolab.com.au

Company:	Reditus	Client Project Name/Number/Site etc (ie report title):	23210
Contact Person:	Ross K.		
Project Mgr:	Natasha. P.	~~PO No. (if applicable)~~:	Please report with 336965
Sampler:	Ross K.	Envirolab Quote No. :	
Address:	~~Unit~~ 1A / 29-33 Wharatah St, Kirrawee	Date results required:	
		Or choose:	☒ Standard ☐ Same Day ☐ 1 day ☐ 2 day ☐ 3 day
Phone:	Mob: 0428 992 391	Note: Inform lab in advance if urgent turnaround is required - surcharges apply	
Email Results to:	rosskingswell natashapasley@reditus.com.au	Additional report format:	☒ Esdat ☐ Equis
Email Invoice to:	"	Lab Comments:	

Sample information					Tests Required																Comments
Envirolab Sample ID (Lab use only)	Client Sample ID or Information	Depth	Date Sampled	Type of Sample	~~Asbestos~~	Combo 5b	Asbestos ~~Quant~~ NEPM	HOLD													Provide as much information about the sample as you can
1	BH06	0.15-0.25	7.11.23	Soil			X														
2	BH06	0.25-0.6	↓	↓				X													
3	BH06	0.15				X															
4	BH06	0.5						X													
5	BH06	0.8	↓	↓				X													

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company):	Reditus	Received by (Company):	ELS SYD	*Lab Use Only*	
Print Name:	Ross Kingswell	Print Name:	Nam Pirth	Job number: 337219	Cooling: Ice / Ice pack / None
Date & Time:	2:40 PM 7.11.23	Date & Time:	7/11/23 14:45	Temperature: 4	Security seal: Intact / Broken / None
Signature:		Signature:		TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Reditus Consulting
Attention	Ross Kingswell

Sample Login Details

Your reference	23210
Envirolab Reference	337219
Date Sample Received	07/11/2023
Date Instructions Received	07/11/2023
Date Results Expected to be Reported	14/11/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	5 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	4
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM - ASB-001	On Hold
BH06-0.15-0.25							✓	
BH06-0.25-0.6								✓
BH06-0.15	✓	✓	✓	✓	✓	✓		
BH06-0.5								✓
BH06-0.8								✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

CERTIFICATE OF ANALYSIS

Work Order	: **ES2338272**	Page	: 1 of 7
Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Contact	: Customer Services ES
Address	: 1A/29-33 Waratah Street KIRRAWEE	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: 23210	Date Samples Received	: 06-Nov-2023 15:04
Order number	: ----	Date Analysis Commenced	: 09-Nov-2023
C-O-C number	: ----	Issue Date	: 14-Nov-2023 11:40
Sampler	: Ross Kingswell		
Site	:		
Quote number	: EN/333		
No. of samples received	: 2		
No. of samples analysed	: 2		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Rassem Ayoubi	Senior Organic Chemist	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TRIP01	TRIP02	----	----	----
			Sampling date / time	02-Nov-2023 00:00	03-Nov-2023 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2338272-001	ES2338272-002	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**12.9**	**10.5**	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	**5**	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	**13**	**12**	----	----	----
Copper	7440-50-8	5	mg/kg	**25**	**43**	----	----	----
Lead	7439-92-1	5	mg/kg	**212**	**289**	----	----	----
Nickel	7440-02-0	2	mg/kg	**3**	**5**	----	----	----
Zinc	7440-66-6	5	mg/kg	**130**	**494**	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	**0.1**	**0.2**	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TRIP01	TRIP02	----	----	----
			Sampling date / time	02-Nov-2023 00:00	03-Nov-2023 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2338272-001	ES2338272-002	--------	--------	--------
				Result	Result	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	----	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	----	----	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	----	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	----	----	----
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	----	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	----	----	----
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	**1.1**	**0.6**	----	----	----
Pyrene	129-00-0	0.5	mg/kg	**1.2**	**0.6**	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	**0.5**	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TRIP01	TRIP02	----	----	----
			Sampling date / time	02-Nov-2023 00:00	03-Nov-2023 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2338272-001	ES2338272-002	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	**0.8**	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	**3.6**	**1.2**	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.7**	**0.6**	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TRIP01	TRIP02	----	----	----
			Sampling date / time	02-Nov-2023 00:00	03-Nov-2023 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2338272-001	ES2338272-002	--------	--------	--------
				Result	Result	----	----	----
EP080: BTEXN - Continued								
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	97.6	87.0	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	96.1	80.9	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	87.6	102	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	96.2	102	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	75.4	74.7	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	103	92.3	----	----	----
Anthracene-d10	1719-06-8	0.5	%	97.0	104	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	102	99.6	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	72.1	71.0	----	----	----
Toluene-D8	2037-26-5	0.2	%	89.9	90.9	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	103	102	----	----	----

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	63	125
Toluene-D8	2037-26-5	67	124
4-Bromofluorobenzene	460-00-4	66	131

QUALITY CONTROL REPORT

Work Order	: **ES2338272**	Page	: 1 of 10
Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Contact	: Customer Services ES
Address	: 1A/29-33 Waratah Street KIRRAWEE	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: 23210	Date Samples Received	: 06-Nov-2023
Order number	: ----	Date Analysis Commenced	: 09-Nov-2023
C-O-C number	: ----	Issue Date	: 14-Nov-2023
Sampler	: Ross Kingswell		
Site	:		
Quote number	: EN/333		
No. of samples received	: 2		
No. of samples analysed	: 2		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Rassem Ayoubi	Senior Organic Chemist	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 5413953)									
ES2338272-002	TRIP02	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	12	11	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	5	5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	5	5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	43	36	19.8	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	289	257	11.5	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	494	430	13.9	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5413963)									
ES2338272-002	TRIP02	EA055: Moisture Content	----	0.1	%	10.5	16.0	41.2	0% - 50%
EW2304892-004	Anonymous	EA055: Moisture Content	----	0.1	%	0.2	0.1	70.2	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5413951)									
ES2338153-025	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2338255-004	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5413954)									
ES2338272-002	TRIP02	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	0.3	38.7	No Limit
EW2304892-007	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 5408076)									
ES2338272-001	TRIP01	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP068A: Organochlorine Pesticides (OC) (QC Lot: 5408076) - continued									
ES2338272-001	TRIP01	EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 5408076)									
ES2338272-001	TRIP01	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 5408074)									
ES2338272-001	TRIP01	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
				Laboratory Duplicate (DUP) Report					
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 5408074) - continued									
ES2338272-001	TRIP01	EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.1	1.0	13.2	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.2	0.9	20.8	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	0.8	0.7	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	3.6	2.6	32.3	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5408075)									
ES2338272-001	TRIP01	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5413877)									
ES2338153-028	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES2338255-008	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5408075)									
ES2338272-001	TRIP01	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5413877)									
ES2338153-028	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES2338255-008	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080: BTEXN (QC Lot: 5413877)									
ES2338153-028	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES2338255-008	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 5413877) - continued									
ES2338255-008	Anonymous	EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5413953)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	101	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	98.1	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	108	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	102	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	94.6	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	85.9	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	87.6	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5413951)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	104	70.0	125
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5413954)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	86.2	70.0	125
EP068A: Organochlorine Pesticides (OC) (QCLot: 5408076)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	83.0	69.0	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	85.5	65.0	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	79.1	67.0	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	97.5	68.0	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	81.1	65.0	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	84.4	67.0	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	89.7	69.0	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	89.0	62.0	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	84.9	63.0	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	86.8	66.0	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	84.9	64.0	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	87.5	66.0	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	83.9	67.0	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	87.0	67.0	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	88.2	69.0	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	87.9	69.0	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	75.1	56.0	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	86.3	62.0	124

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP068A: Organochlorine Pesticides (OC) (QCLot: 5408076) - continued								
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	84.8	66.0	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	88.7	64.0	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	84.3	54.0	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 5408076)								
EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	0.5 mg/kg	85.3	59.0	119
EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	93.8	62.0	128
EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	0.5 mg/kg	78.7	54.0	126
EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	0.5 mg/kg	88.1	67.0	119
EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	0.5 mg/kg	88.8	70.0	120
EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	0.5 mg/kg	84.1	72.0	120
EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	0.5 mg/kg	76.2	68.0	120
EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	0.5 mg/kg	86.5	68.0	122
EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	0.5 mg/kg	80.2	69.0	117
EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	0.5 mg/kg	91.4	76.0	118
EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	0.5 mg/kg	75.6	64.0	122
EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	0.5 mg/kg	84.8	70.0	116
EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	0.5 mg/kg	85.1	69.0	121
EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	0.5 mg/kg	89.5	66.0	118
EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	0.5 mg/kg	84.8	68.0	124
EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	0.5 mg/kg	87.8	62.0	112
EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	0.5 mg/kg	91.6	68.0	120
EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	0.5 mg/kg	87.6	65.0	127
EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	0.5 mg/kg	69.6	41.0	123
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5408074)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	93.6	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	99.7	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	102	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	99.2	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	102	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	90.0	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	107	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	99.9	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	98.8	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	97.3	75.0	127

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low	Acceptable Limits (%) High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5408074) - continued								
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	96.0	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	97.2	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	95.2	70.0	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	95.0	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	98.8	62.0	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	97.2	63.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5408075)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	105	75.0	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	104	77.0	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	107	71.0	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5413877)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	85.6	72.2	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5408075)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	105	77.0	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	103	74.0	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	104	63.0	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5413877)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	77.3	72.4	133
EP080: BTEXN (QCLot: 5413877)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	94.8	76.0	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	86.3	78.5	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	88.6	77.4	121
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	92.6	78.2	121
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	91.9	81.3	121
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	104	78.8	122

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Acceptable Limits (%) Low	Acceptable Limits (%) High

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Acceptable Limits (%) Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5413953)							
ES2338272-002	TRIP02	EG005T: Arsenic	7440-38-2	50 mg/kg	109	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	106	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	106	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	101	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	102	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	107	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	102	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5413951)							
ES2338153-025	Anonymous	EG035T: Mercury	7439-97-6	10 mg/kg	79.6	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5413954)							
ES2338272-002	TRIP02	EG035T: Mercury	7439-97-6	5 mg/kg	105	70.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 5408076)							
ES2338272-001	TRIP01	EP068: gamma-BHC	58-89-9	0.5 mg/kg	80.6	70.0	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	85.5	70.0	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	97.7	70.0	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	93.2	70.0	130
		EP068: Endrin	72-20-8	2 mg/kg	99.9	70.0	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	95.1	70.0	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 5408076)							
ES2338272-001	TRIP01	EP068: Diazinon	333-41-5	0.5 mg/kg	94.8	70.0	130
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5 mg/kg	84.4	70.0	130
		EP068: Pirimphos-ethyl	23505-41-1	0.5 mg/kg	97.8	70.0	130
		EP068: Bromophos-ethyl	4824-78-6	0.5 mg/kg	80.2	70.0	130
		EP068: Prothiofos	34643-46-4	0.5 mg/kg	75.8	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5408074)							
ES2338272-001	TRIP01	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	96.9	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	97.5	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5408075)							
ES2338272-001	TRIP01	EP071: C10 - C14 Fraction	----	480 mg/kg	91.2	73.0	137
		EP071: C15 - C28 Fraction	----	3100 mg/kg	102	53.0	131
		EP071: C29 - C36 Fraction	----	2060 mg/kg	111	52.0	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5413877)							
ES2338153-028	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	74.1	60.4	142
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5408075)							
ES2338272-001	TRIP01	EP071: >C10 - C16 Fraction	----	860 mg/kg	98.8	73.0	137
		EP071: >C16 - C34 Fraction	----	4320 mg/kg	106	53.0	131

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5408075) - continued							
ES2338272-001	TRIP01	EP071: >C34 - C40 Fraction	----	890 mg/kg	104	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5413877)							
ES2338153-028	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	70.1	61.1	142
EP080: BTEXN (QCLot: 5413877)							
ES2338153-028	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	79.5	62.1	122
		EP080: Toluene	108-88-3	2.5 mg/kg	73.9	66.6	119
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	77.8	67.4	123
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	86.2	66.4	121
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	88.3	70.7	121
		EP080: Naphthalene	91-20-3	2.5 mg/kg	94.0	61.1	115

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2338272**	Page	: 1 of 5
Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Telephone	: +61-2-8784 8555
Project	: 23210	Date Samples Received	: 06-Nov-2023
Site	:	Issue Date	: 14-Nov-2023
Sampler	: Ross Kingswell	No. of samples received	: 2
Order number	: ----	No. of samples analysed	: 2

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) TRIP01	**02-Nov-2023**	**----**	----	----	**09-Nov-2023**	16-Nov-2023	✓
Soil Glass Jar - Unpreserved (EA055) TRIP02	**03-Nov-2023**	**----**	----	----	**09-Nov-2023**	17-Nov-2023	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) TRIP01	**02-Nov-2023**	**09-Nov-2023**	30-Apr-2024	✓	**10-Nov-2023**	30-Apr-2024	✓
Soil Glass Jar - Unpreserved (EG005T) TRIP02	**03-Nov-2023**	**09-Nov-2023**	01-May-2024	✓	**10-Nov-2023**	01-May-2024	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) TRIP01	**02-Nov-2023**	**09-Nov-2023**	30-Nov-2023	✓	**12-Nov-2023**	30-Nov-2023	✓
Soil Glass Jar - Unpreserved (EG035T) TRIP02	**03-Nov-2023**	**09-Nov-2023**	01-Dec-2023	✓	**12-Nov-2023**	01-Dec-2023	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068) TRIP01	**02-Nov-2023**	**09-Nov-2023**	16-Nov-2023	✓	**11-Nov-2023**	19-Dec-2023	✓
Soil Glass Jar - Unpreserved (EP068) TRIP02	**03-Nov-2023**	**09-Nov-2023**	17-Nov-2023	✓	**11-Nov-2023**	19-Dec-2023	✓
EP068B: Organophosphorus Pesticides (OP)							
Soil Glass Jar - Unpreserved (EP068) TRIP01	**02-Nov-2023**	**09-Nov-2023**	16-Nov-2023	✓	**11-Nov-2023**	19-Dec-2023	✓
Soil Glass Jar - Unpreserved (EP068) TRIP02	**03-Nov-2023**	**09-Nov-2023**	17-Nov-2023	✓	**11-Nov-2023**	19-Dec-2023	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) TRIP01	**02-Nov-2023**	**09-Nov-2023**	16-Nov-2023	✓	**10-Nov-2023**	19-Dec-2023	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) TRIP02	**03-Nov-2023**	**09-Nov-2023**	17-Nov-2023	✓	**10-Nov-2023**	19-Dec-2023	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) TRIP01	**02-Nov-2023**	**09-Nov-2023**	16-Nov-2023	✓	**10-Nov-2023**	16-Nov-2023	✓
Soil Glass Jar - Unpreserved (EP080) TRIP02	**03-Nov-2023**	**09-Nov-2023**	17-Nov-2023	✓	**10-Nov-2023**	17-Nov-2023	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080) TRIP01	**02-Nov-2023**	**09-Nov-2023**	16-Nov-2023	✓	**10-Nov-2023**	16-Nov-2023	✓
Soil Glass Jar - Unpreserved (EP080) TRIP02	**03-Nov-2023**	**09-Nov-2023**	17-Nov-2023	✓	**10-Nov-2023**	17-Nov-2023	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) TRIP01	**02-Nov-2023**	**09-Nov-2023**	16-Nov-2023	✓	**10-Nov-2023**	16-Nov-2023	✓
Soil Glass Jar - Unpreserved (EP080) TRIP02	**03-Nov-2023**	**09-Nov-2023**	17-Nov-2023	✓	**10-Nov-2023**	17-Nov-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	33	**12.12**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2338272**

Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Contact	: Customer Services ES
Address	: 1A/29-33 Waratah Street KIRRAWEE	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: natashapasley@reditusconsulting.com	E-mail	: ALSEnviro.Sydney@ALSGlobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: 23210	Page	: 1 of 2
Order number	: ----	Quote number	: EP2023REDITUS0001 (EN/333)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	:		
Sampler	: Ross Kingswell		

Dates

Date Samples Received	: 06-Nov-2023 15:04	Issue Date	: 06-Nov-2023
Client Requested Due Date	: 13-Nov-2023	Scheduled Reporting Date	: **13-Nov-2023**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 10.5'C, 11.1'C, 11.0'C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 2 / 2

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - EA055-103 Moisture Content	SOIL - S-12 OC/OP Pesticides	SOIL - S-26 8 metals/TRH/BTEXN/PAH
ES2338272-001	02-Nov-2023 00:00	TRIP01	✓	✓	✓
ES2338272-002	03-Nov-2023 00:00	TRIP02	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

Accounts		
- A4 - AU Tax Invoice (INV)	Email	accounts@reditus.com.au
Esdat Deliverables		
- EDI Format - ESDAT (ESDAT)	Email	reditusconsulting@esdat.com.au
NATASHA PASLEY		
- *AU Certificate of Analysis - NATA (COA)	Email	natashapasley@reditusconsulting.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	natashapasley@reditusconsulting.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	natashapasley@reditusconsulting.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	natashapasley@reditusconsulting.com
- Chain of Custody (CoC) (COC)	Email	natashapasley@reditusconsulting.com
- EDI Format - ENMRG (ENMRG)	Email	natashapasley@reditusconsulting.com
- EDI Format - ESDAT (ESDAT)	Email	natashapasley@reditusconsulting.com
Ross Kingswell		
- *AU Certificate of Analysis - NATA (COA)	Email	rosskingswell@reditus.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	rosskingswell@reditus.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	rosskingswell@reditus.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	rosskingswell@reditus.com.au
- Chain of Custody (CoC) (COC)	Email	rosskingswell@reditus.com.au
- EDI Format - ENMRG (ENMRG)	Email	rosskingswell@reditus.com.au
- EDI Format - ESDAT (ESDAT)	Email	rosskingswell@reditus.com.au

COC 3/11/23 1504

CHAIN OF CUSTODY FORM - Client

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ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
02 9910 6200 | sydney@envirolab.com.au

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16-18 Hayden Crt, Myaree, WA 6154
08 9317 2505 | lab@mpl.com.au

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25 Research Drive, Croydon South, VIC 3136
03 9763 2500 | melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
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08 7087 6800 | adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 7, 17 Willes Rd, Berrimah, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Rec: ERW 6/11/23 1504

Client: Reditus Consulting
Contact Person: Natasha Pasley
Project Mgr: Natasha Pasley
Sampler: Ross Kingswell
Address: Unit 1A, Level 1, 29-33 Waratah Street Kirrawee NSW
Phone: 02 9521 6567 Mob:
Email Invoice To: accounts@redituisconsulting.com
Email Results To: natashapasley@reditus.com.au; rosskingswell@reditus.com.au

Client Project Name/Number/Site etc (ie report title): 23210
PO No.:
Envirolab Quote No. :
Date results required:
Or choose: standard
Note. Inform lab in advance if urgent turnaround is required - surcharges apply
Additional report format: esdat
Lab Comments:

Environmental Division Sydney
Work Order Reference
ES2338272
Telephone : + 61-2-8784 8555

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Combo 3	Combo 5b	Combo 5bAN	Asbestos NEPM	Asbestos ID	Hold	Comments: Provide as much information about the sample as you can
1	MW01	0.1	2/11/2023	Soil						x	
2	MW01	0.5	2/11/2023	Soil		x					
3	MW01	1	2/11/2023	Soil						x	
4	MW01	1.4	2/11/2023	Soil	x						
5	MW01	3	2/11/2023	Soil						x	
6	MW01	5	2/11/2023	Soil						x	
7	MW01	9	2/11/2023	Soil						x	
8	MW01	0.1-0.2	2/11/2023	Soil						x	
9	MW01	0.2-1.3	2/11/2023	Soil				x			
10	MW02	0.1	2/11/2023	Soil		x					
11	MW02	0.3	2/11/2023	Soil	x						
12	MW02	1	2/11/2023	Soil						x	
13	MW02	4	2/11/2023	Soil						x	
14	MW02	8	2/11/2023	Soil						x	
15	MW02	10	2/11/2023	Soil						x	
16	MW02	0.1-0.2	2/11/2023	Soil				x			
17	MW03	0.1	2/11/2023	Soil		x					
18	MW03	0.7	2/11/2023	Soil	x						
19	MW03	1.5	2/11/2023	Soil						x	
20	MW03	3	2/11/2023	Soil						x	
21	MW03	6	2/11/2023	Soil						x	
22	MW03	9	2/11/2023	Soil						x	
23	MW03	0.1-0.5	2/11/2023	Soil				x			
24	BH01	0.1	3/11/2023	Soil		x					
25	BH01	0.4	3/11/2023	Soil						x	
26	BH01	0.8	3/11/2023	Soil	x						
27	BH01	0.1-0.3	3/11/2023	Soil				x			
28	BH02	0.1	3/11/2023	Soil						x	
29	BH02	0.5	3/11/2023	Soil		x					
30	BH02	0.8	3/11/2023	Soil	x						
31	BH02	1.3	3/11/2023	Soil						x	
32	BH02	0.1-0.2	3/11/2023	Soil						x	
33	BH02	0.2-0.8	3/11/2023	Soil				x			
34	BH03	0.15	3/11/2023	Soil		x					
35	BH03	0.3	3/11/2023	Soil						x	
36	BH03	0.8	3/11/2023	Soil	x						
37	BH03	0.15-0.25	3/11/2023	Soil				x			
38	BH04	0.05	2/11/2023	Soil		x					
39	BH04	0.2	2/11/2023	Soil						x	
40	BH04	0-0.1	2/11/2023	Soil				x			
41	BH05	0.1	2/11/2023	Soil			x				
42	BH05	0.2	2/11/2023	Soil						x	
43	BH07	0.1	3/11/2023	Soil						x	
44	BH07	0.3	3/11/2023	Soil		x					
45	BH07	0.1-0.2	3/11/2023	Soil						x	
46	BH07	0.2-0.3	3/11/2023	Soil				x			
47	BH08	0.1	3/11/2023	Soil		x					
48	BH08	0.1-0.3	3/11/2023	Soil				x			
49	BH08-0.1-0.3_PACM	0.1-0.3	3/11/2023	Soil					x		
50	BH09	0.1	3/11/2023	Soil			x				
51	BH10	0.1	3/11/2023	Soil		x					
52	BH10	0.4	3/11/2023	Soil	x						
53	BH10	0.1-0.3	3/11/2023	Soil				x			
54	BH11	0.1	3/11/2023	Soil		x					
55	BH11	0.4	3/11/2023	Soil						x	
56	BH11	0.1-0.2	3/11/2023	Soil				x			
57	BH11	0.2-0.4	3/11/2023	Soil						x	
58	BH12	0.1	3/11/2023	Soil						x	
59	BH12	0.4	3/11/2023	Soil		x					
60	BH12	0.7	3/11/2023	Soil						x	
61	BH12	0.1-0.2	3/11/2023	Soil						x	
62	BH12	0.2-0.7	3/11/2023	Soil				x			
63	DUP01		2/11/2023	Soil		x					
(1) ~~64~~	TRIP01		2/11/2023	Soil		x					Please forward to ALS
64 ~~65~~	DUP02		3/11/2023	Soil		x					
(2) ~~66~~	TRIP02		3/11/2023	Soil		x					Please forward to ALS
				Sample Count	7	16	2	12	1	28	

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 336965
Date Received: 3/11
Time Received: 1340
Received By: Paul
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): Reditus	Received by (Company):	Lab Use Only	
Print Name: Ross Kingswell	Print Name:	Job number:	Cooling: Ice / Ice pack / None
Date & Time: 3/11/2023	Date & Time:	Temperature:	Security seal: Intact / Broken / None
Signature:	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

65: 13H09-0.1-0.2 Extra

Relinquished by: ELS SYD Sarah P Saal 06/11/23 1130

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 337552

Client Details

Client	Reditus Consulting
Attention	Natasha Pasley
Address	Shop 1, 29-33 Waratah St, KIRRAWEE, NSW, 2232

Sample Details

Your Reference	**23210**
Number of Samples	5 Water
Date samples received	10/11/2023
Date completed instructions received	10/11/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	17/11/2023
Date of Issue	17/11/2023

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diana Korniewicz, Chemist
Greta Petzold, Operation Manager
Liam Timmins, Organics Supervisor
Loren Bardwell, Development Chemist
Priya Samarawickrama, Senior Chemist
Tim Toll, Chemist (FAS)

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water						
Our Reference		337552-1	337552-2	337552-3	337552-4	337552-5
Your Reference	UNITS	MW01	MW02	MW03	RB01	DUP01
Date Sampled		10/11/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	13/11/2023	13/11/2023	13/11/2023	13/11/2023	13/11/2023
Date analysed	-	14/11/2023	14/11/2023	14/11/2023	14/11/2023	14/11/2023
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	95	95	95	94	96
Surrogate Toluene-d8	%	94	94	93	93	94
Surrogate 4-Bromofluorobenzene	%	106	106	108	108	108

svTRH (C10-C40) in Water						
Our Reference		337552-1	337552-2	337552-3	337552-4	337552-5
Your Reference	UNITS	MW01	MW02	MW03	RB01	DUP01
Date Sampled		10/11/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	14/11/2023	14/11/2023	14/11/2023	14/11/2023	14/11/2023
Date analysed	-	14/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	94	91	76	85	76

PAHs in Water						
Our Reference		337552-1	337552-2	337552-3	337552-4	337552-5
Your Reference	UNITS	MW01	MW02	MW03	RB01	DUP01
Date Sampled		10/11/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	14/11/2023	14/11/2023	14/11/2023	14/11/2023	14/11/2023
Date analysed	-	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023
Naphthalene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	98	106	100	101	87

HM in water - dissolved						
Our Reference		337552-1	337552-2	337552-3	337552-4	337552-5
Your Reference	UNITS	MW01	MW02	MW03	RB01	DUP01
Date Sampled		10/11/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	13/11/2023	13/11/2023	13/11/2023	13/11/2023	13/11/2023
Date analysed	-	13/11/2023	13/11/2023	13/11/2023	13/11/2023	13/11/2023
Arsenic-Dissolved	µg/L	3	1	3	<1	4
Cadmium-Dissolved	µg/L	0.2	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	6	2	1	<1	2
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	14	5	39	<1	42
Zinc-Dissolved	µg/L	44	17	62	2	58

Miscellaneous Inorganics				
Our Reference		337552-1	337552-2	337552-3
Your Reference	UNITS	MW01	MW02	MW03
Date Sampled		10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water
Date prepared	-	10/11/2023	10/11/2023	10/11/2023
Date analysed	-	10/11/2023	10/11/2023	10/11/2023
Nitrate as N in water	mg/L	0.01	<0.005	0.02
Ammonia as N in water	mg/L	0.018	0.016	0.037
Total Nitrogen in water	mg/L	<0.1	0.1	0.1
NOx as N in water	mg/L	0.01	<0.005	0.02
Phosphate as P in water	mg/L	0.03	0.04	<0.005

Metals in Waters - Total				
Our Reference		337552-1	337552-2	337552-3
Your Reference	UNITS	MW01	MW02	MW03
Date Sampled		10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water
Date prepared	-	13/11/2023	13/11/2023	13/11/2023
Date analysed	-	13/11/2023	13/11/2023	13/11/2023
Phosphorus - Total	mg/L	0.2	1.8	0.52

Ion Balance				
Our Reference		337552-1	337552-2	337552-3
Your Reference	UNITS	MW01	MW02	MW03
Date Sampled		10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water
Date prepared	-	10/11/2023	10/11/2023	10/11/2023
Date analysed	-	10/11/2023	10/11/2023	10/11/2023
Calcium - Dissolved	mg/L	2	1	5.6
Potassium - Dissolved	mg/L	3	4	10
Sodium - Dissolved	mg/L	73	200	300
Magnesium - Dissolved	mg/L	1	7.7	14
Hardness	mgCaCO 3 /L	9.6	35	70
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	10	13	24
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	10	13	24
Sulphate, SO4	mg/L	98	210	140
Chloride, Cl	mg/L	45	150	390
Ionic Balance	%	-1.0	2.0	0

Microbiologocal Testing				
Our Reference		337552-1	337552-2	337552-3
Your Reference	UNITS	MW01	MW02	MW03
Date Sampled		10/11/2023	10/11/2023	10/11/2023
Type of sample		Water	Water	Water
Date of testing	-	11/11/2023	11/11/2023	11/11/2023
E. coli	mpn/100mL	<18	<18	<18

Method ID	Methodology Summary
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055/062/127	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determinined stoichiometrically from the base metal concentration.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			13/11/2023	1	13/11/2023	14/11/2023		13/11/2023	[NT]
Date analysed	-			14/11/2023	1	14/11/2023	15/11/2023		14/11/2023	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	1	<10	<10	0	95	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	1	<10	<10	0	95	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	94	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	94	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	96	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	96	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	96	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	95	1	95	101	6	91	[NT]
Surrogate Toluene-d8	%		Org-023	95	1	94	96	2	96	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	108	1	106	108	2	102	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			14/11/2023	1	14/11/2023	14/11/2023		14/11/2023	[NT]
Date analysed	-			14/11/2023	1	14/11/2023	14/11/2023		14/11/2023	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	1	<50	<50	0	85	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	1	<100	<100	0	99	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	1	<100	<100	0	86	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	1	<50	<50	0	85	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	1	<100	<100	0	99	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	1	<100	<100	0	86	[NT]
Surrogate o-Terphenyl	%		Org-020	78	1	94	79	17	82	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Date extracted	-			14/11/2023	1	14/11/2023	14/11/2023		14/11/2023	[NT]
Date analysed	-			15/11/2023	1	15/11/2023	15/11/2023		15/11/2023	[NT]
Naphthalene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	101	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	[NT]
Fluorene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	89	[NT]
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	96	[NT]
Anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	98	[NT]
Pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	104	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	91	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	107	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	97	1	98	107	9	98	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	337552-2
Date prepared	-			13/11/2023	1	13/11/2023	13/11/2023		13/11/2023	13/11/2023
Date analysed	-			13/11/2023	1	13/11/2023	13/11/2023		13/11/2023	13/11/2023
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	3	[NT]		83	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	0.2	[NT]		83	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		86	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	1	6	[NT]		82	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		97	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	108	74
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	14	[NT]		85	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	44	[NT]		84	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	3	13/11/2023	13/11/2023		[NT]	[NT]
Date analysed	-			[NT]	3	13/11/2023	13/11/2023		[NT]	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	[NT]	3	3	3	0	[NT]	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	[NT]	3	<0.1	<0.1	0	[NT]	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	[NT]	3	<1	<1	0	[NT]	[NT]
Copper-Dissolved	µg/L	1	Metals-022	[NT]	3	1	2	67	[NT]	[NT]
Lead-Dissolved	µg/L	1	Metals-022	[NT]	3	<1	<1	0	[NT]	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	[NT]	3	<0.05	[NT]		[NT]	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	[NT]	3	39	38	3	[NT]	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	[NT]	3	62	70	12	[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			10/11/2023	[NT]	[NT]	[NT]	[NT]	10/11/2023	[NT]
Date analysed	-			10/11/2023	[NT]	[NT]	[NT]	[NT]	10/11/2023	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	98	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	[NT]	[NT]	[NT]	[NT]	99	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	[NT]	[NT]	[NT]	[NT]	103	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	98	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	[NT]	[NT]	[NT]	[NT]	108	[NT]

QUALITY CONTROL: Metals in Waters - Total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			13/11/2023	[NT]	[NT]	[NT]	[NT]	13/11/2023	[NT]
Date analysed	-			13/11/2023	[NT]	[NT]	[NT]	[NT]	13/11/2023	[NT]
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			10/11/2023	1	10/11/2023	10/11/2023		10/11/2023	[NT]
Date analysed	-			10/11/2023	1	10/11/2023	10/11/2023		10/11/2023	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	2	2	0	102	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	3	3	0	108	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	73	73	0	104	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	1	1	0	104	[NT]
Hardness	mgCaCO 3 /L	3	Metals-020	[NT]	1	9.6	9.4	2	[NT]	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	10	[NT]		[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	[NT]		[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	10	[NT]		101	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	98	[NT]		115	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	1	45	[NT]		110	[NT]
Ionic Balance	%		Inorg-040	[NT]	1	-1.0	[NT]		[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Microbiology analysed by Sonic Food & Water Testing. Report No. W2326549

The time between collection and the commencement of testing should not exceed 24 hours. Samples tested outside this time may have their results compromised

CHAIN OF CUSTODY FORM - Client

[Copyright and Confidential]

ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
02 9910 6200 | sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
08 9317 2505 | lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
03 9763 2500 | melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
08 7087 6800 | adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 7, 17 Willes Rd, Berrimah, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Client: Reditus Consulting	Client Project Name/Number/Site etc (ie report title): 23210
Contact Person: Ross Kingswell	
Project Mgr: Natasha Pasley	PO No.:
Sampler: Ross Kingswell	Envirolab Quote No. :
Address: Unit 1A, Level 1, 29-33 Waratah Street Kirrawee NSW	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: 02 9521 6567 Mob: 0426992391	Additional report format: esdat
Email Invoice To: accounts@reditusconsulting.com	Lab Comments:
Email Results To: natashapasley@reditus.com.au rosskingswell@reditus.com.au	

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Major Cations	Major Anions	Combo 3 (TRH, BTEX, PAHs, 8 heavy metals (dissolved))	Ionic Balance	Microbiological (E.coli)	Nutrients (ammonia, nitrate, total nitrogen, oxidised nitrogen, total phosphorus and reactive phosphorus)										Provide as much information about the sample as you can
1	MW01		10.11.23	Water	x	x	x	x	x	x										
2	MW02		10.11.23	Water	x	x	x	x	x	x										
3	MW03		10.11.23	Water	x	x	x	x	x	x										
4	RB01		10.11.23	Water			x													
5	DUP01		10.11.23	Water			x													
	TRIP01		10.11.23	Water			x													Please forward to ALS
				Sample Count	3	3	6	3	3	3										

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): Reditus	Received by (Company): Envirolab	Lab Use Only	
Print Name: Ross Kingswell	Print Name: Nancy Strang	Job number: 337552	Cooling: Ice / Ice pack / None
Date & Time: 10.11.23 4:30 PM	Date & Time: 10/11/2023 16:50	Temperature: 15°C	Security seal: Intact / Broken / None
Signature: RK	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Reditus Consulting
Attention	Natasha Pasley

Sample Login Details

Your reference	23210
Envirolab Reference	337552
Date Sample Received	10/11/2023
Date Instructions Received	10/11/2023
Date Results Expected to be Reported	17/11/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	5 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	15
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water	HM in water - dissolved	Nitrate as N in water	Ammonia as N in water	Total Nitrogen in water	NOx as N in water	Phosphate as P in water	Metals in Waters -Total	Calcium - Dissolved	Potassium - Dissolved	Sodium - Dissolved	Magnesium - Dissolved	Hardness	Hydroxide Alkalinity (OH-) as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulphate, SO4	Chloride, Cl	Ionic Balance	Microbiologocal Testing
MW01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MW02	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MW03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
RB01	✓	✓	✓	✓																			
DUP01	✓	✓	✓	✓																			

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

CERTIFICATE OF ANALYSIS

Work Order	: **ES2339232**	Page	: 1 of 6
Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Contact	: Customer Services ES
Address	: 1A/29-33 Waratah Street KIRRAWEE	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: 23210	Date Samples Received	: 13-Nov-2023 15:45
Order number	: ----	Date Analysis Commenced	: 14-Nov-2023
C-O-C number	: ----	Issue Date	: 20-Nov-2023 17:05
Sampler	: Ross Kingswell		
Site	:		
Quote number	: EN/333		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	TRIP01	----	----	----	----
			Sampling date / time	10-Nov-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2339232-001	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.004**	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.042**	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.051**	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	TRIP01	----	----	----	----
			Sampling date / time	10-Nov-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2339232-001	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	29.7	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	TRIP01	----	----	----	----
			Sampling date / time	10-Nov-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2339232-001	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
2-Chlorophenol-D4	93951-73-6	1.0	%	63.2	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	71.2	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	82.0	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%	86.4	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	81.4	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	115	----	----	----	----
Toluene-D8	2037-26-5	2	%	112	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	113	----	----	----	----

Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	72	143
Toluene-D8	2037-26-5	75	131
4-Bromofluorobenzene	460-00-4	73	137

QUALITY CONTROL REPORT

Work Order	: **ES2339232**	Page	: 1 of 6
Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Contact	: Customer Services ES
Address	: 1A/29-33 Waratah Street KIRRAWEE	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: 23210	Date Samples Received	: 13-Nov-2023
Order number	: ----	Date Analysis Commenced	: 14-Nov-2023
C-O-C number	: ----	Issue Date	: 20-Nov-2023
Sampler	: Ross Kingswell		
Site	:		
Quote number	: EN/333		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5432341)									
EW2305024-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
ES2339228-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.008	0.009	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.011	0.012	10.7	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 5432342)									
ES2339232-001	TRIP01	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EW2305024-003	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5425929)									
ES2339107-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2339121-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5425929)									
ES2339107-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5425929) - continued									
ES2339121-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 5425929)									
ES2339107-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES2339121-002	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5432341)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	95.2	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	97.0	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	94.3	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	91.3	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	84.2	83.0	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	88.9	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	90.4	81.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 5432342)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	95.1	83.0	105
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5421778)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	66.5	50.0	94.0
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	72.3	63.6	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	66.6	62.2	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	75.0	63.9	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	73.0	62.6	116
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	77.8	64.3	116
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	77.2	63.6	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	79.0	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	72.4	64.1	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	80.6	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	74.4	61.7	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	78.8	63.0	115
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	74.5	63.3	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	70.1	59.9	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	70.3	61.2	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	70.2	59.1	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5421776)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	69.6	53.7	97.0
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	73.3	63.3	107
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	98.3	58.3	120

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5425929)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	95.3	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5421776)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	64.9	53.9	95.5
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	71.6	57.8	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	69.0	50.5	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5425929)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	92.8	75.0	127
EP080: BTEXN (QCLot: 5425929)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	108	68.3	119
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	109	73.5	120
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	113	73.8	122
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	116	73.0	122
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	112	76.4	123
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	97.3	75.5	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5432341)							
EP2315892-014	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	120	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	124	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	121	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	120	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	122	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	115	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	123	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5432342)							
ES2339026-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	89.8	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5425929)							
ES2339107-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	94.5	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5425929)							

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5425929) - continued							
ES2339107-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	91.7	70.0	130
EP080: BTEXN (QCLot: 5425929)							
ES2339107-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	96.6	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	104	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	111	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	114	70.0	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	112	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	114	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2339232**	Page	: 1 of 4
Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Telephone	: +61-2-8784 8555
Project	: 23210	Date Samples Received	: 13-Nov-2023
Site	:	Issue Date	: 20-Nov-2023
Sampler	: Ross Kingswell	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)						
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	6	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	14	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)						
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	6	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	14	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
TRIP01	**10-Nov-2023**	**----**	----	**----**	**17-Nov-2023**	08-May-2024	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
TRIP01	**10-Nov-2023**	**----**	----	**----**	**20-Nov-2023**	08-Dec-2023	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
TRIP01	**10-Nov-2023**	**14-Nov-2023**	17-Nov-2023	✓	**17-Nov-2023**	24-Dec-2023	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
TRIP01	**10-Nov-2023**	**14-Nov-2023**	17-Nov-2023	✓	**17-Nov-2023**	24-Dec-2023	✓
Clear glass VOC vial - HCl (EP080)							
TRIP01	**10-Nov-2023**	**17-Nov-2023**	24-Nov-2023	✓	**17-Nov-2023**	24-Nov-2023	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
TRIP01	**10-Nov-2023**	**14-Nov-2023**	17-Nov-2023	✓	**17-Nov-2023**	24-Dec-2023	✓
Clear glass VOC vial - HCl (EP080)							
TRIP01	**10-Nov-2023**	**17-Nov-2023**	24-Nov-2023	✓	**17-Nov-2023**	24-Nov-2023	✓
EP080: BTEXN							
Clear glass VOC vial - HCl (EP080)							
TRIP01	**10-Nov-2023**	**17-Nov-2023**	24-Nov-2023	✓	**17-Nov-2023**	24-Nov-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	6	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	14	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	6	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	14	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270 Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2339232**

Client	: **REDITUS CONSULTING PTY LTD.**	Laboratory	: Environmental Division Sydney
Contact	: NATASHA PASLEY	Contact	: Customer Services ES
Address	: 1A/29-33 Waratah Street KIRRAWEE	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: natashapasley@reditus.com.au	E-mail	: ALSEnviro.Sydney@ALSGlobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: 23210	Page	: 1 of 2
Order number	: ----	Quote number	: EP2023REDITUS0001 (EN/333)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	:		
Sampler	: Ross Kingswell		

Dates

Date Samples Received	: 13-Nov-2023 15:45	Issue Date	: 13-Nov-2023
Client Requested Due Date	: 20-Nov-2023	Scheduled Reporting Date	: **20-Nov-2023**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 11.3, 11.6, 13.1'C - Ice Bricks present
Receipt Detail	: HARD ESKY	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - W-26 TRH/BTEXN/PAH/8 Metals
ES2339232-001	10-Nov-2023 00:00	TRIP01	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS

- A4 - AU Tax Invoice (INV)	Email	accounts@reditusconsulting.com

Esdat Deliverables

- EDI Format - ESDAT (ESDAT)	Email	reditusconsulting@esdat.com.au

NATASHA PASLEY

- *AU Certificate of Analysis - NATA (COA)	Email	natashapasley@reditus.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	natashapasley@reditus.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	natashapasley@reditus.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	natashapasley@reditus.com.au
- Chain of Custody (CoC) (COC)	Email	natashapasley@reditus.com.au
- EDI Format - ENMRG (ENMRG)	Email	natashapasley@reditus.com.au
- EDI Format - ESDAT (ESDAT)	Email	natashapasley@reditus.com.au

CHAIN OF CUSTODY FORM - Client

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08 8967 1201 | darwin@envirolab.com.au

Client: Reditus Consulting
Contact Person: Ross Kingswell
Project Mgr: Natasha Pasley
Sampler: Ross Kingswell
Address: Unit 1A, Level 1, 29-33 Waratah Street Kirrawee NSW
Phone: 02 9521 6567 Mob: 0426992391
Email Invoice To: accounts@reditusconsulting.com
Email Results To: natashapasley@reditus.com.au
rosskingswell@reditus.com.au

Client Project Name/Number/Site etc (ie report title): 23210
PO No.:
Envirolab Quote No. :
Date results required:
Or choose: standard
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Additional report format: esdat
Lab Comments:

Environmental Division Sydney
Work Order Reference
ES2339232
Telephone : +61-2-8784 8555

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Major Cations	Major Anions	Combo 3 (TRH, BTEX, PAHs, 8 heavy metals (dissolved))	Ionic Balance	Microbiological (E.coli)	Nutrients (ammonia, nitrate, total nitrogen, oxidised nitrogen, total phosphorus and reactive phosphorus)	Comments
1	MW01		10.11.23	Water	X	X	X	X	X	X	Provide as much information about the sample as you can
2	MW02		10.11.23	Water	X	X	X	X	X	X	
3	MW03		10.11.23	Water	X	X	X	X	X	X	
4	RB01		10.11.23	Water			X				
5	DUP01		10.11.23	Water			X				
6	TRIP01		10.11.23	Water			X				Please forward to ALS
				Sample Count	3	3	6	3	3	3	

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): Reditus
Print Name: Ross Kingswell
Date & Time: 10.11.23 4:30 PM
Signature: RK

Received by (Company): Envirolab
Print Name: Nancy Zhang
Date & Time: 10/11/2023 16:50
Signature:

Lab Use Only
Job number: 337552
Cooling: Ice / Ice pack / None
Temperature: 15°C
Security seal: Intact / Broken / None
TAT Req - SAME day / 1 / 2 / 3 / 4 / STD

Relinquished by ELS SYD
Grace Zhang
13/11/23 1100

Rec: [illegible]
13/11/23
1545

REDITUS

02 9521 6567
admin@reditusconsulting.com

Unit 1A, 29-33 Waratah Street,
Kirrawee NSW 2232

reditus.com.au

Annexure F: Limited Environmental Investigation Report by Geotech Services- Extracts for Hydrology report

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Geotest Services

ABN: 39 089 302 009
18/24 Garling Road, Kings Park NSW 2148
P (02) 9671 4443
E admin@geotestservices.com.au

Wednesday 6th October 2021

Our Ref. **33465-2**

853 Pacific Highway Pty Ltd
C/- Sanctuary Partners

Via email: nicholas@sanctuarypartners.com.au

Re: Limited Environmental Investigation, 849 – 859 Pacific Hwy & 2 Wilson Street Chatswood NSW 2067

1. INTRODUCTION

This report presents the results of a Limited Environmental Site Investigation undertaken by Geotest Services Pty Ltd (Geotest) at the Site. This report was commissioned by Sanctuary Partners to characterise environmental and geotechnical ground conditions at the Site in support the clients' acquisition of the Site. A geotechnical report (ref. 33465-1) has been prepared and should be read separately to this report.

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The Site comprises four registered lots. Their respective street identification and approximate area is within the table below:

Lot Identification	Street Identification	Approx. Area (m^2)	Site plan
SP1496	849 Pacific Hwy Chatswood	900	
SP60178	853 Pacific Hwy Chatswood	760	
SP10110	859 Pacific Hwy Chatswood	730	
SP522947	2 Wilson Street Chatswood	725	

The comprised area of investigation across the four registered lots is approximately ~3,115m^2. The lots all have a boundary to the Pacific Hwy (west), with Wilson Street and O'Brien Street (north and south) respectively. Taken from a central location within the comprised site, the following geographical coordinates were measured on the NSW Department of Lands website: -33.793027 S, 151.180245 E.

The locality of the Site and borehole locations is presented in Figure 1.

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2. OBJECTIVES

The objective of this investigation was to identify preliminary environmental contamination risks at the Site from a scope of works that included a limited desktop assessment, select intrusive site works and limited environmental sampling and analysis program.

3. SCOPE OF WORKS

The following scope of works was undertaken to address the objective:

- Limited desktop assessment
- Site inspection
- Four boreholes undertaken with drill rig
- Sample collection
- NATA laboratory analysis for broad chemical screen
- Interpretation of results and preparation of this report

4. LIMITED DESKTOP ASSESSMENT

Regional Geology

Published information indicates that the Site is underlain by rock formations of the Wianamatta Group, principally shale.

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Regional Topography and Drainage

The NSW Department of Lands Spatial Information Exchange maps (SIX Maps, http://imagery.maps.nsw.gov.au) indicates that the Site lies at an elevation of approximately 100 metres Australian Height Datum (AHD). It is expected that Site surface waters would either percolate into sub-surface soils (where permeability allows) or become run-off and generally drain off-site to the street drainage on the western and southern boundaries.

Regional Hydrogeology

A search for registered groundwater monitoring bores within a 500m radius of the Site was undertaken using the NSW Department of Primary Industries department for Water (DPI Water) online resource, 'All Groundwater Map' (http://allwaterdata.water.nsw.gov.au/) on 2nd October 2021. The results of the searches did not identify any registered groundwater bores located within the 500-metre search radius. There was insufficient data available to make a desktop assessment of likely depth to groundwater or the expected yield on the Site.

Acid Sulfate Soils

The Department of Land and Water Conservation (DLWC) has a platform for searching Acid Sulfate Soils in Australia. The National Acid Sulfate Soils Atlas was developed by the Australian government (in conjunction with Commonwealth Scientific and Industrial Research Organisation CSIRO - http://www.asris.csiro.au/).

The results of the search indicated that the Site is situated in an area where there is a very low probability of ASS and no known occurrence. The site is not likely to be affected by ASS. Furthermore, the site is situated at an approx. elevation of 100 m AHD. The presence of acid sulfate soils is generally limited to elevations less than 10m AHD.

Is it considered that ASS or potential ASS is unlikely to be present at the Site.

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NSW Office of Environment and Heritage Contaminated Land Record

Geotest conducted a search NSW Office of Environment (OEH) contaminated land record information on the 2nd October 2021. The searches did not identify any contaminated land record for the Site or for the properties located adjacent to the Site.

NSW EPA POEO Public Register Search

Geotest conducted a search of POEO records for Environment Protection licences, applications, notices, audits or pollution studies and reduction programs within vicinity of the site on 2nd October 2021. No records for the Site or within the immediately vicinity of the Site was identified.

Historical Photography

Geotest reviewed the publicly available aerial photographs for the site made available via NSW Government Department of Finance, Services and Innovation (https://portal.spatial.nsw.gov.au/portal/apps/). Geotest makes the following comments regarding land use at the site and surrounding the site:

1943	**1965**	**1970**
1986	**2005**	**2015**

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As it can be seen from the above imagery the site has been primarily used for residential purposes. The current light industrial building is present to the east since 1970. The north-shore train line is further east. O'Brien Street is to the south, and Chatswood CBD further south. The Pacific Highway and residential areas to the West and North. The Shell (Coles Express) service station is present approximately 80m to the north of the Site.

Site Walkover

A site walkover was conducted on the 20th September 2021 and the following general site observations and potential environmental contamination risks were observed:

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- All the individual lots are being used for high density residential purposes (apartments)
- The apartments present are of varying ages. 2 Wilson St appears to be most recently constructed building
    - It can be assumed that hazardous materials (eg. lead and asbestos products) were used as part of building construction and may be present in the 849 – 859 Pacific Hwy buildings
- Both 2 Wilson St & 853 Pacific Hwy had underground parking basements (no access)
- The building to the east appeared to be an at grade, light-industrial warehouse/ office. The building was occupied
- No underground or above ground storage tanks (eg. petrol or diesel) were observed
- No obvious visual or olfactory contamination indicators (eg. spills, wastes, staining or odours) were observed
- Vegetation at the site was in a good condition with no signs of extensive stress or dieback
- Some elevated gardens and landscaping were present, typical with residential land use. It is assumed that fill (in addition to other topsoils across the site) is present within these areas.

5. ENVIRONMENTAL RISK AREAS

Item	AEC	COPC	Mitigation Strategy
1	Footprints of former structures and deteriorated HAZMAT material	Asbestos, Metals (8), asbestos, elevated foreign materials in or on soils	Ensure all material picked up prior to demolition. Ensure demolition is undertaken to high standard – not cross-contaminating ground
2	Fill under building footprints, behind retaining/ structural walls or any other uncontrolled fill area	Asbestos, Metals (8), PAH, TRH, BTEX, OCP, PCB, asbestos, elevated foreign materials in soils	Following demolition of above ground structures, investigate footprint and basement areas
3	Adjacent industrial uses including light-industrial office to the east and service station further to the north	Asbestos, Metals (8), PAH, TRH, BTEX, PCB	Undertake intrusive investigation including locations nearest to boundaries of potential source

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6. FIELD WORK

Sampling

A total of four borehole locations were undertaken as part of client-guided geotechnical investigations at the Site. Due to access constraints no boreholes were conducted in 2 Wilson St. The existing building footprints occupy most of the site area across all lots. Therefore, the most accessible locations outside the footprints were utilised and to target adjoining property land uses. Based on the site history and current site features this was considered acceptable to address the objectives of the investigation.

Sampling was carried out on 24th September 2021 by a suitably experienced environmental scientist from Geotest Services. The boreholes were undertaken using a track mounted geo-probe drill rig. Samples were collected directly from the auger/ sample recovery tool. The boreholes were logged by a suitably experienced geotechnical engineer. The boreholes were terminated following confirmation of adequate investigation, discovery of natural soils, or refusal onto bedrock.

Soil samples were placed into laboratory supplied glass jars with Teflon lined seals to limit volatile loss and plastic zip locked bags. The samples were placed into an ice-brick chilled cooler. The samples were dispatched to a NATA accredited laboratory under chain of custody protocols.

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Areas not investigated

Due to the ongoing use of the Site for high-density residential occupancy, the building footprints, elevated landscaped areas, and areas surrounding underground infrastructure were not investigated. These areas should be investigated following demolition.

Laboratory Analysis

Samples were submitted to Eurofins, Lane Cove (#827443) laboratory analysis for the relevant contaminants of potential concern.

Sample Preservation and Storage

Sample storage and preservation is presented in the table below:

Analyte	Sample Volume and Container	Preservative	Storage
Organics/ inorganics (soil)	250ml glass & Teflon lined lid	Nil	Insulated container with ice
Asbestos	Sealed plastic zip lock bag	Nil	With the samples above

The sample containers were transported to the NATA accredited analytical laboratory with the Chain of Custody (COC) form, recording the following information:

- project reference;
- date of sampling;
- sample identification;
- matrix and container details;
- preservation method;
- name of sampler;
- required analysis;
- turnaround times required; and
- signatures of sender and receiving laboratory.

A copy of the COC was kept in the project file. Samples were transported to the laboratory with sufficient time to perform analysis within the applicable holding period.

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Reported Data Quality Conclusion

Based on our data quality evaluation including third-party historical data, field data and laboratory data, we consider the data in this investigation to be suitable for its intended purpose.

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7. RESULTS

Site Specific Geology

Generally, a residual clay profile overlain by a thin layer of uncontrolled fill/ topsoil (up to 0.5m) and underlain by shale bedrock was encountered. The geology at the site can be broadly described as:

Topsoil: Clayey Silt, dark grey

Silty CLAY, high plasticity, dark brown, red, light grey, some ironstone bands

SHALE, brown and grey, extremely to distinctly weathered, very low to medium strength

It is likely that encountered filling was associated with re-contouring, retaining and landscaping of the site following building construction.

Borehole locations are shown in Figure 1.

Visual and Olfactory Observations

The Site was free of widespread, significant offensive visual or olfactory contamination indicators. The table below indicates the recorded depths of fill at the site:

TABLE 10.2

Borehole ID	Total Depth of fill recorded (approx., m, bgl)	Elevated foreign materials or asbestos identified (Y / N)
BH1	0.0-0.4	N
BH2	0.0-0.6	N
BH3	0.2-0.6	N
BH4	0.11-0.31	N

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The fill was observed to be free from any visual and olfactory contamination indicators. Some asphaltic concrete fines and light concrete rubble was identified to comprise the fill in select bore holes. These foreign inclusions were observed in very low quantities and were not considered to be aesthetically unsuitable.

Groundwater

Groundwater was not encountered in any of the boreholes undertaken to a maximum depth of 7.5m bgl.

Reported Laboratory Results

The laboratory results (Eurofins Report # are summarised below including maximum concentrations. The results were compared to the most conservative published site contamination criteria under NEPM 2013 for reference.

Metals

The results for metals in soils were all less than the adopted site reference criteria for human health in a standard residential land use setting. Lead was equal to the most conservative human health criteria (HIL-A Sensitive Residential) within sample BH03-1_1.4m (300mg/kg).

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Analyte	Units	PQL	NEPM HIL A (2013) #	NEPM EIL (2013) 'aged' (Col 2)	BH01-1 0.3M	BH02-1 0.5M	BH03-1 0.4M	BH04-1 0.2M
Arsenic	mg/kg	<2	**100**	**100**	**6.2**	**5.2**	**9.5**	**7.1**
Cadmium	mg/kg	<0.4	**20**	**-**	**< 0.4**	**< 0.4**	**< 0.4**	**< 0.4**
Chromium total (Chromium VI, if relevant)	mg/kg	<5	**100**	**400**	**29**	**22**	**40**	**30**
Copper	mg/kg	<5	**6000**	**230**	**19**	**39**	**210**	**10**
Lead	mg/kg	<5	**300**	**1100**	**130**	**110**	**300**	**110**
Mercury	mg/kg	<0.1	**40**	**-**	**0.3**	**< 0.1**	**1.7**	**0.3**
Nickel	mg/kg	<5	**400**	**560**	**5.5**	**14**	**6**	**< 5**
Zinc	mg/kg	<5	**7400**	**1300**	**140**	**300**	**260**	**67**

OCP/OPP

The concentrations of aldrin, dieldrin, chlordane, DDT, DDD, DDE and heptachlor in the samples analysed were all below the laboratory LOR. All OCP concentrations were below the adopted site criteria for human and ecological health.

PCB

The concentrations of PCB were all below LOR. The LOR is less than the adopted site threshold criteria.

PAHs

The samples analysed for PAHs were generally below LOR. This is except for BH03-1_1.4m which reported PAHs as shown below.

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Analyte	Units	PQL	NEPM HIL A (2013) #	NEPM EIL (2013) 'aged' (Col 2)	BH01-1 0.3M	BH02-1 0.5M	BH03-1 0.4M	BH04-1 0.2M
Acenaphthene	mg/kg	< 0.5			< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	mg/kg	< 0.5			< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	mg/kg	< 0.5			< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	mg/kg	< 0.5			< 0.5	< 0.5	1.2	< 0.5
Benzo(a)pyrene	mg/kg	< 0.5	**3**	**0.7^**	< 0.5	< 0.5	1.2	< 0.5
Benzo(a)pyrene TEQ (lower bound)*	mg/kg	< 0.5	**3**		< 0.5	< 0.5	1.6	< 0.5
Benzo(a)pyrene TEQ (medium bound)*	mg/kg	<0.6	**3**		0.6	0.6	1.9	0.6
Benzo(a)pyrene TEQ (upper bound)*	mg/kg	<1.2	**3**		1.2	1.2	2.1	1.2
Benzo(b&j)fluoranthene	mg/kg	< 0.5			< 0.5	< 0.5	0.8	< 0.5
Benzo(g.h.i)perylene	mg/kg	< 0.5			< 0.5	< 0.5	0.9	< 0.5
Benzo(k)fluoranthene	mg/kg	< 0.5			< 0.5	< 0.5	1.3	< 0.5
Chrysene	mg/kg	< 0.5			< 0.5	< 0.5	1	< 0.5
Dibenz(a.h)anthracene	mg/kg	< 0.5			< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	mg/kg	< 0.5			< 0.5	< 0.5	1.2	< 0.5
Fluorene	mg/kg	< 0.5			< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			< 0.5	< 0.5	0.9	< 0.5
Naphthalene	mg/kg	< 0.5			< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	mg/kg	< 0.5			< 0.5	< 0.5	0.6	< 0.5

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Pyrene	mg/kg	< 0.5			< 0.5	< 0.5	1.4	< 0.5
Total PAH	mg/kg	< 0.5	**300**		< 0.5	< 0.5	10.5	< 0.5

^NEPM Column 2 2013 EIL Criteria adopting coarse grained soils

The results are all less than the adopted conservative ecological health reference criteria with exception to sample BH03-1_1.4m for B(a)P. This exceedance does not pose a risk due to the nature of asphaltic concrete material within the fill and having low bioavailability for phytotoxic uptake.

TRH & BTEX

The samples analysed for TRH and BTEX generally reported concentrations below LOR. The LOR is less than the adopted site threshold criteria.

Analyte	Units	PQL	NEPM HIL A (2013) #	NEPM EIL (2013) 'aged' (Col 2)	BH01-1 0.3M	BH02-1 0.5M	BH03-1 0.4M	BH04-1 0.2M
Benzene	mg/kg	< 0.1	**0.5**	**65^**	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	mg/kg	< 0.1	**55**	**125^**	< 0.1	< 0.1	< 0.1	< 0.1
o-Xylene	mg/kg	< 0.1	**40**	**45^**	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	mg/kg	< 0.1	**160**	**105^**	< 0.1	< 0.1	< 0.1	< 0.1
Naphthalene	mg/kg	< 0.5	**3**	**170**	< 0.5	< 0.5	< 0.5	< 0.5
TRH >C10-C16	mg/kg	< 50	**110**	**120^**	< 50	< 50	< 50	< 50
TRH >C16-C34	mg/kg	< 100		**1,300^**	130	210	290	< 100
TRH >C34-C40	mg/kg	< 100		**5,600^**	< 100	< 100	120	< 100
TRH C6-C10	mg/kg	< 20	**45**	**180^**	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)	mg/kg	< 20			< 20	< 20	< 20	< 20

^NEPM Table 1B(6) ESLs TPH fractions F1 – F4, BTEX and benzo(a)pyrene in soil adopting fine grained

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Asbestos

Asbestos was not detected at the LOR in any of the samples.

8. DISCUSSION

Soils – Human Health

The results of the laboratory analysis indicate that the chemical concentrations of the contaminants of potential concern in soils at the sampling locations did not exceed the most conservative human health assessment criteria (HIL-A). Further, no asbestos was detected in any of the samples.

Soils – Aesthetics

The field observations of all the boreholes did not display any aesthetically unsuitable soils. No visual or olfactory contamination indicators were observed.

Soils – Ecological Environments

Generally, all reported results were less than the conservative EIL and ESLs adopted for metal and volatile compounds. At BH03-1_1.4m Benzo(a)pyrene was reported above the criteria. This is likely associated with minor asphaltic concrete material

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in surface profiles. The NEPM 2013 notes that where B(a)P is present as a result of bituminous material, bioavailability of this material is low and is not considered to pose a risk to sensitive receptors.

Groundwater

Groundwater was not encountered during the field program. Groundwater monitoring was not a part of this scope of works. Based on the environmental results presented above we do not consider the requirement for groundwater investigation to be required. This report has not identified any potential significant contamination sources impacting groundwater at the site, nor the likelihood of any current or future groundwater use at the site. During further phases of investigation and remediation work at the site however, should a requirement for groundwater investigation or management be required it should be undertaken by an experienced consultant and give consideration to the results reported within this report.

9. CONCLUSION

Geotest concludes that; based on the limited desktop assessment, site walkover and field-sampling program that the site presents a low risk of contamination. The site can be considered suitable for sensitive residential land uses (HIL-A).

Further assessment of areas not previously investigated is required following the demolition of buildings at the Site.

This report should be read in conjunction with its limitations.

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10. REFERENCES

- NEPM 'National Environmental Protection (Assessment of Site Contamination) Measure 1999 (April 2013), EPHC 2013, Canberra, incorporating CRC Care 2012.
- NSW EPA 2017, 'Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd edition)' ISBN 978 1 928088 23 8, Environmental Protection Authority NSW.

11. LIMITATIONS

Geotest Services Pty Ltd works at the site is based on a specific scope of investigation and upon the program of surface and/or subsurface screening and/or laboratory testing of samples. The findings of this report are based on site conditions existing at the time of the inspection. On this basis, Geotest Services Pty Ltd cannot provide unqualified warranties or assume liability for site conditions not observed and/or not accessible during the time of its investigation. Despite all reasonable care and diligence, the conditions encountered and concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. On this basis, conclusions have been made from a limited number of observation points assuming that the geological and chemical conditions are representative. No other warranties are made or intended.

This report and associated document has been prepared solely for the use the engaging client and it's interested parties for the purpose of a limited environmental investigation. Any reliance assumed on this report shall be at each such party's own risk. Any ensuing liability resulting from use of the report by third parties cannot be transferred to Geotest Services Pty Ltd.

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12. CLOSING

Geotest trusts this report is satisfactory to your needs. Should you require further information, please do not hesitate to contact the undersigned.

For and on behalf of Geotest Services Pty Ltd.

David Spasojevic

General Manager

Attachments

1. Figure 1 - site locality and borehole locations
2. Site photographs
3. Eurofins Laboratory Certificate of Analysis #827443

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1. FIGURE 1; SITE LOCALITY & BOREHOLE LOCATIONS

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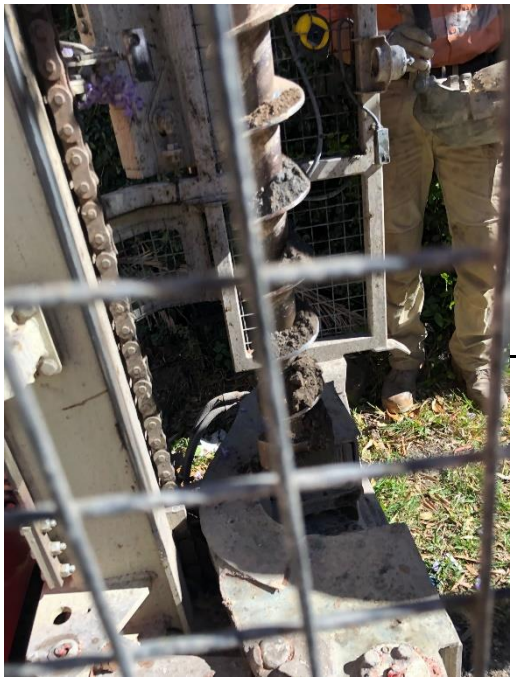
2. SITE PHOTOGRAPHS



Typical near surface topsoil/fill

Weathered shale being augered

Geoprobe drill rig at BH02

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3. LABORATORY CERTIFICATE OF ANALYSIS

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eurofins | Environment Testing

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Geotest Services
Unit 18/24 Garling Rd
Kings Park
NSW 2148

Attention: **Alan Halpin CC Results/SRA/Invoices**

Report **827443-S**
Project name COWMAN 2 WILSON ST CHATSWOOD
Project ID 33465-2
Received Date Sep 24, 2021

Client Sample ID			**BH01-1 0.3M**	**BH02-1 0.5M**	**BH03-1 0.4M**	**BH04-1 0.2M**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S21-Se52112**	**S21-Se52113**	**S21-Se52114**	**S21-Se52115**
Date Sampled			**Sep 24, 2021**	**Sep 24, 2021**	**Sep 24, 2021**	**Sep 24, 2021**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	77	120	180	69
TRH C29-C36	50	mg/kg	110	140	180	< 50
TRH C10-C36 (Total)	50	mg/kg	187	260	360	69
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	130	210	290	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	120	< 100
TRH >C10-C40 (total)*	100	mg/kg	130	210	410	< 100
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	61	84	79	89
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	1.6	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	1.9	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	2.1	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	1.2	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	1.2	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	0.8	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	0.9	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	1.3	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	1.0	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

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Client Sample ID			BH01-1 0.3M	BH02-1 0.5M	BH03-1 0.4M	BH04-1 0.2M
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S21-Se52112	S21-Se52113	S21-Se52114	S21-Se52115
Date Sampled			Sep 24, 2021	Sep 24, 2021	Sep 24, 2021	Sep 24, 2021
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	1.2	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	0.9	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	0.6	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	1.4	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	10.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	72	57	70	82
p-Terphenyl-d14 (surr.)	1	%	66	50	64	82
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-HCH	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-HCH (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	59	50	60	87
Tetrachloro-m-xylene (surr.)	1	%	71	53	66	81
Polychlorinated Biphenyls						
Aroclor-1016	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1221	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1232	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1242	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1248	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1254	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1260	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Total PCB*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	59	50	60	87
Tetrachloro-m-xylene (surr.)	1	%	71	53	66	81

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Client Sample ID			BH01-1 0.3M	BH02-1 0.5M	BH03-1 0.4M	BH04-1 0.2M
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S21-Se52112	S21-Se52113	S21-Se52114	S21-Se52115
Date Sampled			Sep 24, 2021	Sep 24, 2021	Sep 24, 2021	Sep 24, 2021
Test/Reference	LOR	Unit				
Heavy Metals						
Arsenic	2	mg/kg	6.2	5.2	9.5	7.1
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	29	22	40	30
Copper	5	mg/kg	19	39	210	10
Lead	5	mg/kg	130	110	300	110
Mercury	0.1	mg/kg	0.3	< 0.1	1.7	0.3
Nickel	5	mg/kg	5.5	14	6.0	< 5
Zinc	5	mg/kg	140	300	260	67
% Moisture	1	%	14	12	22	23

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Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Sep 30, 2021	14 Days
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Sep 30, 2021	14 Days
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Sep 30, 2021	14 Days
BTEX - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Sep 30, 2021	14 Days
Polycyclic Aromatic Hydrocarbons - Method: LTM-ORG-2130 PAH and Phenols in Soil and Water	Sydney	Sep 30, 2021	14 Days
Metals M8 - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Sep 30, 2021	28 Days
Organochlorine Pesticides - Method: LTM-ORG-2220 OCP & PCB in Soil and Water	Sydney	Sep 30, 2021	14 Days
Polychlorinated Biphenyls - Method: LTM-ORG-2220 OCP & PCB in Soil and Water	Sydney	Sep 30, 2021	28 Days
% Moisture - Method: LTM-GEN-7080 Moisture	Sydney	Sep 27, 2021	14 Days

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Company Name: Geotest Services
Address: Unit 18/24 Garling Rd
Kings Park
NSW 2148

Project Name: COWMAN 2 WILSON ST CHATSWOOD
Project ID: 33465-2

Order No.:
Report #: 827443
Phone: 02 9671 4443
Fax: 02 9671 4343

Received: Sep 24, 2021 2:39 PM
Due: Oct 1, 2021
Priority: 5 Day
Contact Name: Alan Halpin CC

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Asbestos - AS4964	HOLD	Suite B13: OCP/PCB	Moisture Set	Eurofins Suite B7
Melbourne Laboratory - NATA # 1261 Site # 1254										
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X	X	X
Brisbane Laboratory - NATA # 1261 Site # 20794										
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
1	BH01-1 0.3M	Sep 24, 2021		Soil	S21-Se52112	X		X	X	X
2	BH02-1 0.5M	Sep 24, 2021		Soil	S21-Se52113	X		X	X	X
3	BH03-1 0.4M	Sep 24, 2021		Soil	S21-Se52114	X		X	X	X
4	BH04-1 0.2M	Sep 24, 2021		Soil	S21-Se52115	X		X	X	X
5	BH01-2 0.7M	Sep 24, 2021		Soil	S21-Se52116		X			
6	BH02-2 1.0M	Sep 24, 2021		Soil	S21-Se52117		X			
7	BH03-2 0.8M	Sep 24, 2021		Soil	S21-Se52118		X			
8	BH04-2 0.5M	Sep 24, 2021		Soil	S21-Se52119		X			
Test Counts						4	4	4	4	4

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

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QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs..

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM where no positive PFAS results have been reported have been reviewed and no data was affected.

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QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

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Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total*	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4.4'-DDD	mg/kg	< 0.05			0.05	Pass	
4.4'-DDE	mg/kg	< 0.05			0.05	Pass	
4.4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-HCH	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-HCH	mg/kg	< 0.05			0.05	Pass	
d-HCH	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	

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Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-HCH (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.05			0.05	Pass	
Toxaphene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Polychlorinated Biphenyls							
Aroclor-1016	mg/kg	< 0.1			0.1	Pass	
Aroclor-1221	mg/kg	< 0.1			0.1	Pass	
Aroclor-1232	mg/kg	< 0.1			0.1	Pass	
Aroclor-1242	mg/kg	< 0.1			0.1	Pass	
Aroclor-1248	mg/kg	< 0.1			0.1	Pass	
Aroclor-1254	mg/kg	< 0.1			0.1	Pass	
Aroclor-1260	mg/kg	< 0.1			0.1	Pass	
Total PCB*	mg/kg	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons							
TRH C6-C9	%	102			70-130	Pass	
TRH C10-C14	%	100			70-130	Pass	
Naphthalene	%	106			70-130	Pass	
TRH C6-C10	%	100			70-130	Pass	
TRH >C10-C16	%	98			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	107			70-130	Pass	
Toluene	%	101			70-130	Pass	
Ethylbenzene	%	105			70-130	Pass	
m&p-Xylenes	%	106			70-130	Pass	
o-Xylene	%	106			70-130	Pass	
Xylenes - Total*	%	106			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	95			70-130	Pass	
Acenaphthylene	%	107			70-130	Pass	
Anthracene	%	95			70-130	Pass	
Benz(a)anthracene	%	95			70-130	Pass	
Benzo(a)pyrene	%	97			70-130	Pass	
Benzo(b&j)fluoranthene	%	98			70-130	Pass	
Benzo(g.h.i)perylene	%	130			70-130	Pass	
Benzo(k)fluoranthene	%	102			70-130	Pass	
Chrysene	%	97			70-130	Pass	

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Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Dibenz(a.h)anthracene			%	125			70-130	Pass	
Fluoranthene			%	91			70-130	Pass	
Fluorene			%	98			70-130	Pass	
Indeno(1.2.3-cd)pyrene			%	122			70-130	Pass	
Naphthalene			%	98			70-130	Pass	
Phenanthrene			%	92			70-130	Pass	
Pyrene			%	93			70-130	Pass	
LCS - % Recovery									
Organochlorine Pesticides									
Chlordanes - Total			%	101			70-130	Pass	
4.4'-DDD			%	117			70-130	Pass	
4.4'-DDE			%	93			70-130	Pass	
4.4'-DDT			%	100			70-130	Pass	
a-HCH			%	106			70-130	Pass	
Aldrin			%	94			70-130	Pass	
b-HCH			%	113			70-130	Pass	
d-HCH			%	108			70-130	Pass	
Dieldrin			%	113			70-130	Pass	
Endosulfan I			%	109			70-130	Pass	
Endosulfan II			%	121			70-130	Pass	
Endosulfan sulphate			%	73			70-130	Pass	
Endrin			%	82			70-130	Pass	
Endrin aldehyde			%	100			70-130	Pass	
Endrin ketone			%	88			70-130	Pass	
g-HCH (Lindane)			%	113			70-130	Pass	
Heptachlor			%	82			70-130	Pass	
Heptachlor epoxide			%	107			70-130	Pass	
Hexachlorobenzene			%	89			70-130	Pass	
Methoxychlor			%	102			70-130	Pass	
LCS - % Recovery									
Polychlorinated Biphenyls									
Aroclor-1016			%	83			70-130	Pass	
Aroclor-1260			%	100			70-130	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic			%	99			80-120	Pass	
Cadmium			%	99			80-120	Pass	
Chromium			%	100			80-120	Pass	
Copper			%	99			80-120	Pass	
Lead			%	100			80-120	Pass	
Mercury			%	97			80-120	Pass	
Nickel			%	100			80-120	Pass	
Zinc			%	99			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Total Recoverable Hydrocarbons				Result 1					
TRH C6-C9	S21-Se61600	NCP	%	95			70-130	Pass	
Naphthalene	S21-Se61600	NCP	%	94			70-130	Pass	
TRH C6-C10	S21-Se61600	NCP	%	94			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S21-Se61600	NCP	%	102			70-130	Pass	
Toluene	S21-Se61600	NCP	%	95			70-130	Pass	
Ethylbenzene	S21-Se61600	NCP	%	99			70-130	Pass	

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Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
m&p-Xylenes	S21-Se61600	NCP	%	100			70-130	Pass	
o-Xylene	S21-Se61600	NCP	%	100			70-130	Pass	
Xylenes - Total*	S21-Se61600	NCP	%	100			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S21-Se49974	NCP	%	72			70-130	Pass	
Acenaphthylene	S21-Se49974	NCP	%	76			70-130	Pass	
Anthracene	S21-Se50880	NCP	%	96			70-130	Pass	
Benz(a)anthracene	S21-Se50880	NCP	%	97			70-130	Pass	
Benzo(a)pyrene	S21-Se50880	NCP	%	100			70-130	Pass	
Benzo(b&j)fluoranthene	S21-Se50880	NCP	%	104			70-130	Pass	
Benzo(g.h.i)perylene	S21-Se49974	NCP	%	74			70-130	Pass	
Benzo(k)fluoranthene	S21-Se49974	NCP	%	73			70-130	Pass	
Chrysene	S21-Se49974	NCP	%	76			70-130	Pass	
Dibenz(a.h)anthracene	S21-Se50880	NCP	%	122			70-130	Pass	
Fluoranthene	S21-Se50880	NCP	%	92			70-130	Pass	
Fluorene	S21-Se50880	NCP	%	101			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S21-Se49974	NCP	%	70			70-130	Pass	
Naphthalene	S21-Se49974	NCP	%	79			70-130	Pass	
Phenanthrene	S21-Se50880	NCP	%	99			70-130	Pass	
Pyrene	S21-Se50880	NCP	%	94			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
Chlordanes - Total	S21-Se49974	NCP	%	80			70-130	Pass	
4.4'-DDD	S21-Se49974	NCP	%	78			70-130	Pass	
4.4'-DDE	S21-Se50880	NCP	%	87			70-130	Pass	
4.4'-DDT	S21-Se50880	NCP	%	83			70-130	Pass	
a-HCH	S21-Se50880	NCP	%	98			70-130	Pass	
Aldrin	S21-Se50880	NCP	%	84			70-130	Pass	
b-HCH	S21-Se50880	NCP	%	107			70-130	Pass	
d-HCH	S21-Se50880	NCP	%	105			70-130	Pass	
Dieldrin	S21-Se50880	NCP	%	116			70-130	Pass	
Endosulfan I	S21-Se50880	NCP	%	98			70-130	Pass	
Endosulfan II	S21-Se50880	NCP	%	114			70-130	Pass	
Endosulfan sulphate	S21-Se56583	NCP	%	70			70-130	Pass	
Endrin	S21-Se50880	NCP	%	73			70-130	Pass	
Endrin aldehyde	S21-Se49974	NCP	%	112			70-130	Pass	
Endrin ketone	S21-Se50880	NCP	%	72			70-130	Pass	
g-HCH (Lindane)	S21-Se49974	NCP	%	84			70-130	Pass	
Heptachlor	S21-Se50880	NCP	%	79			70-130	Pass	
Heptachlor epoxide	S21-Se49974	NCP	%	80			70-130	Pass	
Hexachlorobenzene	S21-Se49974	NCP	%	71			70-130	Pass	
Methoxychlor	S21-Se49974	NCP	%	78			70-130	Pass	
Spike - % Recovery									
Polychlorinated Biphenyls				Result 1					
Aroclor-1016	S21-Se49974	NCP	%	85			70-130	Pass	
Aroclor-1260	S21-Se49974	NCP	%	91			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S21-Se50896	NCP	%	93			75-125	Pass	
Cadmium	S21-Se50896	NCP	%	93			75-125	Pass	
Chromium	S21-Se50896	NCP	%	85			75-125	Pass	
Copper	S21-Se50896	NCP	%	91			75-125	Pass	
Lead	S21-Se50896	NCP	%	98			75-125	Pass	

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Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Mercury	S21-Se50896	NCP	%	93			75-125	Pass	
Nickel	S21-Se50896	NCP	%	88			75-125	Pass	
Zinc	S21-Se50896	NCP	%	95			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C6-C9	S21-Se61595	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Naphthalene	S21-Se61595	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S21-Se61595	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S21-Se61595	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S21-Se61595	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S21-Se61595	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S21-Se61595	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S21-Se61595	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total*	S21-Se61595	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Toxaphene	S21-Se50879	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S21-Se50895	NCP	mg/kg	10	7.4	29	30%	Pass	
Cadmium	S21-Se50895	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S21-Se50895	NCP	mg/kg	23	17	29	30%	Pass	
Copper	S21-Se50895	NCP	mg/kg	110	99	9.0	30%	Pass	
Lead	S21-Se50895	NCP	mg/kg	38	35	8.0	30%	Pass	
Mercury	S21-Se50895	NCP	mg/kg	0.2	0.2	14	30%	Pass	
Nickel	S21-Se50895	NCP	mg/kg	8.5	8.3	2.0	30%	Pass	
Zinc	S21-Se50895	NCP	mg/kg	180	180	1.0	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C10-C14	S21-Se52114	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S21-Se52114	CP	mg/kg	180	230	20	30%	Pass	
TRH C29-C36	S21-Se52114	CP	mg/kg	180	190	9.0	30%	Pass	
TRH >C10-C16	S21-Se52114	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S21-Se52114	CP	mg/kg	290	350	17	30%	Pass	
TRH >C34-C40	S21-Se52114	CP	mg/kg	120	120	4.0	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S21-Se52114	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S21-Se52114	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S21-Se52114	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S21-Se52114	CP	mg/kg	1.2	1.7	39	30%	Fail	Q15
Benzo(a)pyrene	S21-Se52114	CP	mg/kg	1.2	1.7	33	30%	Fail	Q15
Benzo(b&j)fluoranthene	S21-Se52114	CP	mg/kg	0.8	1.1	34	30%	Fail	Q15
Benzo(g.h.i)perylene	S21-Se52114	CP	mg/kg	0.9	1.2	34	30%	Fail	Q15
Benzo(k)fluoranthene	S21-Se52114	CP	mg/kg	1.3	1.8	34	30%	Fail	Q15
Chrysene	S21-Se52114	CP	mg/kg	1.0	1.5	38	30%	Fail	Q15
Dibenz(a.h)anthracene	S21-Se52114	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S21-Se52114	CP	mg/kg	1.2	2.2	61	30%	Fail	Q15
Fluorene	S21-Se52114	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S21-Se52114	CP	mg/kg	0.9	1.2	33	30%	Fail	Q15
Naphthalene	S21-Se52114	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

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Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Phenanthrene	S21-Se52114	CP	mg/kg	0.6	1.4	73	30%	Fail	Q15
Pyrene	S21-Se52114	CP	mg/kg	1.4	2.2	47	30%	Fail	Q15
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-HCH	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-HCH	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-HCH	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-HCH (Lindane)	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S21-Se52114	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Polychlorinated Biphenyls				Result 1	Result 2	RPD			
Aroclor-1016	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1221	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1232	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1242	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1248	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1254	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1260	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Total PCB*	S21-Se52114	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S21-Se52114	CP	%	22	25	12	30%	Pass	

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Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Andrew Black	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
John Nguyen	Senior Analyst-Metal (NSW)
Roopesh Rangarajan	Senior Analyst-Volatile (NSW)

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Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

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Geotest Services
Unit 18/24 Garling Rd
Kings Park
NSW 2148

Attention:	Alan Halpin CC Results/SRA/Invoices
Report	827443-AID
Project Name	COWMAN 2 WILSON ST CHATSWOOD
Project ID	33465-2
Received Date	Sep 24, 2021
Date Reported	Oct 05, 2021

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence NATA Accreditation does not cover the performance of this service (non-NATA results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

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Project Name COWMAN 2 WILSON ST CHATSWOOD
Project ID 33465-2
Date Sampled Sep 24, 2021
Report 827443-AID

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
BH01-1 0.3M	21-Se52112	Sep 24, 2021	Approximate Sample 46g Sample consisted of: Brown coarse-grained clayey-sandy soil, organic debris and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
BH02-1 0.5M	21-Se52113	Sep 24, 2021	Approximate Sample 99g Sample consisted of: Brown coarse-grained clayey-sandy soil, coal, bitumen and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
BH03-1 0.4M	21-Se52114	Sep 24, 2021	Approximate Sample 101g Sample consisted of: Brown coarse-grained clayey-sandy soil, coal, bitumen and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
BH04-1 0.2M	21-Se52115	Sep 24, 2021	Approximate Sample 116g Sample consisted of: Brown coarse-grained clayey soil, bitumen and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.

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Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Sydney	Sep 27, 2021	Indefinite

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43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

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Company Name:	Geotest Services	**Order No.:**		**Received:**	Sep 24, 2021 2:39 PM
Address:	Unit 18/24 Garling Rd Kings Park NSW 2148	**Report #:**	827443	**Due:**	Oct 1, 2021
		Phone:	02 9671 4443	**Priority:**	5 Day
		Fax:	02 9671 4343	**Contact Name:**	Alan Halpin CC
Project Name:	COWMAN 2 WILSON ST CHATSWOOD				
Project ID:	33465-2				

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Asbestos - AS4964	HOLD	Suite B13: OCP/PCB	Moisture Set	Eurofins Suite B7
Melbourne Laboratory - NATA # 1261 Site # 1254										
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X	X	X
Brisbane Laboratory - NATA # 1261 Site # 20794										
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
1	BH01-1 0.3M	Sep 24, 2021		Soil	S21-Se52112	X		X	X	X
2	BH02-1 0.5M	Sep 24, 2021		Soil	S21-Se52113	X		X	X	X
3	BH03-1 0.4M	Sep 24, 2021		Soil	S21-Se52114	X		X	X	X
4	BH04-1 0.2M	Sep 24, 2021		Soil	S21-Se52115	X		X	X	X
5	BH01-2 0.7M	Sep 24, 2021		Soil	S21-Se52116		X			
6	BH02-2 1.0M	Sep 24, 2021		Soil	S21-Se52117		X			
7	BH03-2 0.8M	Sep 24, 2021		Soil	S21-Se52118		X			
8	BH04-2 0.5M	Sep 24, 2021		Soil	S21-Se52119		X			
Test Counts						4	4	4	4	4

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Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
5. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Sample is dried by heating prior to analysis
LOR	Limit of Reporting
COC	Chain of Custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Reference document for the NEPM. Government of Western Australia, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009), including supporting document Recommended Procedures for Laboratory Analysis of Asbestos in Soil (2011)
NEPM	National Environment Protection (Assessment of Site Contamination) Measure, 2013 (as amended)
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded and/or sound condition. For the purposes of the NEPM, ACM is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
AF	Asbestos Fines. Asbestos containing materials, including friable, weathered and bonded materials, able to pass a 7mm x 7mm sieve. Considered under the NEPM as equivalent to “non-bonded / friable”.
FA	Fibrous Asbestos. Asbestos containing materials in a friable and/or severely weathered condition. For the purposes of the NEPM, FA is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres in the matrix.

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Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N/A	Not applicable

Asbestos Counter/Identifier:

Sayeed Abu	Senior Analyst-Asbestos (NSW)

Authorised by:

Chamath JHM Annakkage	Senior Analyst-Asbestos (NSW)

Glenn Jackson
General Manager

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Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Email: enquiries.melb@mgtlabmark.com.au

CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Company Name : GEOTEST SERVICES PTY LTD	Contact Name : Alan Halpin	Purchase Order :	COC Number :
Office Address : 18/24 GARLING ROAD	Project Manager :	PROJECT Number : 33465-2	Eurofins | mgt quote ID : 180326GEO
KINGS PARK, N.S.W. 2148	Email for results : admin@geotestservices.com.au	PROJECT Name : Cowman, 2 Wilson St, Chatswood	Data output format:
PH: 9671 4443 FAX: 9671 4343			

Special Directions & Comments :

Eurofins | mgt DI water batch number:

Analytes

	Sample ID	Date	Matrix	SUITE B7*1	SUITE B13	ASBESTOS IDENTIFICATION	HOLD
1	BH01-1, 0.3m	24/09/2021	Soil	X	X	X	
2	BH01-2, 0.7m	24/09/2021	Soil				X
3	BH02-1, 0.5m	24/09/2021	Soil	X	X	X	
4	BH02-2, 1.0m	24/09/2021	Soil				X
5	BH03-1, 0.4m	24/09/2021	Soil	X	X	X	
6	BH03-2, 0.8m	24/09/2021	Soil				X
7	BH04-1, 0.2m	24/09/2021	Soil	X	X	X	
8	BH04-2, 0.5m	24/09/2021	Soil				X
9							
10							
11							
12							
13							
14							
15							
16							

Some common holding times (with correct preservation).
For further information contact the lab

Waters		Soils	
BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days
TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days
Heavy Metals	6 months	Heavy Metals	6 months
Mercury, CrVI	28 days	Mercury, CrVI	28 days
Microbiological testing	24 hours	Microbiological testing	72 hours
BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days
Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours
Ferrous iron	7 days	ASLP, TCLP	7 days

Containers:

1LP	250P	125P	1LA	40mL vial	125mL A	Jar	ZIP.BAG	Sample comments:
						X	X	
						X		
						X	X	
						X		
						X	X	
						X		
						X	X	
						X		

Laboratory Staff

Relinquished By: S.Penfold
Date & Time : 24/09/21
Signature:

Received By: Kenneth R
Date & Time:
Signature: 24/9/21 - 2:39 PM

Turn around time

1 DAY ☐ 2 DAY ☐ 3 DAY ☐
5 DAY ☑ 10 DAY ☐ Other:

Method Of Shipment

☐ Courier
☑ Hand Delivered
☐ Postal
Courier Consignment # :

Temperature on arrival: 7.1°C

Report number: 827443

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Annexure H: Design calculation on the shoring piles provided by Cadigal Group

C:\Users\Sasi Parameswaran\OneDrive - Cadigal Group\D1\Cadigal Group\Cadigalgroup-SL - Cadigalgroup-SL\01-100084_ Wilson Street Chatswood\03_Calculations\11_Soldier pile design\XS2\900 DIA_BM.rpf

RAPT - Version: 7.1.3.0
Reinforced And Post-Tensioned Concrete Analysis & Design Package
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Licensee
Cadigal Group Engineers Pty Ltd
1002
22 Market St
SYDNEY
New South Wales 2000
Australia
11531971300824WPN1

Input

General

Design Code	List	Australia - AS3600-2018*SAVED*
Material	List	Australia - Australian Materials - 2018*SAVED*
Reinforcement Type	List	Reinforced
Member Type	List	Beam
Panel Type	List	Internal
Strip Type	List	One way - Nominal Width
Column Stiffness	List	Equivalent Column
Concrete Type	List	Standard Concrete
Concrete - Spanning Members	List	50MPa
Concrete - Columns	List	50MPa
Top Reinforcement Cover	mm	60
Bottom Reinforcement Cover	mm	60
Top Reinforcement Axis Depth Limit	mm	30
Bottom Reinforcement Axis Depth Limit	mm	30
Concrete Unit Weight	kn/m3	25
Self Weight Definition	List	Program Calculated
Pattern Live Load	Y/N	
Earthquake Design	List	None
Moment Redistribution	%	0
Design Surface Levels	List	Extreme Surfaces

Span

Span	Span Length	Slab Depth	Panel Width Left	Panel Width Right
	mm	mm	mm	mm
LE	0			
1	1000	200	1000	1000
RE	0			

Columns

Column	Column Grid Reference	Support Type	Transverse Column spacing	Transverse prestress (P/A)
	A	List	mm	MPa
1	1	Knife-Edge	1000	
2	2	Knife-Edge	1000	

Beams

Beam Number	Beam Depth	Beam Width at Slab	Beam Width	Effective Flange Width
	mm	mm	mm	mm
1	788	788	788	988

Load Cases

Load Case	Load Type	Load Definition	Live Load Deflection Case	Description
	List	List	Y/N	A
1	Self Weight	Applied Loads		

Load Case	Load Type	Load Definition	Live Load Deflection Case	Description
	List	List	Y/N	A
2	Initial Dead Load	Applied Loads		

1. Self Weight - Line

Load	Left End Reference Column	Left end of load from reference column	Load at left end	Right End reference column	Right end of load from reference column	Load at right end	Description
	#	mm	kN/m	#	mm	kN/m	A
1	1	0	16.58	2	0	16.58	

2. Initial Dead Load - Point

Load	Reference column	Distance to Load from reference column	Load	Load Length	Description
	#	mm	kN	mm	A
1	1	500	840	0	

Load Combinations : Ultimate

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Live Load	0	1.5
2	Live Load	0	0.9
3	Dead Load	0	1.35

Load Combinations : Short Term Service

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Live Load	1	1

Load Combinations : Permanent Service

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Live Load	1	1

Load Combinations : Deflection

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Short Term - Deflection	1	1
2	Permanent - Deflection	1	1
3	Initial - Deflection	1	1

Load Combinations : Transfer Prestress

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Transfer	1	0

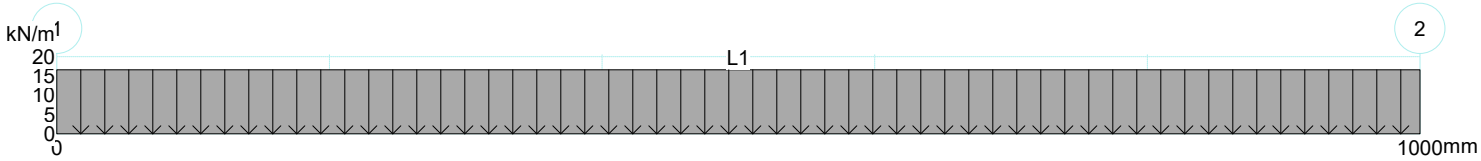
Load Combinations : Pre Existing

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Pre Existing	1	0

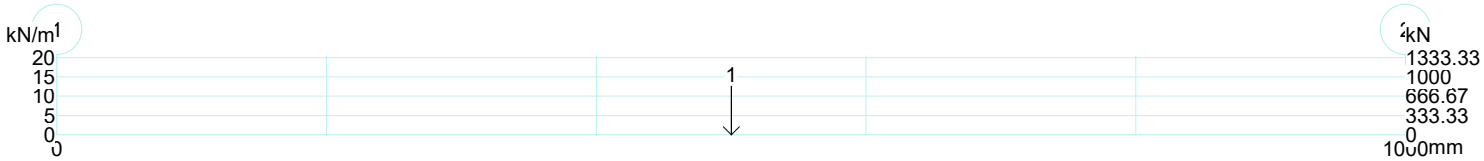
Load Combinations : Construction

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Construction	1	0

Load Case 1 : 1. Self Weight



Load Case 2 : 2. Initial Dead Load



Reinforcement

Reinforcement Use	Reinforcement Type	Preferred Bar Size	Number of Legs
	List	List	#
Flexural Bar	N 500MPa		
Flexural Mesh	F 450MPa		
Shear Option 1	N 500MPa	16	2
Shear Option 2	N 500MPa	16	4
Shear Option 3	N 500MPa	16	6
Punching Shear	N 500MPa	12	1

Reinforcement

	Maximum Bar Spacing	Minimum Bar Spacing	Minimum Continuous Reinforcement	Minimum Span Reinforcement into End Support	Minimum Span Reinforcement into Internal Support	Infill Bars	Stagger Bars
	mm	mm	#.#	#.#	#.#	Y/N	Y/N
Support Reinforcement	300	60	0			N	N
Span Reinforcement	300	60		0	0	N	N

Design Zones

Layer Number	Steel type	Left End Reference Column	Distance to left end of bar	Bar stagger length at left end	Top Cover at left end	Right End Reference Column	Distance to right end of bar	Bar stagger length at right end	Top Cover at Right end	Maximum Bar Size	Minimum Bar Size	Preferred bar size	Minimum Number of Bars	Maximum Spacing of Bars
	List	#	mm	mm	mm	#	mm	mm	mm	List	List	List	#	mm
1	Bar	1	0	0	60	2	0	0	60	36	16	28	0	0

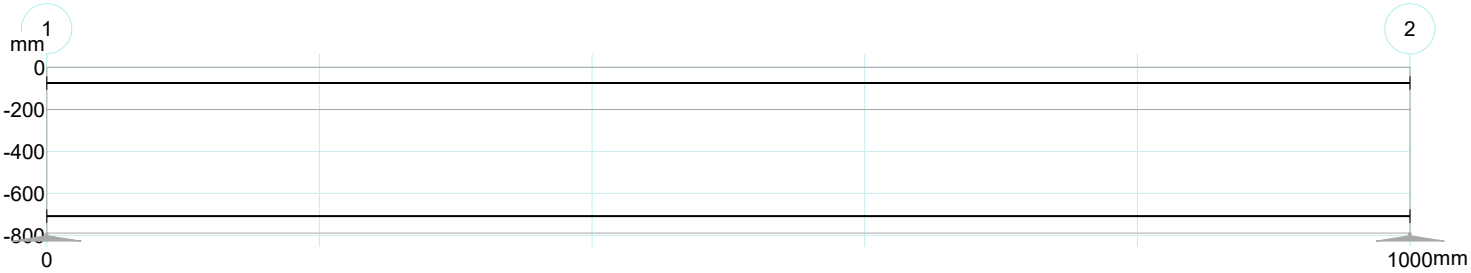
Layer Number	Minimum Steel area as %	% in Flange
	%	%
1	0	0

Design Zones

Layer Number	Steel type	Left End Reference Column	Distance to left end of bar	Bar stagger length at left end	Bottom Cover at left end	Right End Reference Column	Distance to right end of bar	Bar stagger length at right end	Bottom Cover at Right End	Maximum Bar Size	Minimum Bar Size	Preferred bar size	Minimum Number of Bars
	List	#	mm	mm	mm	#	mm	mm	mm	List	List	List	#
1	Bar	1	0	0	60	2	0	0	60	40	32	40	0

Layer Number	Maximum Spacing of Bars	Minimum Steel area as %	Minimum Reinforcement placed at	% in Flange
	mm	%	List	%
1	400	0	Tension Points	0

Reinforcement Design Zones



Design Data

Capacity Reduction factor (phi) for Flexure	#.#	0.85
Capacity Reduction factor (phi) for Shear	#.#	0.7
Capacity Reduction factor (phi) for Shear with transverse reinf	#.#	0.75
Material Factor for Concrete in Flexure	#.#	1
Material Factor for Concrete in Shear	#.#	1
Material Factor for Reinforcement	#.#	1
Maximum Ratio of Neutral Axis Depth for Ductility	#.#	0.4
Ductility Limit - Strain	#.#	0
Ductility Check at Left End Column	Y/N	Y
Ductility Check at Right End Column	Y/N	Y
Minimum Reinforcement Strength Limit - #.## x M*	#.#	0
Flexural Critical Section - Consider Transverse Beams	Y/N	Y
Flexural Critical Section - Distance from centre of Support	#.#	-1
Beam Left Sideface Cover (Internal)	mm	25
Beam Right Sideface cover	mm	40
Prestress Minimum Reinforcement Basis	List	Program Default
Shear Enhancement at Supports	Y/N	N
Ast Value in Shear Calculations	List	Calculated
Limit Reinforcement Strain	Y/N	Y
Include Strain Hardening of Reinforcement	Y/N	N
Beam Shear Critical Section Location	List	Code Critical Section

Maximum Service Stress Change - Prestressed Sections	MPa	0
Maximum Service Stress Change - Reinforced Sections	MPa	0
Relative Humidity	%	50
Average Temperature	C.	20
Prestress Losses Calculations based on	List	Program Default
Crack Width Calculations	List	Code default
AS3600 Shrinkage and Temperature Reinforcement	List	Moderate
Degree of Restraint in Primary Direction	%	0
Degree of Restraint in Secondary Direction	%	0
Concrete Strength Gain Rate	List	N

Concrete Tensile Strength for Deflection Calculations- #.## x (Fc)n	#.#	-1
Maximum Value of Ieff/Igross for Deflection Calculations	#.#	0.6
Total Deflection Warning Limit - Maximum Span/Deflection	#.#	250
Total Deflection Warning Limit - Maximum Deflection	mm	25
Incremental Deflection Warning Limit - Maximum Span/Deflection	#.#	500
Incremental Deflection Warning Limit - Maximum Deflection	mm	25
Initial Time for Shrinkage	List	Full Shrinkage
Time of Loading in days	#.#	10
Age Adjustment Factor	#.#	0.76
Concrete Strength at Time of Loading	MPa	42.25
Loaded Period in years	#.#	30
Tension stiffening Approach	List	Modified Concrete Tensile Modulus Method
Top Surface Shrinkage Factor - General	#.#	1
Bottom Surface Shrinkage Factor - General	#.#	1
Top Surface Shrinkage Factor - Metal Decking	#.#	1.2
Bottom Surface Shrinkage Factor - Metal Decking	#.#	0.2

Live Load Pattern Factor	#.#
Pattern Live Load for Ultimate Strength	Y/N
Pattern Live Load for Crack Control	Y/N
Pattern Live Load For Deflections	Y/N
Pattern Live Load for Deflection Permanent Load Combination	Y/N

Material Properties

Concrete : Standard Concrete : Concrete Strength Basis - Cylinder

Description	A	50MPa
Characteristic Compressive Strength	MPa	50
Mean Compressive Strength	MPa	59.7
Lower Characteristic Tensile Strength	MPa	4.24
Upper Characteristic Tensile Strength	MPa	7.64

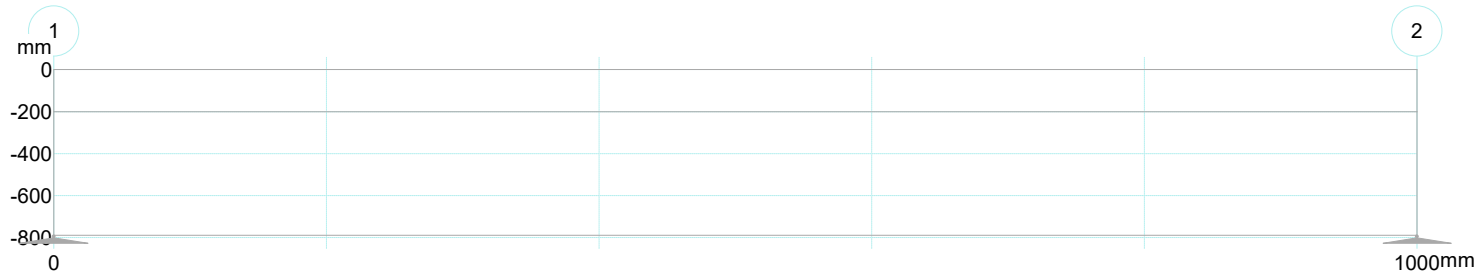
Concrete Density	kg/m3	2447
Design Concrete Modulus	MPa	34013.6
Mean Concrete Modulus	MPa	35820.8
Basic Shrinkage Strain	mm/mm	800
Shrinkage Multiplier	#.#	1
Basic Creep Factor	#.#	2.4
Creep Multiplier	#.#	1
Concrete Strain at Peak Stress	#.#	0.002
Squash Load Factor	#.#	0.9
Concrete Strain Limit	#.#	0.004
Strength Gain Rate	List	Normal
Maximum Aggregate Size	mm	20

Reinforcement Bar

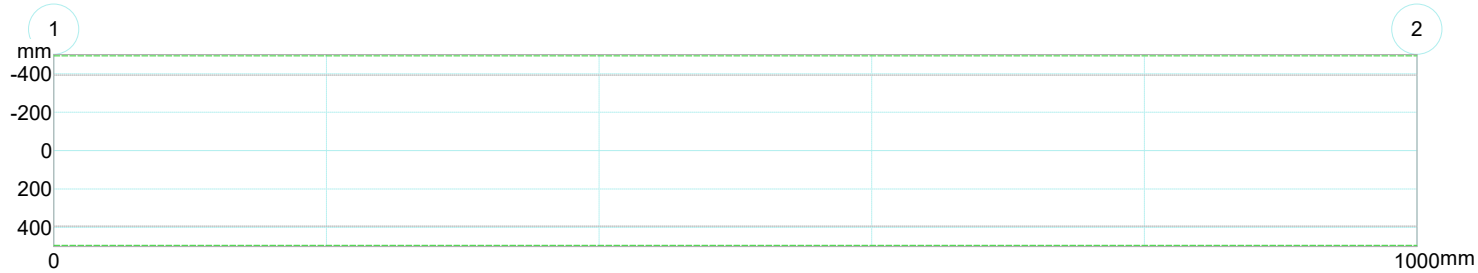
Designation	Type	Yield Stress	Elastic Modulus	Ductility	Peak Strain	Peak Stress	Design Strain Limit	Material Factor Flexure	Material Factor Shear	Material Capacity Reduction Factor - Flexure	Material Capacity Reduction Factor - Shear	Include as Flexural Reinforcement for Shear	Description
N	Deformed	500	2e5	N	0.05	540	90	-1	-1	-1	-1	Y	

Nominal Bar Size	Bar Diameter	Bar Area	Bar Inertia	Bar Weight	Stock Length
A	mm	mm2	mm4	kg/m	mm
10	10	78.5	491.07	0.62	12000
12	12	113	1018.29	0.89	12000
16	16	201	3218.29	1.58	12000
20	20	314	7857.14	2.47	12000
24	24	452	16292.6	3.55	12000
28	28	616	30184	4.83	12000
32	32	804	51492.6	6.31	12000
36	36	1020	82481.1	7.99	12000
40	40	1260	1.257e5	9.86	12000

Elevation view



Plan view



Warnings

Input

Warning:No Live Load Case defined for deflection calculations.

Output

No errors or warnings were found.

Bending Moments

Load Cases

Column Actions

Col No. 1		Self Weight	Initial Dead Load
Moment Above	kNm	-0	-0
Moment Below	kNm	-0	-0
Reaction	kN	8.29	420

Col No. 1		Self Weight	Initial Dead Load
Elastic Rotation	#.#	0	0
Elastic Axial Shortening	mm	0	0

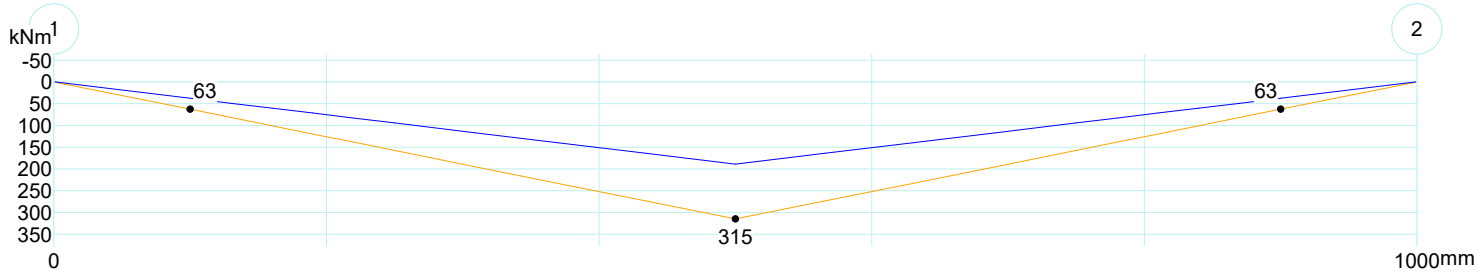
Col No. 2		Self Weight	Initial Dead Load
Moment Above	kNm	-0	-0
Moment Below	kNm	-0	-0
Reaction	kN	8.29	420
Elastic Rotation	#.#	0	0
Elastic Axial Shortening	mm	0	0

Load Combinations
Column Actions

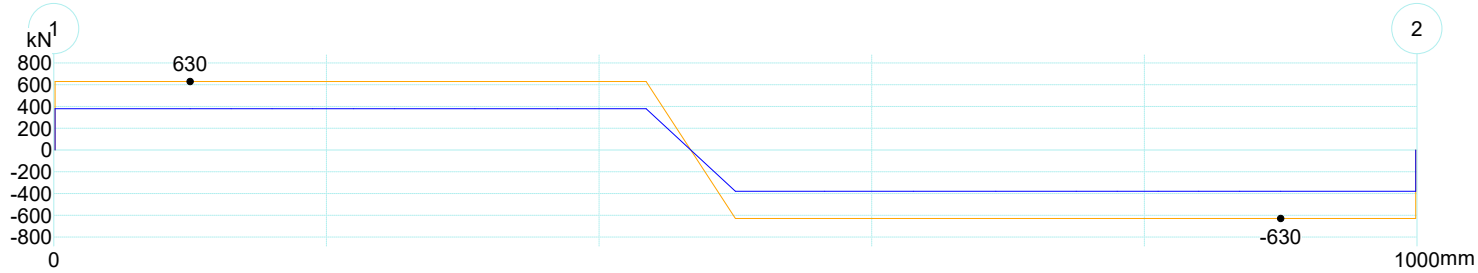
Col No. 1		Characteristic Service	Characteristic Service (Reversal)	Service	Service (Reversal)	Ultimate Flexure	Ultimate Flexure (Reversal)	Ultimate Shear	Ultimate Shear (Reversal)
Moment Above	kNm	0	0	0	0	0	0	0	0
Moment Below	kNm	0	0	0	0	0	0	0	0
Reaction	kN	428.29	428.29	428.29	428.29	630	630	378	630
Elastic Rotation	#.#	0	0	0	0	0	0	0	0
Elastic Axial Shortening	mm	0	0	0	0	0	0	0	0

Col No. 2		Characteristic Service	Characteristic Service (Reversal)	Service	Service (Reversal)	Ultimate Flexure	Ultimate Flexure (Reversal)	Ultimate Shear	Ultimate Shear (Reversal)
Moment Above	kNm	0	0	0	0	0	0	0	0
Moment Below	kNm	0	0	0	0	0	0	0	0
Reaction	kN	428.29	428.29	428.29	428.29	630	630	378	630
Elastic Rotation	#.#	0	0	0	0	0	0	0	0
Elastic Axial Shortening	mm	0	0	0	0	0	0	0	0

Ultimate Design
Flexure

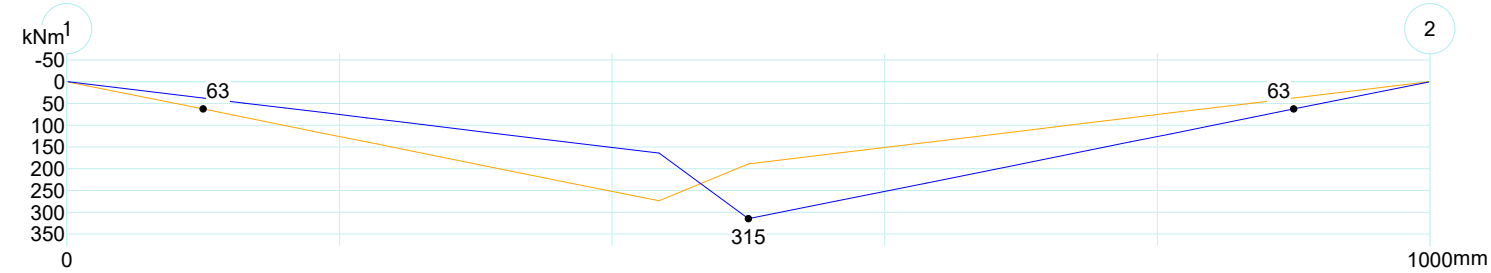


Moment Moment 1 Moment 2

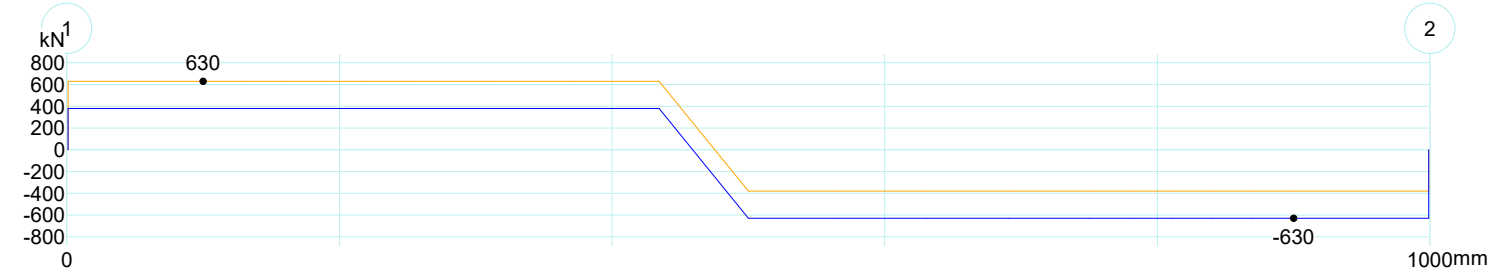


Shear Shear 1 Shear 2

Shear

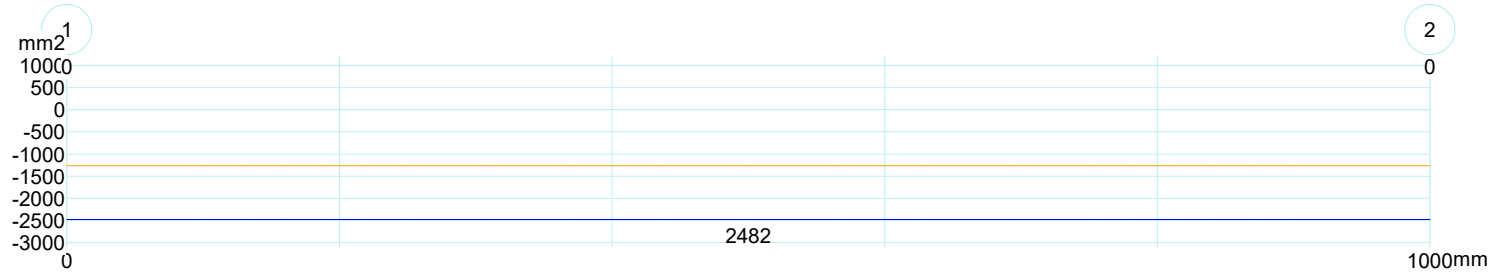


Moment Moment 1 Moment 2

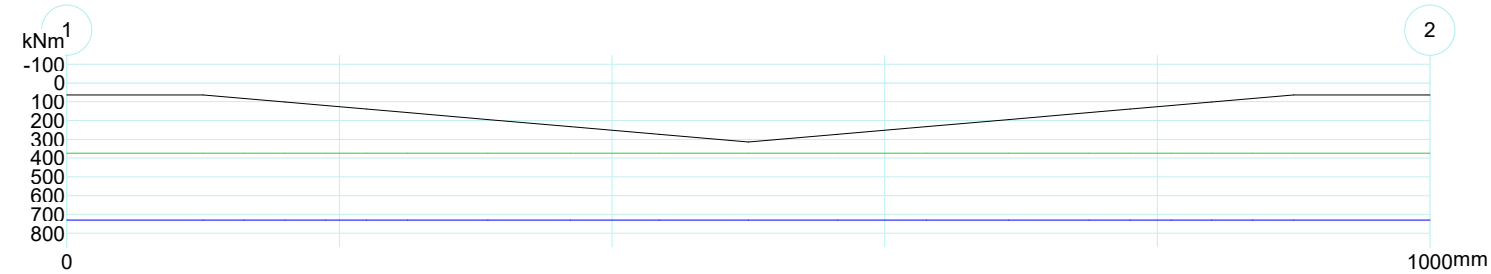


Shear Shear 1 Shear 2

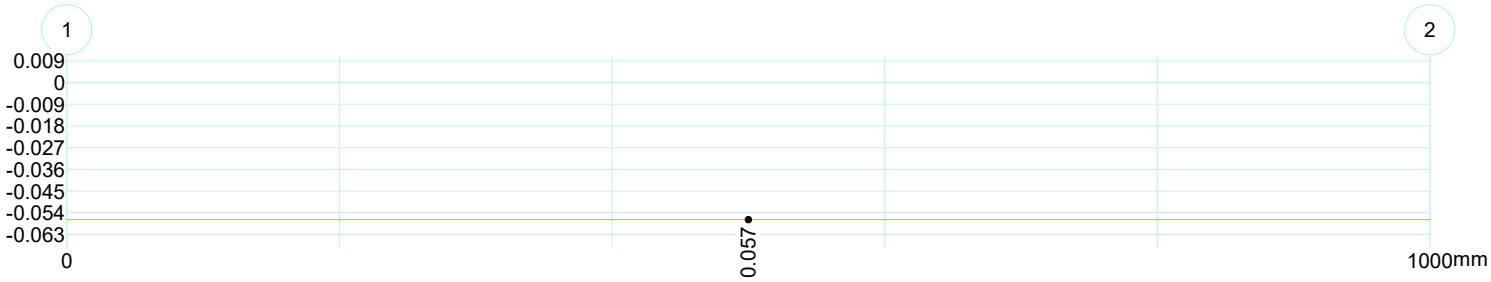
Flexural Design
Ultimate



Reinforcement Top Total Bottom Total Top Ultimate Bottom Ultimate Min Top Min Bot



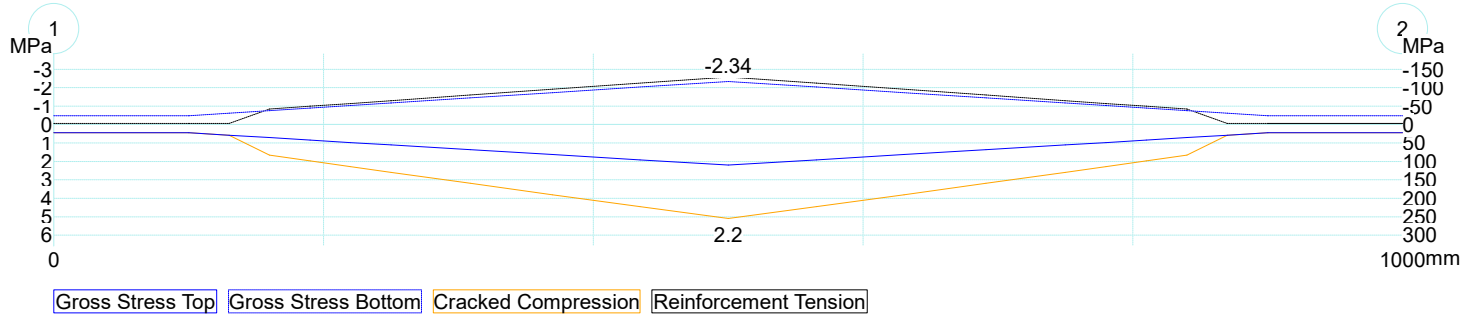
Capacity Minimum Ultimate Design Initial Final



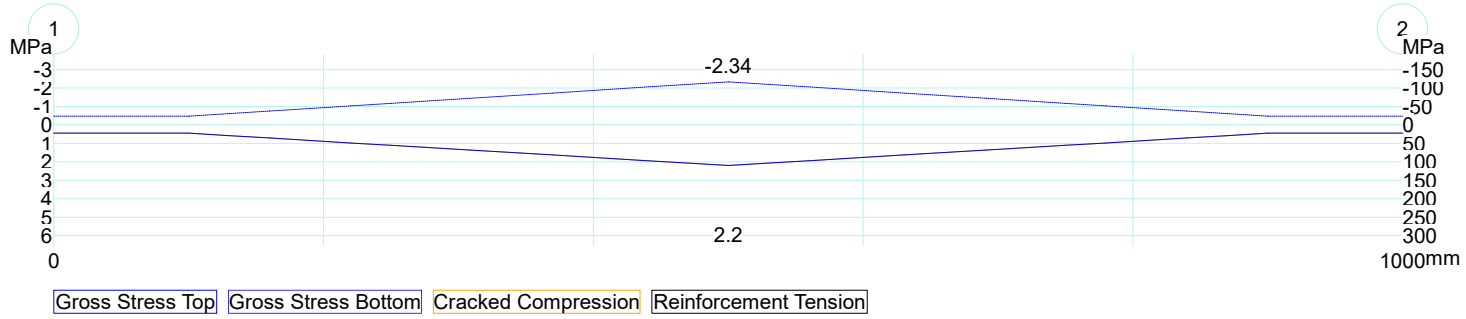
Neutral Axis Depth Initial Final

Service

Maximum Moment Condition

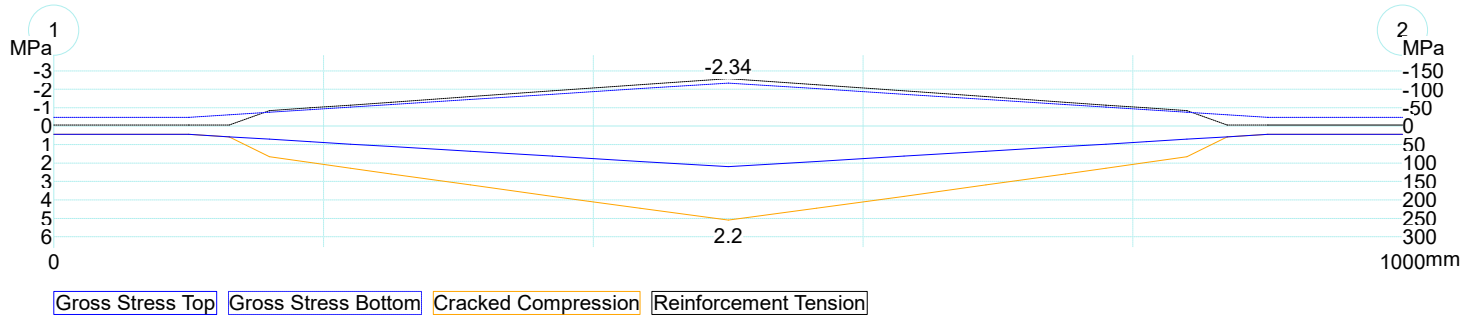


Reversal Moment Condition

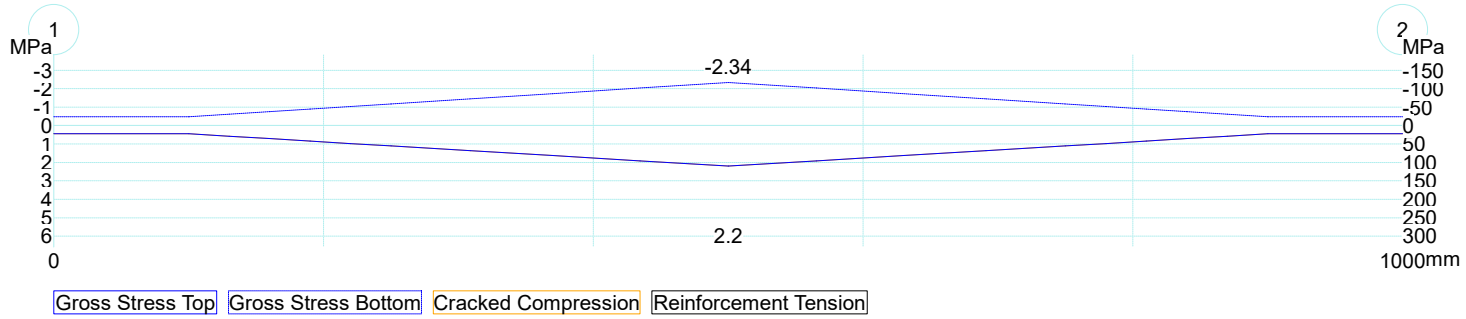


Permanent

Maximum Moment Condition

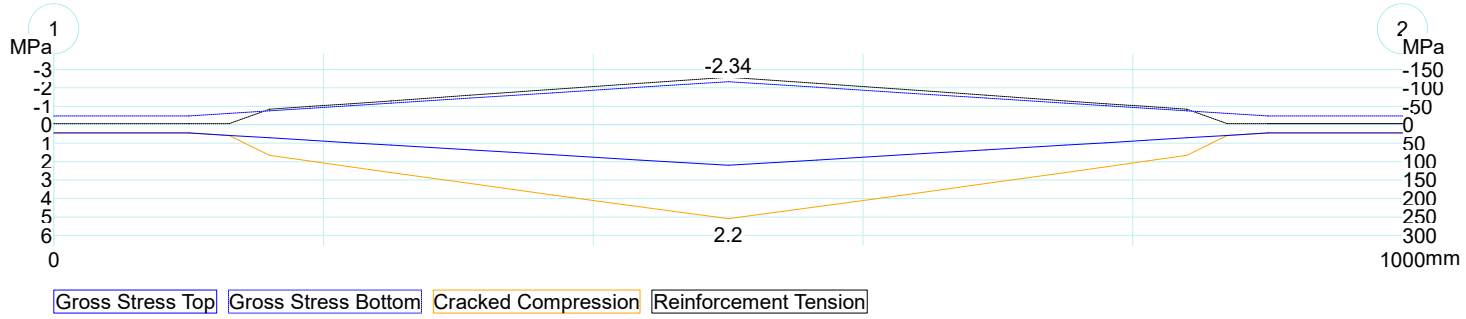


Reversal Moment Condition

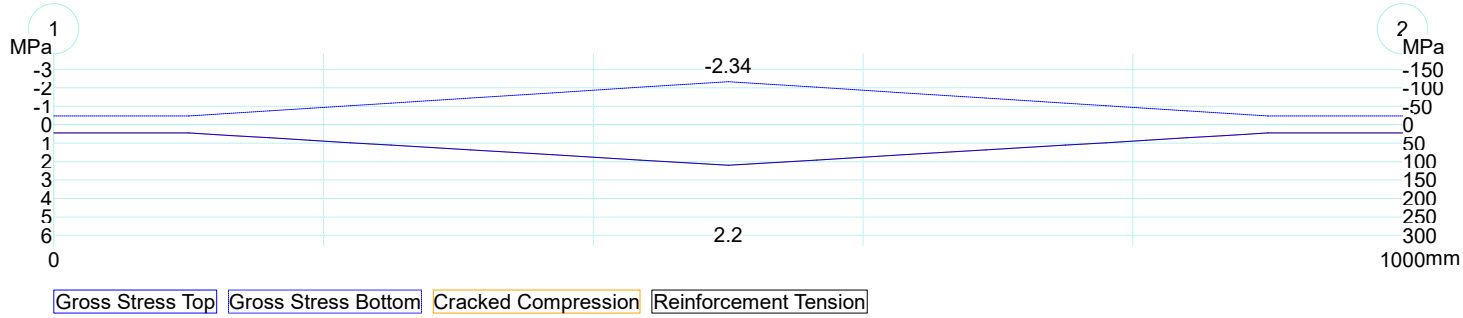


Characteristic Service

Maximum Moment Condition



Reversal Moment Condition



Shear Design
Beam
Span 1

Locat	V*	Mv*	Pv	d	Ast	bv	phi Vu	ks phi Vu	Phi Vumax	phi VuMin	phi Vus	Theta	Asv/sSpacing of Sets				
														2 legs N16	4 legs N16	6 legs N16	Min legs N16
mm	kN	kNm	kN	mm	mm2	mm	kN	kN	kN	kN	kN	#.#	mm2/mm	mm	mm	mm	mm
100	630	63	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
130	630	81.9	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
160	630	100.8	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
190	630	119.7	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
220	630	138.6	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
250	630	157.5	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
309	630	194.67	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
369.6	630	232.85	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
434.6	630	273.8	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
500	-630	315	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
565.4	-630	273.8	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
630.4	-630	232.85	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
691	-630	194.67	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
750	-630	157.5	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
780	-630	138.6	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
810	-630	119.7	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
840	-630	100.8	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
870	-630	81.9	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500
900	-630	63	0	637.2	2482.2	788	284.16	0	4216.04	640.65	263.16	37.8832	0.89	450.9	500	500	500

Minimum Legs	Shear Comments
#	A
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel

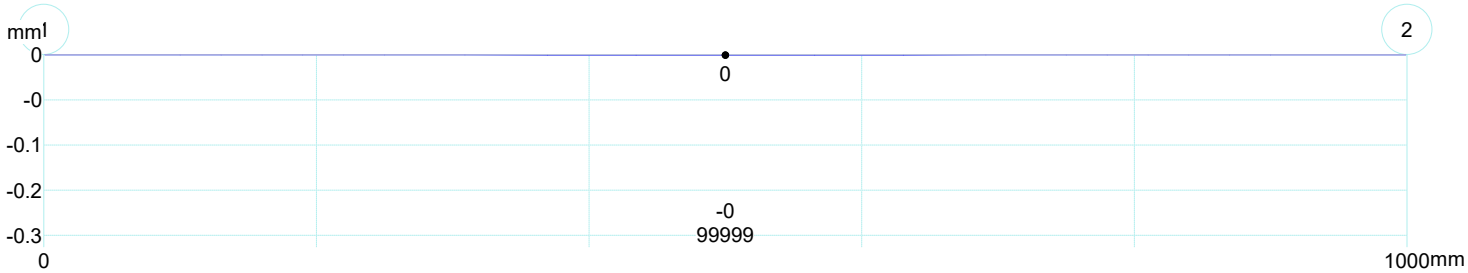
Punching
Column Head Critical Section

Column No.	Bh	a	at	u	d	fcv	P/A	Asw/s min	V*	Mv*	phi Vuo	phi Vu	phi VuMin	phi Vumax	side beam	Moment Transfer	Asw/s reqd	result
A	#.#	mm	mm	mm	mm	MPa	MPa	mm2/mm	kN	kNm	kN	kN	kN	kN	A	A	mm2/mm	A
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	Check Not Carried Out!
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	Check Not Carried Out!

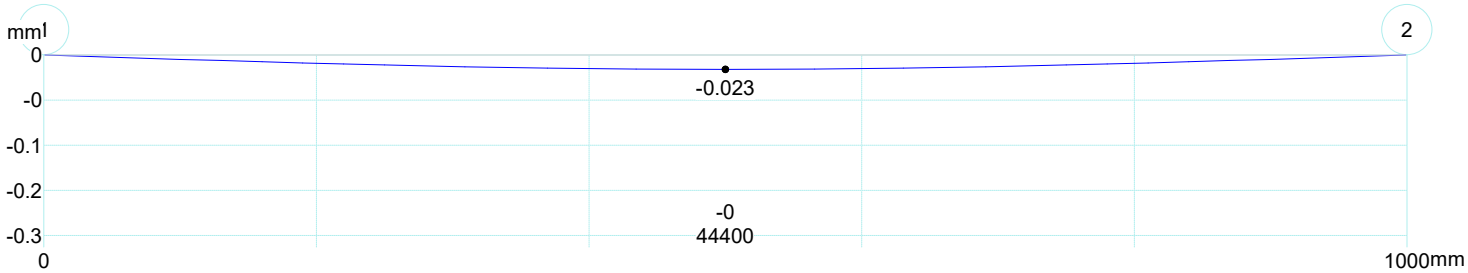
Deflections

All Spans Loaded

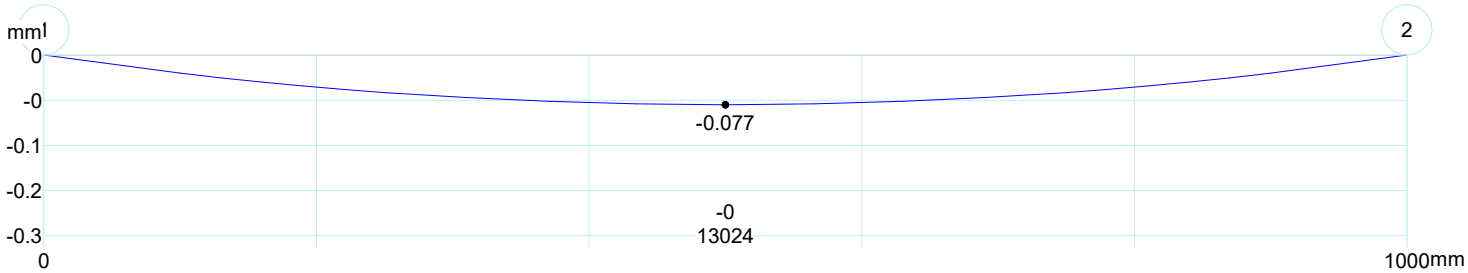
Transfer



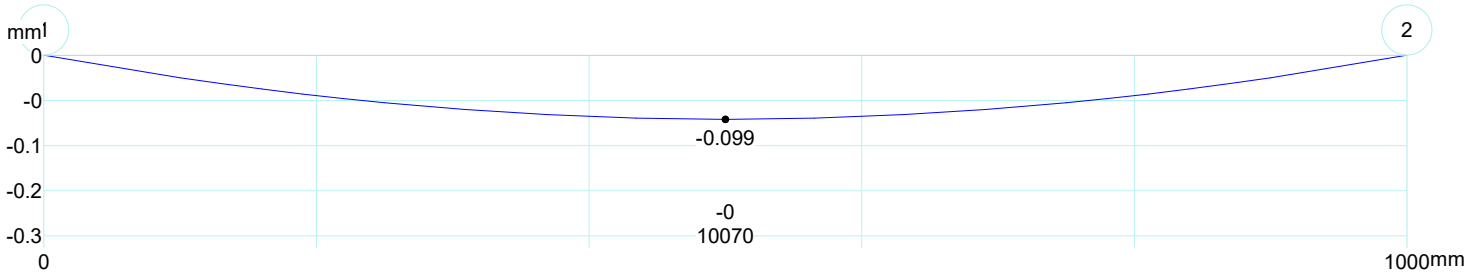
Short Term



Incremental



Total Long Term



Detailed Reinforcement

Span 1

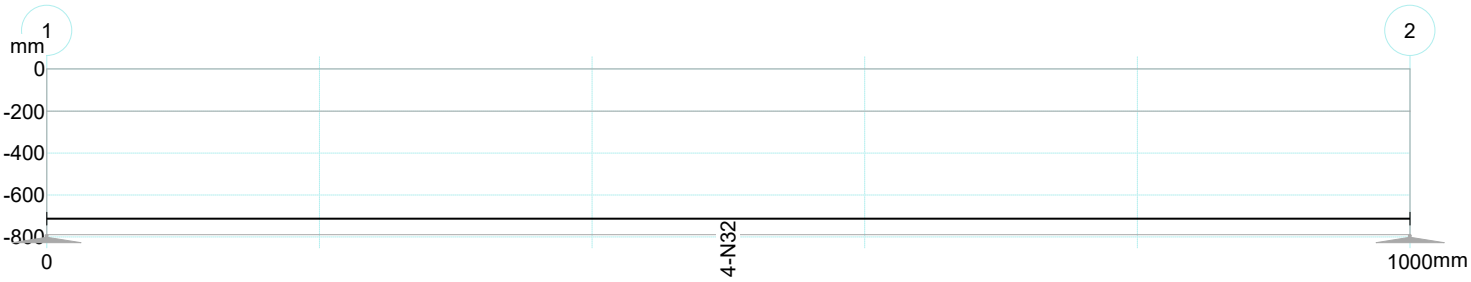
	Top Reinforcement						Bottom Reinforcement					
Locat	Max Size	Max Space	Area	Depth	Section Width	Rebar Reqd	Max Size	Max Space	Area	Depth	Section Width	Rebar Reqd
mm	mm	mm	mm2	mm	mm	A	mm	mm	mm2	mm	mm	A
100	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
130	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
160	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
190	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
220	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
250	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
309	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
369.6	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
434.6	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
500	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
565.4	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
630.4	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
691	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
750	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
780	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
810	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
840	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
870	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7

	Top Reinforcement						Bottom Reinforcement					
Locat	Max Size	Max Space	Area	Depth	Section Width	Rebar Reqd	Max Size	Max Space	Area	Depth	Section Width	Rebar Reqd
mm	mm	mm	mm2	mm	mm	A	mm	mm	mm2	mm	mm	A
900	0	0	0	74	988	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7

Shear Reinforcement						
	Spacing of Sets					
Area	2 legs N16	4 legs N16	6 legs N16	Min legs N16	Minimum Legs	Shear Comments
mm2/mm	mm	mm	mm	mm	#	A
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel

Design Comments:-
- - Span 1 - Required Bar Size is smaller than the Preferred Bar Size. Maintaining the same cover will require slightly less reinforcement than calculated.
- Span - 1 - Reinforcement added at left span contraflexure point for Offset of Bending Moment Diagram for Shear - 1070.01mm2
- Span - 1 - Reinforcement added at right span contraflexure point for Offset of Bending Moment Diagram for Shear - 1070.01mm2

Reinforcement Layout



- - Span 1 - Required Bar Size is smaller than the Preferred Bar Size. Maintaining the same cover will require slightly less reinforcement than calculated.

Design Comments:-
- Span - 1 - Reinforcement added at left span contraflexure point for Offset of Bending Moment Diagram for Shear - 1070.01mm2
- Span - 1 - Reinforcement added at right span contraflexure point for Offset of Bending Moment Diagram for Shear - 1070.01mm2

C:\Users\Sasi Parameswaran\OneDrive - Cadigal Group\D1\Cadigal Group\Cadigalgroup-SL - Cadigalgroup-SL\01-100084_ Wilson Street Chatswood\03_Calculations\11_Soldier pile design\XS2\900 DIA_Sec2.rpf

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Reinforced And Post-Tensioned Concrete Analysis & Design Package
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New South Wales 2000
Australia
11531971300824WPN1

Input

General

Design Code	List	Australia - AS3600-2018*SAVED*
Material	List	Australia - Australian Materials - 2018*SAVED*
Reinforcement Type	List	Reinforced
Member Type	List	Beam
Panel Type	List	Internal
Strip Type	List	One way - Nominal Width
Column Stiffness	List	Equivalent Column
Concrete Type	List	Standard Concrete
Concrete - Spanning Members	List	50MPa
Concrete - Columns	List	50MPa
Top Reinforcement Cover	mm	60
Bottom Reinforcement Cover	mm	60
Top Reinforcement Axis Depth Limit	mm	30
Bottom Reinforcement Axis Depth Limit	mm	30
Concrete Unit Weight	kn/m3	25
Self Weight Definition	List	Program Calculated
Pattern Live Load	Y/N	
Earthquake Design	List	None
Moment Redistribution	%	0
Design Surface Levels	List	Extreme Surfaces

Span

Span	Span Length	Slab Depth	Panel Width Left	Panel Width Right
	mm	mm	mm	mm
LE	0			
1	650	200	1000	1000
RE	0			

Columns

Column	Column Grid Reference	Support Type	Transverse Column spacing	Transverse prestress (P/A)
	A	List	mm	MPa
1	1	Knife-Edge	1000	
2	2	Knife-Edge	1000	

Beams

Beam Number	Beam Depth	Beam Width at Slab	Beam Width	Effective Flange Width
	mm	mm	mm	mm
1	788	788	788	918

Load Cases

Load Case	Load Type	Load Definition	Live Load Deflection Case	Description
	List	List	Y/N	A
1	Self Weight	Applied Loads		

Load Case	Load Type	Load Definition	Live Load Deflection Case	Description
	List	List	Y/N	A
2	Initial Dead Load	Applied Loads		

1. Self Weight - Line

Load	Left End Reference Column	Left end of load from reference column	Load at left end	Right End reference column	Right end of load from reference column	Load at right end	Description
	#	mm	kN/m	#	mm	kN/m	A
1	1	0	16.58	2	0	16.58	

2. Initial Dead Load - Point

Load	Reference column	Distance to Load from reference column	Load	Load Length	Description
	#	mm	kN	mm	A
1	1	375	740	0	

Load Combinations : Ultimate

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Live Load	0	1.5
2	Live Load	0	0.9
3	Dead Load	0	1.35

Load Combinations : Short Term Service

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Live Load	1	1

Load Combinations : Permanent Service

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Live Load	1	1

Load Combinations : Deflection

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Short Term - Deflection	1	1
2	Permanent - Deflection	1	1
3	Initial - Deflection	1	1

Load Combinations : Transfer Prestress

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Transfer	1	0

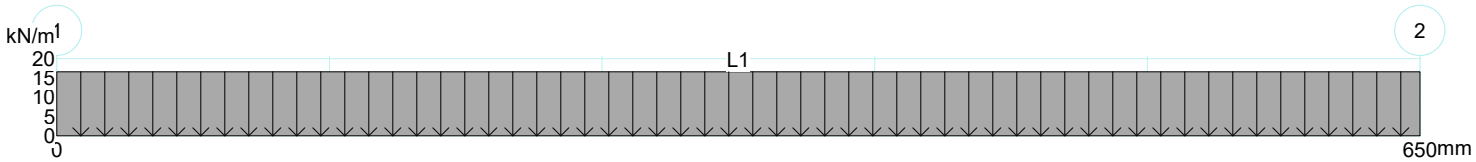
Load Combinations : Pre Existing

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Pre Existing	1	0

Load Combinations : Construction

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Construction	1	0

Load Case 1 : 1. Self Weight



Load Case 2 : 2. Initial Dead Load

Reinforcement

Reinforcement Use	Reinforcement Type	Preferred Bar Size	Number of Legs
	List	List	#
Flexural Bar	N 500MPa		
Flexural Mesh	F 450MPa		
Shear Option 1	N 500MPa	16	2
Shear Option 2	N 500MPa	16	4
Shear Option 3	N 500MPa	16	6
Punching Shear	N 500MPa	12	1

Reinforcement

	Maximum Bar Spacing	Minimum Bar Spacing	Minimum Continuous Reinforcement	Minimum Span Reinforcement into End Support	Minimum Span Reinforcement into Internal Support	Infill Bars	Stagger Bars
	mm	mm	#.#	#.#	#.#	Y/N	Y/N
Support Reinforcement	300	60	0			N	N
Span Reinforcement	300	60		0	0	N	N

Design Zones

Layer Number	Steel type	Left End Reference Column	Distance to left end of bar	Bar stagger length at left end	Top Cover at left end	Right End Reference Column	Distance to right end of bar	Bar stagger length at right end	Top Cover at Right end	Maximum Bar Size	Minimum Bar Size	Preferred bar size	Minimum Number of Bars	Maximum Spacing of Bars
	List	#	mm	mm	mm	#	mm	mm	mm	List	List	List	#	mm
1	Bar	1	0	0	60	2	0	0	60	36	16	28	0	0

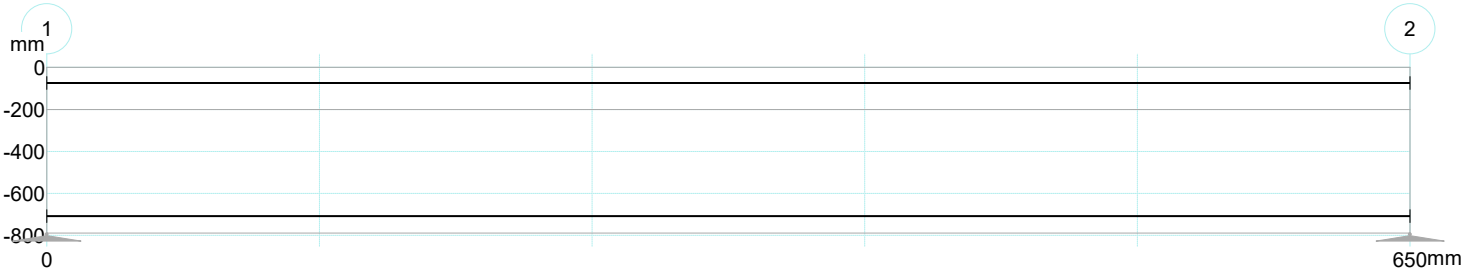
Layer Number	Minimum Steel area as %	% in Flange
	%	%
1	0	0

Design Zones

Layer Number	Steel type	Left End Reference Column	Distance to left end of bar	Bar stagger length at left end	Bottom Cover at left end	Right End Reference Column	Distance to right end of bar	Bar stagger length at right end	Bottom Cover at Right End	Maximum Bar Size	Minimum Bar Size	Preferred bar size	Minimum Number of Bars
	List	#	mm	mm	mm	#	mm	mm	mm	List	List	List	#
1	Bar	1	0	0	60	2	0	0	60	40	32	40	0

Layer Number	Maximum Spacing of Bars	Minimum Steel area as %	Minimum Reinforcement placed at	% in Flange
	mm	%	List	%
1	400	0	Tension Points	0

Reinforcement Design Zones



Design Data

Capacity Reduction factor (phi) for Flexure	#.#	0.85
Capacity Reduction factor (phi) for Shear	#.#	0.7
Capacity Reduction factor (phi) for Shear with transverse reinf	#.#	0.75
Material Factor for Concrete in Flexure	#.#	1
Material Factor for Concrete in Shear	#.#	1
Material Factor for Reinforcement	#.#	1
Maximum Ratio of Neutral Axis Depth for Ductility	#.#	0.4
Ductility Limit - Strain	#.#	0
Ductility Check at Left End Column	Y/N	Y
Ductility Check at Right End Column	Y/N	Y
Minimum Reinforcement Strength Limit - #.## x M*	#.#	0
Flexural Critical Section - Consider Transverse Beams	Y/N	Y
Flexural Critical Section - Distance from centre of Support	#.#	-1
Beam Left Sideface Cover (Internal)	mm	25
Beam Right Sideface cover	mm	40
Prestress Minimum Reinforcement Basis	List	Program Default
Shear Enhancement at Supports	Y/N	N
Ast Value in Shear Calculations	List	Calculated
Limit Reinforcement Strain	Y/N	Y
Include Strain Hardening of Reinforcement	Y/N	N
Beam Shear Critical Section Location	List	Code Critical Section

Maximum Service Stress Change - Prestressed Sections	MPa	0
Maximum Service Stress Change - Reinforced Sections	MPa	0
Relative Humidity	%	50
Average Temperature	C.	20
Prestress Losses Calculations based on	List	Program Default
Crack Width Calculations	List	Code default
AS3600 Shrinkage and Temperature Reinforcement	List	Moderate
Degree of Restraint in Primary Direction	%	0
Degree of Restraint in Secondary Direction	%	0
Concrete Strength Gain Rate	List	N

Concrete Tensile Strength for Deflection Calculations- #.## x (Fc)n	#.#	-1
Maximum Value of Ieff/Igross for Deflection Calculations	#.#	0.6
Total Deflection Warning Limit - Maximum Span/Deflection	#.#	250
Total Deflection Warning Limit - Maximum Deflection	mm	25
Incremental Deflection Warning Limit - Maximum Span/Deflection	#.#	500
Incremental Deflection Warning Limit - Maximum Deflection	mm	25
Initial Time for Shrinkage	List	Full Shrinkage
Time of Loading in days	#.#	10
Age Adjustment Factor	#.#	0.76
Concrete Strength at Time of Loading	MPa	42.25
Loaded Period in years	#.#	30
Tension stiffening Approach	List	Modified Concrete Tensile Modulus Method
Top Surface Shrinkage Factor - General	#.#	1
Bottom Surface Shrinkage Factor - General	#.#	1
Top Surface Shrinkage Factor - Metal Decking	#.#	1.2
Bottom Surface Shrinkage Factor - Metal Decking	#.#	0.2

Live Load Pattern Factor	#.#
Pattern Live Load for Ultimate Strength	Y/N
Pattern Live Load for Crack Control	Y/N
Pattern Live Load For Deflections	Y/N
Pattern Live Load for Deflection Permanent Load Combination	Y/N

Material Properties

Concrete : Standard Concrete : Concrete Strength Basis - Cylinder

Description	A	50MPa
Characteristic Compressive Strength	MPa	50
Mean Compressive Strength	MPa	59.7
Lower Characteristic Tensile Strength	MPa	4.24
Upper Characteristic Tensile Strength	MPa	7.64

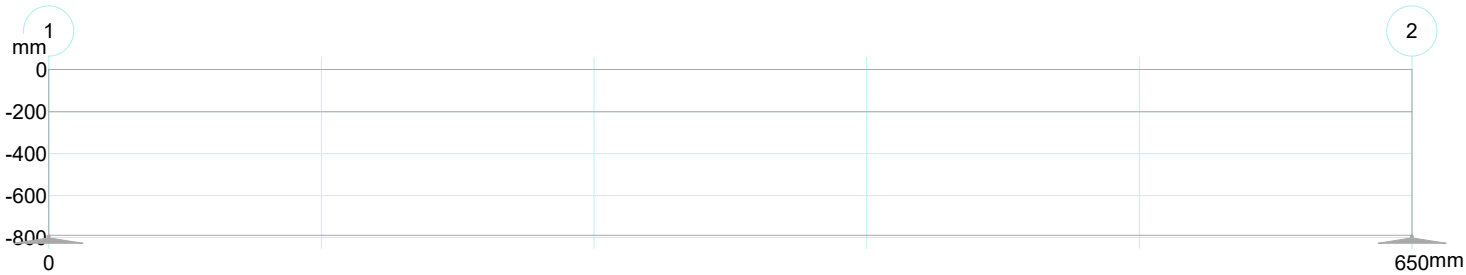
Concrete Density	kg/m3	2447
Design Concrete Modulus	MPa	34013.6
Mean Concrete Modulus	MPa	35820.8
Basic Shrinkage Strain	mm/mm	800
Shrinkage Multiplier	#.#	1
Basic Creep Factor	#.#	2.4
Creep Multiplier	#.#	1
Concrete Strain at Peak Stress	#.#	0.002
Squash Load Factor	#.#	0.9
Concrete Strain Limit	#.#	0.004
Strength Gain Rate	List	Normal
Maximum Aggregate Size	mm	20

Reinforcement Bar

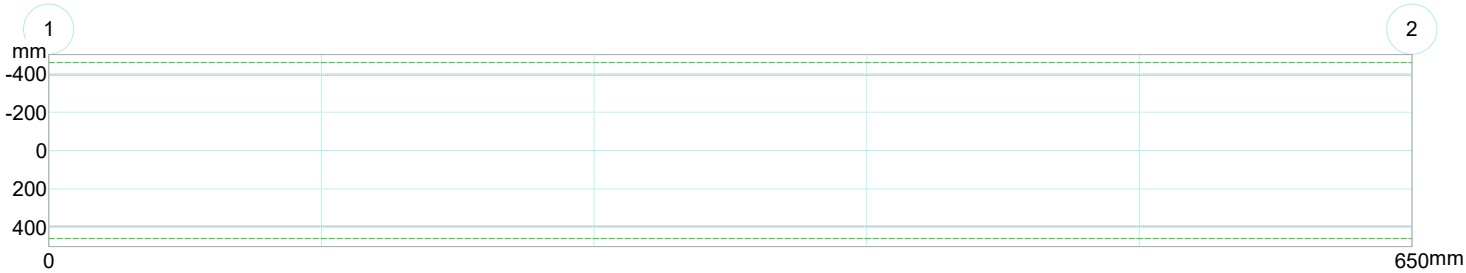
Designation	Type	Yield Stress	Elastic Modulus	Ductility	Peak Strain	Peak Stress	Design Strain Limit	Material Factor Flexure	Material Factor Shear	Material Capacity Reduction Factor - Flexure	Material Capacity Reduction Factor - Shear	Include as Flexural Reinforcement for Shear	Description
N	Deformed	500	2e5	N	0.05	540	90	-1	-1	-1	-1	Y	

Nominal Bar Size	Bar Diameter	Bar Area	Bar Inertia	Bar Weight	Stock Length
A	mm	mm2	mm4	kg/m	mm
10	10	78.5	491.07	0.62	12000
12	12	113	1018.29	0.89	12000
16	16	201	3218.29	1.58	12000
20	20	314	7857.14	2.47	12000
24	24	452	16292.6	3.55	12000
28	28	616	30184	4.83	12000
32	32	804	51492.6	6.31	12000
36	36	1020	82481.1	7.99	12000
40	40	1260	1.257e5	9.86	12000

Elevation view



Plan view



Warnings

Input

Warning:No Live Load Case defined for deflection calculations.

Output

No errors or warnings were found.

Bending Moments

Load Cases

Column Actions

Col No. 1		Self Weight	Initial Dead Load
Moment Above	kNm	-0	-0
Moment Below	kNm	-0	-0

Col No. 1		Self Weight	Initial Dead Load
Reaction	kN	5.39	313.08
Elastic Rotation	#.#	0	0
Elastic Axial Shortening	mm	0	0

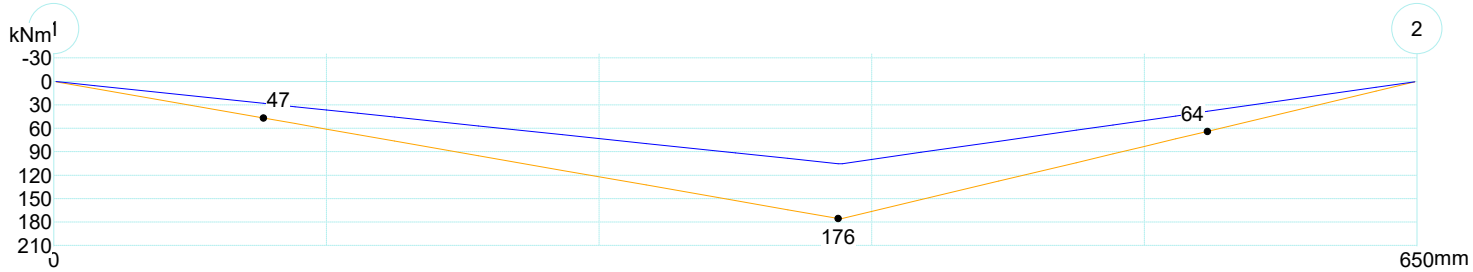
Col No. 2		Self Weight	Initial Dead Load
Moment Above	kNm	-0	-0
Moment Below	kNm	-0	-0
Reaction	kN	5.39	426.92
Elastic Rotation	#.#	0	0
Elastic Axial Shortening	mm	0	0

Load Combinations
Column Actions

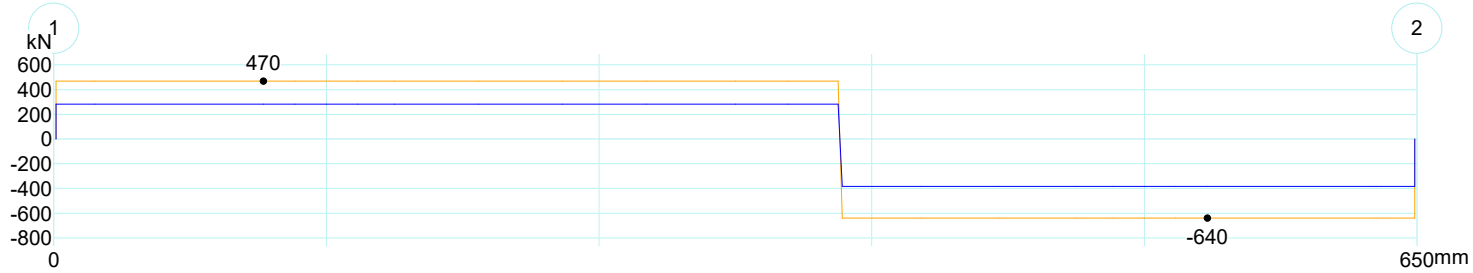
Col No. 1		Characteristic Service	Characteristic Service (Reversal)	Service	Service (Reversal)	Ultimate Flexure	Ultimate Flexure (Reversal)	Ultimate Shear	Ultimate Shear (Reversal)
Moment Above	kNm	0	0	0	0	0	0	0	0
Moment Below	kNm	0	0	0	0	0	0	0	0
Reaction	kN	318.47	318.47	318.47	318.47	469.62	469.62	281.77	469.62
Elastic Rotation	#.#	0	0	0	0	0	0	0	0
Elastic Axial Shortening	mm	0	0	0	0	0	0	0	0

Col No. 2		Characteristic Service	Characteristic Service (Reversal)	Service	Service (Reversal)	Ultimate Flexure	Ultimate Flexure (Reversal)	Ultimate Shear	Ultimate Shear (Reversal)
Moment Above	kNm	0	0	0	0	0	0	0	0
Moment Below	kNm	0	0	0	0	0	0	0	0
Reaction	kN	432.31	432.31	432.31	432.31	640.38	640.38	384.23	640.38
Elastic Rotation	#.#	0	0	0	0	0	0	0	0
Elastic Axial Shortening	mm	0	0	0	0	0	0	0	0

Ultimate Design
Flexure

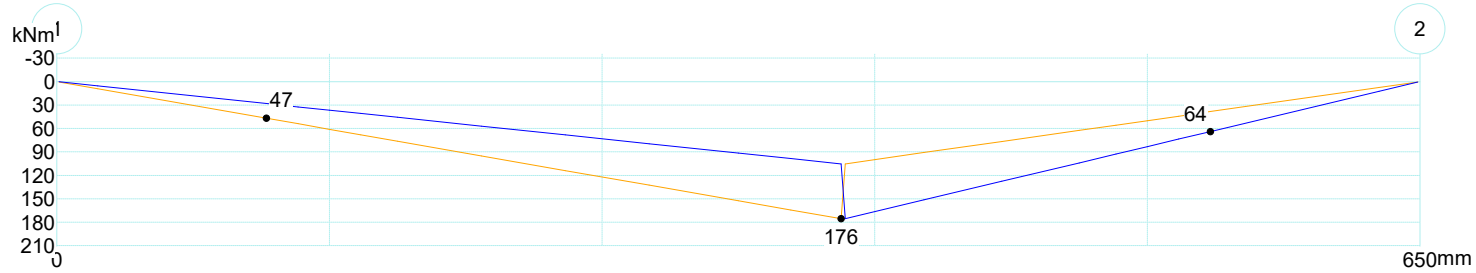


Moment Moment 1 Moment 2

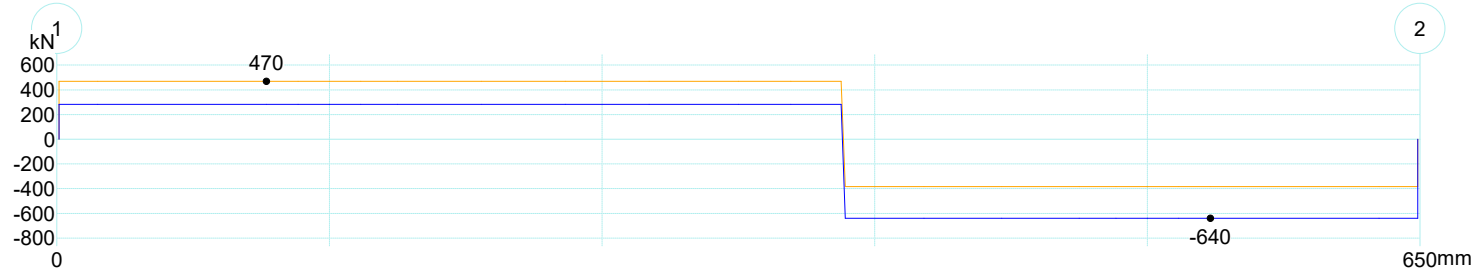


Shear Shear 1 Shear 2

Shear

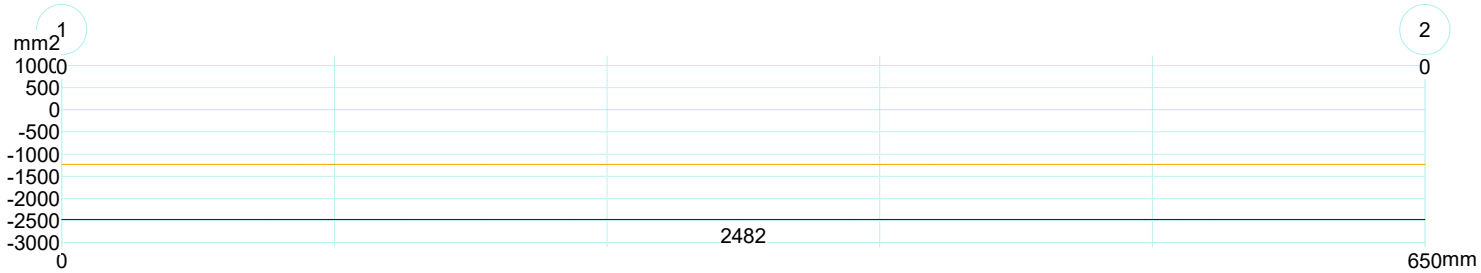


Moment Moment 1 Moment 2

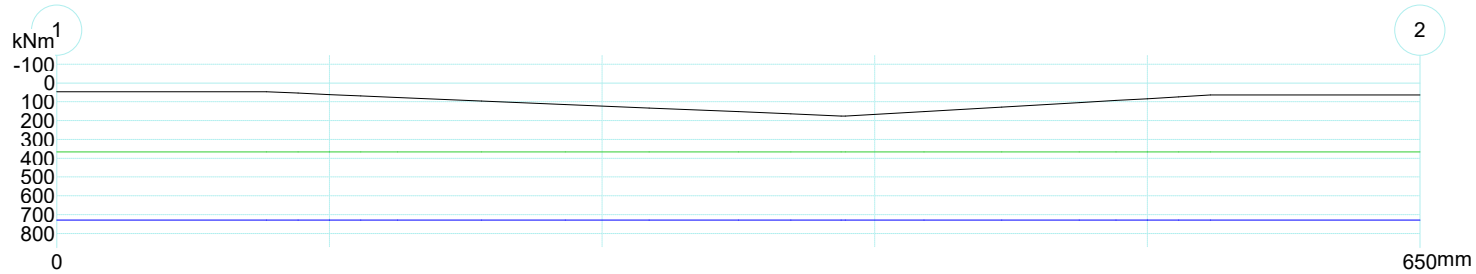


Shear Shear 1 Shear 2

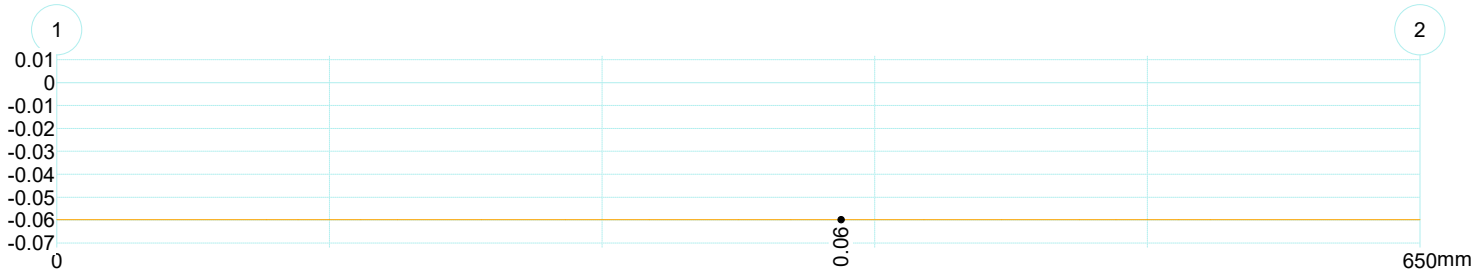
Flexural Design
Ultimate



Reinforcement Top Total Bottom Total Top Ultimate Bottom Ultimate Min Top Min Bot



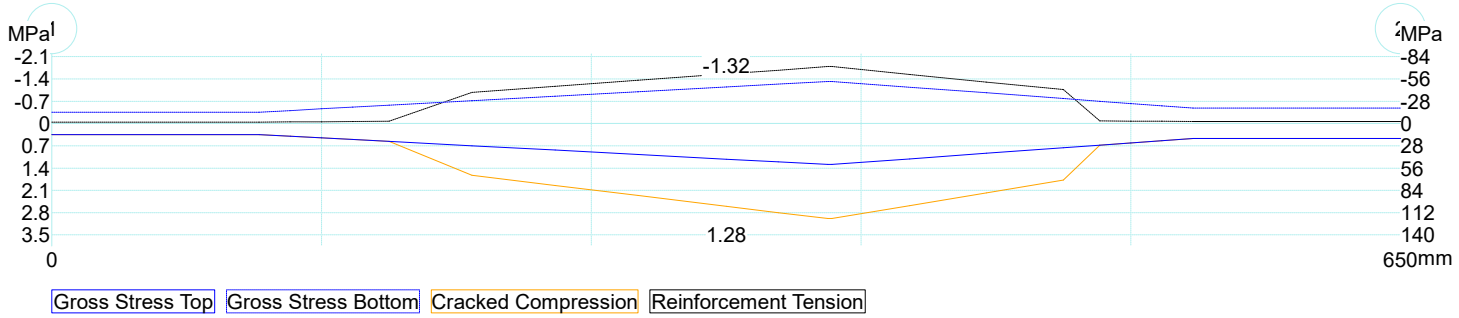
Capacity Minimum Ultimate Design Initial Final



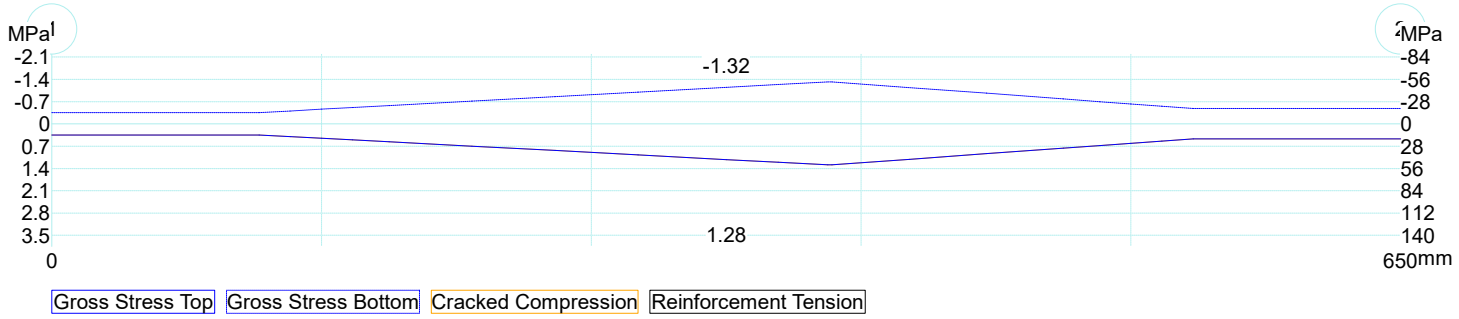
Neutral Axis Depth Initial Final

Service

Maximum Moment Condition

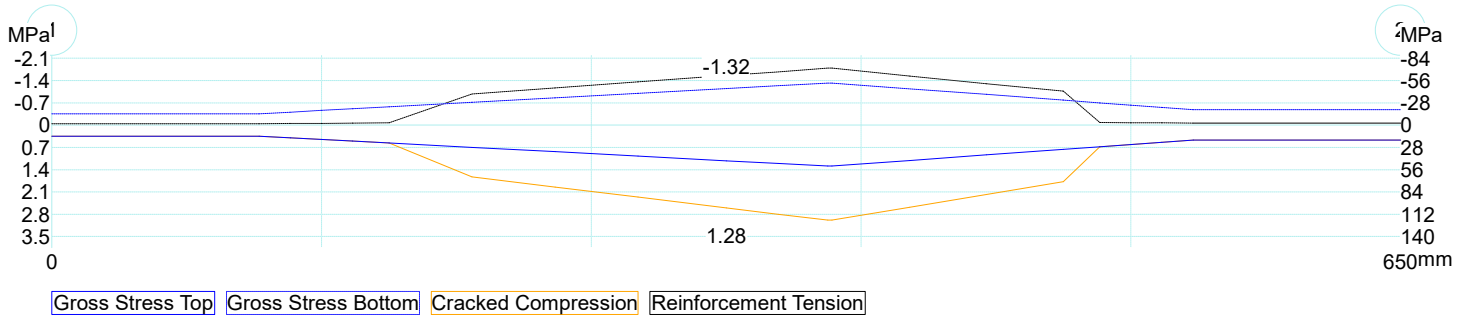


Reversal Moment Condition



Permanent

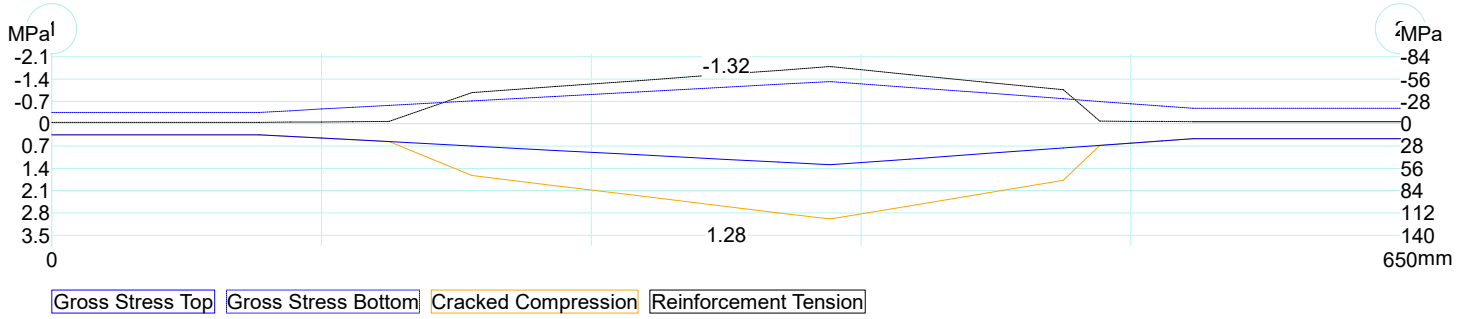
Maximum Moment Condition



Reversal Moment Condition

Characteristic Service

Maximum Moment Condition



Reversal Moment Condition

Shear Design
Beam
Span 1

Locat	V*	Mv*	Pv	d	Ast	bv	phi Vu	ks phi Vu	Phi Vumax	phi VuMin	phi Vus	Theta	Asv/sSpacing of Sets				
														2 legs N16	4 legs N16	6 legs N16	Min legs N16
mm	kN	kNm	kN	mm	mm2	mm	kN	kN	kN	kN	kN	#.#	mm2/mm	mm	mm	mm	mm
100	469.62	46.96	0	637.2	2482.2	788	341.08	0	4118.57	737.65	29.28	35.6218	0.89	450.9	500	500	500
115	469.62	54.01	0	637.2	2482.2	788	341.08	0	4118.57	737.65	29.28	35.6218	0.89	450.9	500	500	500
130	469.62	61.05	0	637.2	2482.2	788	341.08	0	4118.57	737.65	29.28	35.6218	0.89	450.9	500	500	500
145	469.62	68.09	0	637.2	2482.2	788	341.08	0	4118.57	737.65	29.28	35.6218	0.89	450.9	500	500	500
162.5	469.62	76.31	0	637.2	2482.2	788	341.08	0	4118.57	737.65	29.28	35.6218	0.89	450.9	500	500	500
202.5	469.62	95.1	0	637.2	2482.2	788	341.08	0	4118.57	737.65	29.28	35.6218	0.89	450.9	500	500	500
242.5	469.62	113.88	0	637.2	2482.2	788	341.08	0	4118.57	737.65	29.28	35.6218	0.89	450.9	500	500	500
282.5	469.62	132.67	0	637.2	2482.2	788	341.08	0	4118.57	737.65	29.28	35.6218	0.89	450.9	500	500	500
325	469.62	152.62	0	637.2	2482.2	788	341.08	0	4118.57	737.65	29.28	35.6218	0.89	450.9	500	500	500
350	469.62	164.37	0	637.2	2482.2	788	341.08	0	4118.57	737.65	29.28	35.6218	0.89	450.9	500	500	500
374	469.62	175.64	0	637.2	2482.2	788	341.08	0	4118.57	737.65	29.28	35.6218	0.89	450.9	500	500	500
376	-640.38	175.47	0	637.2	2482.2	788	281.12	0	4221.45	635.29	277.47	38.0297	0.91	300	300	300	300
413.5	-640.38	151.45	0	637.2	2482.2	788	281.12	0	4221.45	635.29	277.47	38.0297	0.91	300	300	300	300
450.5	-640.38	127.76	0	637.2	2482.2	788	281.12	0	4221.45	635.29	277.47	38.0297	0.91	300	300	300	300
487.5	-640.38	104.06	0	637.2	2482.2	788	281.12	0	4221.45	635.29	277.47	38.0297	0.91	300	300	300	300
505	-640.38	92.86	0	637.2	2482.2	788	281.12	0	4221.45	635.29	277.47	38.0297	0.91	300	300	300	300
520	-640.38	83.25	0	637.2	2482.2	788	281.12	0	4221.45	635.29	277.47	38.0297	0.91	300	300	300	300
535	-640.38	73.64	0	637.2	2482.2	788	281.12	0	4221.45	635.29	277.47	38.0297	0.91	300	300	300	300
550	-640.38	64.04	0	637.2	2482.2	788	281.12	0	4221.45	635.29	277.47	38.0297	0.91	300	300	300	300

Minimum Legs	Shear Comments
#	A
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	Minimum Steel
3	
3	
3	
3	
3	
3	
3	
3	

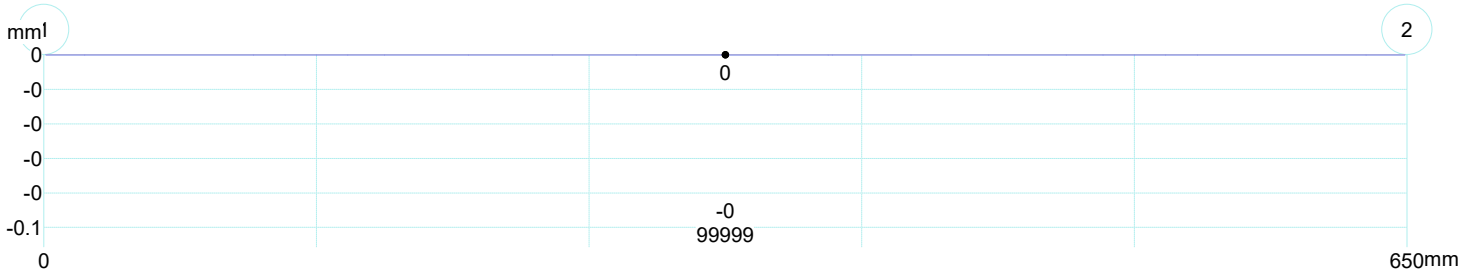
Punching
Column Head Critical Section

Column No.	Bh	a	at	u	d	fcv	P/A	Asw/s min	V*	Mv*	phi Vuo	phi Vu	phi VuMin	phi Vumax	side beam	Moment Transfer	Asw/s reqd	result
A	#.#	mm	mm	mm	mm	MPa	MPa	mm2/mm	kN	kNm	kN	kN	kN	kN	A	A	mm2/mm	A
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	Check Not Carried Out!
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	Check Not Carried Out!

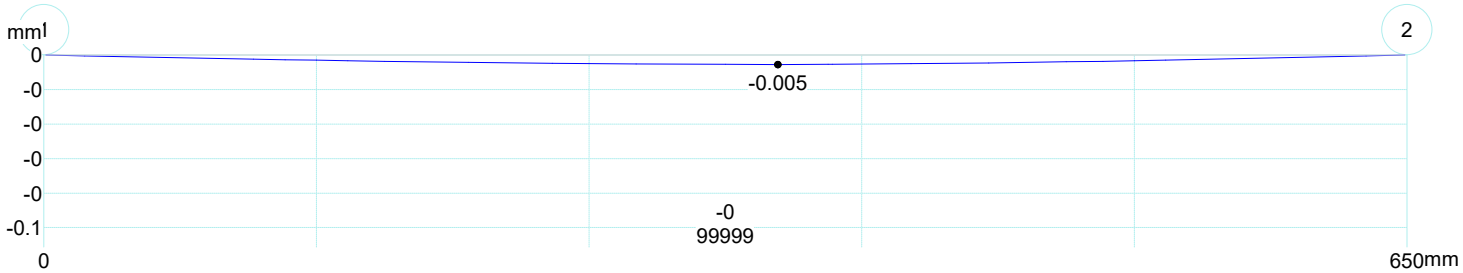
Deflections

All Spans Loaded

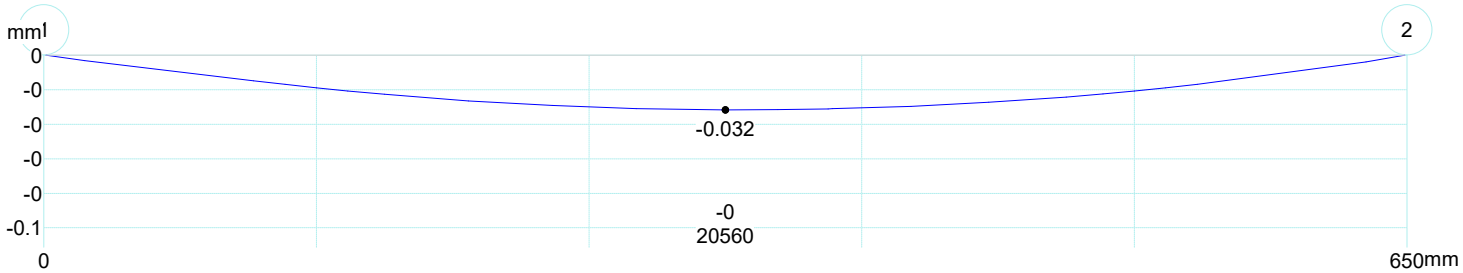
Transfer



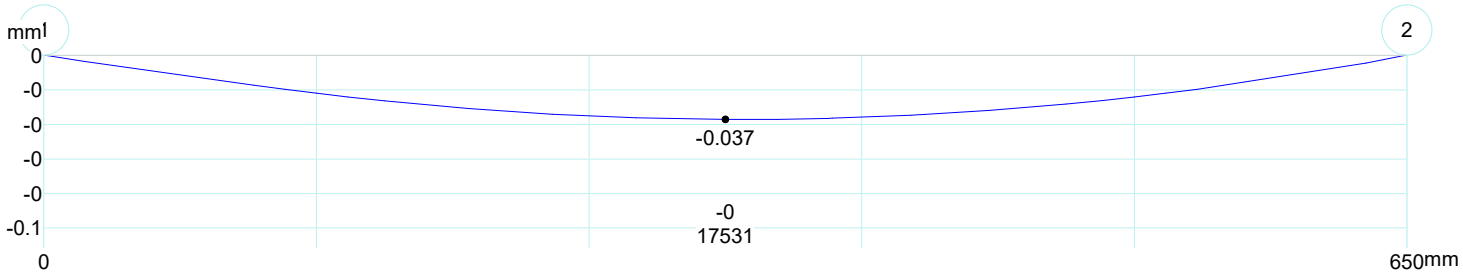
Short Term



Incremental



Total Long Term



Detailed Reinforcement

Span 1

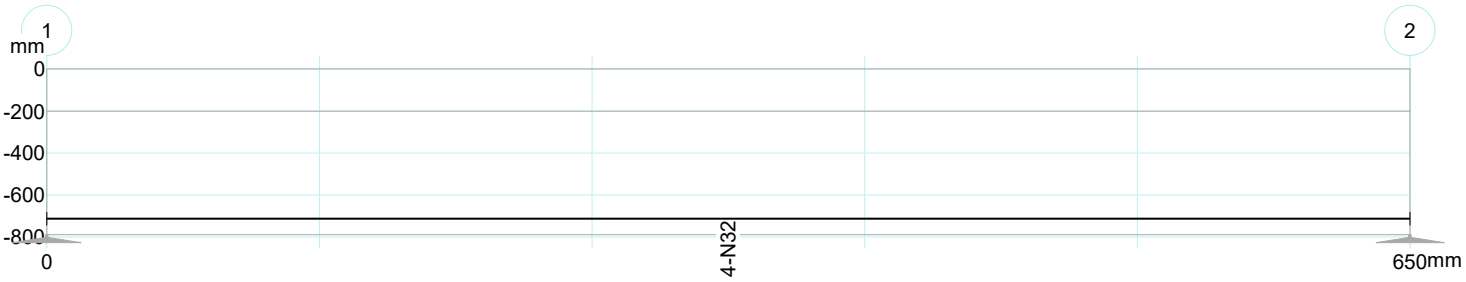
	Top Reinforcement						Bottom Reinforcement					
Locat	Max Size	Max Space	Area	Depth	Section Width	Rebar Reqd	Max Size	Max Space	Area	Depth	Section Width	Rebar Reqd
mm	mm	mm	mm2	mm	mm	A	mm	mm	mm2	mm	mm	A
100	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
115	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
130	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
145	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
162.5	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
202.5	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
242.5	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
282.5	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
325	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
350	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
374	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
376	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
413.5	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
450.5	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
487.5	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
505	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
520	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
535	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7

	Top Reinforcement						Bottom Reinforcement					
Locat	Max Size	Max Space	Area	Depth	Section Width	Rebar Reqd	Max Size	Max Space	Area	Depth	Section Width	Rebar Reqd
mm	mm	mm	mm2	mm	mm	A	mm	mm	mm2	mm	mm	A
550	0	0	0	74	918	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7

Shear Reinforcement						
	Spacing of Sets					
Area	2 legs N16	4 legs N16	6 legs N16	Min legs N16	Minimum Legs	Shear Comments
mm2/mm	mm	mm	mm	mm	#	A
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.89	450.9	500	500	500	3	Minimum Steel
0.91	300	300	300	300	3	
0.91	300	300	300	300	3	
0.91	300	300	300	300	3	
0.91	300	300	300	300	3	
0.91	300	300	300	300	3	
0.91	300	300	300	300	3	
0.91	300	300	300	300	3	
0.91	300	300	300	300	3	

Design Comments:-
- - Span 1 - Required Bar Size is smaller than the Preferred Bar Size. Maintaining the same cover will require slightly less reinforcement than calculated.
- Span - 1 - Reinforcement added at left span contraflexure point for Offset of Bending Moment Diagram for Shear - 597.44mm2
- Span - 1 - Reinforcement added at right span contraflexure point for Offset of Bending Moment Diagram for Shear - 597.44mm2

Reinforcement Layout



- - Span 1 - Required Bar Size is smaller than the Preferred Bar Size. Maintaining the same cover will require slightly less reinforcement than calculated.

Design Comments:-
- Span - 1 - Reinforcement added at left span contraflexure point for Offset of Bending Moment Diagram for Shear - 597.44mm2
- Span - 1 - Reinforcement added at right span contraflexure point for Offset of Bending Moment Diagram for Shear - 597.44mm2

C:\Users\Sasi Parameswaran\OneDrive - Cadigal Group\D1\Cadigal Group\Cadigalgroup-SL - Cadigalgroup-SL\01-100084_ Wilson Street Chatswood\03_Calculations\11_Soldier pile design\XS2\900 DIA_Sec3.rpf

RAPT - Version: 7.1.3.0
Reinforced And Post-Tensioned Concrete Analysis & Design Package
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Licensee
Cadigal Group Engineers Pty Ltd
1002
22 Market St
SYDNEY
New South Wales 2000
Australia
11531971300824WPN1

Input

General

Design Code	List	Australia - AS3600-2018*SAVED*
Material	List	Australia - Australian Materials - 2018*SAVED*
Reinforcement Type	List	Reinforced
Member Type	List	Beam
Panel Type	List	Internal
Strip Type	List	One way - Nominal Width
Column Stiffness	List	Equivalent Column
Concrete Type	List	Standard Concrete
Concrete - Spanning Members	List	50MPa
Concrete - Columns	List	50MPa
Top Reinforcement Cover	mm	60
Bottom Reinforcement Cover	mm	60
Top Reinforcement Axis Depth Limit	mm	30
Bottom Reinforcement Axis Depth Limit	mm	30
Concrete Unit Weight	kn/m3	25
Self Weight Definition	List	Program Calculated
Pattern Live Load	Y/N	
Earthquake Design	List	None
Moment Redistribution	%	0
Design Surface Levels	List	Extreme Surfaces

Span

Span	Span Length	Slab Depth	Panel Width Left	Panel Width Right
	mm	mm	mm	mm
LE	0			
1	780	200	1000	1000
RE	0			

Columns

Column	Column Grid Reference	Support Type	Transverse Column spacing	Transverse prestress (P/A)
	A	List	mm	MPa
1	1	Knife-Edge	1000	
2	2	Knife-Edge	1000	

Beams

Beam Number	Beam Depth	Beam Width at Slab	Beam Width	Effective Flange Width
	mm	mm	mm	mm
1	788	788	788	944

Load Cases

Load Case	Load Type	Load Definition	Live Load Deflection Case	Description
	List	List	Y/N	A
1	Self Weight	Applied Loads		

Load Case	Load Type	Load Definition	Live Load Deflection Case	Description
	List	List	Y/N	A
2	Initial Dead Load	Applied Loads		

1. Self Weight - Line

Load	Left End Reference Column	Left end of load from reference column	Load at left end	Right End reference column	Right end of load from reference column	Load at right end	Description
	#	mm	kN/m	#	mm	kN/m	A
1	1	0	16.58	2	0	16.58	

2. Initial Dead Load - Point

Load	Reference column	Distance to Load from reference column	Load	Load Length	Description
	#	mm	kN	mm	A
1	1	390	880	0	

Load Combinations : Ultimate

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Live Load	0	1.5
2	Live Load	0	0.9
3	Dead Load	0	1.35

Load Combinations : Short Term Service

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Live Load	1	1

Load Combinations : Permanent Service

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Live Load	1	1

Load Combinations : Deflection

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Short Term - Deflection	1	1
2	Permanent - Deflection	1	1
3	Initial - Deflection	1	1

Load Combinations : Transfer Prestress

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Transfer	1	0

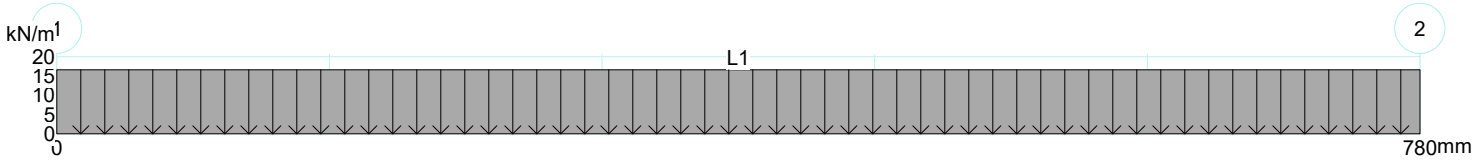
Load Combinations : Pre Existing

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Pre Existing	1	0

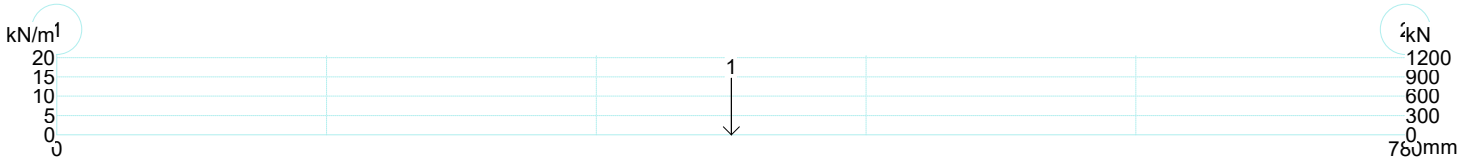
Load Combinations : Construction

Load Combination	Description	1. Self Weight	2. Initial Dead Load
	A	#.#	#.#
1	Construction	1	0

Load Case 1 : 1. Self Weight



Load Case 2 : 2. Initial Dead Load



Reinforcement

Reinforcement Use	Reinforcement Type	Preferred Bar Size	Number of Legs
	List	List	#
Flexural Bar	N 500MPa		
Flexural Mesh	F 450MPa		
Shear Option 1	N 500MPa	16	2
Shear Option 2	N 500MPa	16	4
Shear Option 3	N 500MPa	16	6
Punching Shear	N 500MPa	12	1

Reinforcement

	Maximum Bar Spacing	Minimum Bar Spacing	Minimum Continuous Reinforcement	Minimum Span Reinforcement into End Support	Minimum Span Reinforcement into Internal Support	Infill Bars	Stagger Bars
	mm	mm	#.#	#.#	#.#	Y/N	Y/N
Support Reinforcement	300	60	0			N	N
Span Reinforcement	300	60		0	0	N	N

Design Zones

Layer Number	Steel type	Left End Reference Column	Distance to left end of bar	Bar stagger length at left end	Top Cover at left end	Right End Reference Column	Distance to right end of bar	Bar stagger length at right end	Top Cover at Right end	Maximum Bar Size	Minimum Bar Size	Preferred bar size	Minimum Number of Bars	Maximum Spacing of Bars
	List	#	mm	mm	mm	#	mm	mm	mm	List	List	List	#	mm
1	Bar	1	0	0	60	2	0	0	60	36	16	28	0	0

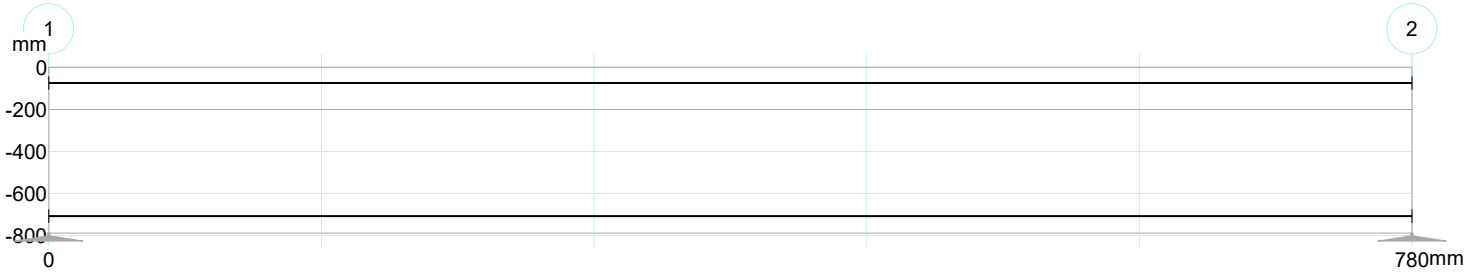
Layer Number	Minimum Steel area as %	% in Flange
	%	%
1	0	0

Design Zones

Layer Number	Steel type	Left End Reference Column	Distance to left end of bar	Bar stagger length at left end	Bottom Cover at left end	Right End Reference Column	Distance to right end of bar	Bar stagger length at right end	Bottom Cover at Right End	Maximum Bar Size	Minimum Bar Size	Preferred bar size	Minimum Number of Bars
	List	#	mm	mm	mm	#	mm	mm	mm	List	List	List	#
1	Bar	1	0	0	60	2	0	0	60	40	32	40	0

Layer Number	Maximum Spacing of Bars	Minimum Steel area as %	Minimum Reinforcement placed at	% in Flange
	mm	%	List	%
1	400	0	Tension Points	0

Reinforcement Design Zones



Design Data

Capacity Reduction factor (phi) for Flexure	#.#	0.85
Capacity Reduction factor (phi) for Shear	#.#	0.7
Capacity Reduction factor (phi) for Shear with transverse reinf	#.#	0.75
Material Factor for Concrete in Flexure	#.#	1
Material Factor for Concrete in Shear	#.#	1
Material Factor for Reinforcement	#.#	1
Maximum Ratio of Neutral Axis Depth for Ductility	#.#	0.4
Ductility Limit - Strain	#.#	0
Ductility Check at Left End Column	Y/N	Y
Ductility Check at Right End Column	Y/N	Y
Minimum Reinforcement Strength Limit - #.## x M*	#.#	0
Flexural Critical Section - Consider Transverse Beams	Y/N	Y
Flexural Critical Section - Distance from centre of Support	#.#	-1
Beam Left Sideface Cover (Internal)	mm	25
Beam Right Sideface cover	mm	40
Prestress Minimum Reinforcement Basis	List	Program Default
Shear Enhancement at Supports	Y/N	N
Ast Value in Shear Calculations	List	Calculated
Limit Reinforcement Strain	Y/N	Y
Include Strain Hardening of Reinforcement	Y/N	N
Beam Shear Critical Section Location	List	Code Critical Section

Maximum Service Stress Change - Prestressed Sections	MPa	0
Maximum Service Stress Change - Reinforced Sections	MPa	0
Relative Humidity	%	50
Average Temperature	C.	20
Prestress Losses Calculations based on	List	Program Default
Crack Width Calculations	List	Code default
AS3600 Shrinkage and Temperature Reinforcement	List	Moderate
Degree of Restraint in Primary Direction	%	0
Degree of Restraint in Secondary Direction	%	0
Concrete Strength Gain Rate	List	N

Concrete Tensile Strength for Deflection Calculations- #.## x (Fc)n	#.#	-1
Maximum Value of Ieff/Igross for Deflection Calculations	#.#	0.6
Total Deflection Warning Limit - Maximum Span/Deflection	#.#	250
Total Deflection Warning Limit - Maximum Deflection	mm	25
Incremental Deflection Warning Limit - Maximum Span/Deflection	#.#	500
Incremental Deflection Warning Limit - Maximum Deflection	mm	25
Initial Time for Shrinkage	List	Full Shrinkage
Time of Loading in days	#.#	10
Age Adjustment Factor	#.#	0.76
Concrete Strength at Time of Loading	MPa	42.25
Loaded Period in years	#.#	30
Tension stiffening Approach	List	Modified Concrete Tensile Modulus Method
Top Surface Shrinkage Factor - General	#.#	1
Bottom Surface Shrinkage Factor - General	#.#	1
Top Surface Shrinkage Factor - Metal Decking	#.#	1.2
Bottom Surface Shrinkage Factor - Metal Decking	#.#	0.2

Live Load Pattern Factor	#.#
Pattern Live Load for Ultimate Strength	Y/N
Pattern Live Load for Crack Control	Y/N
Pattern Live Load For Deflections	Y/N
Pattern Live Load for Deflection Permanent Load Combination	Y/N

Material Properties

Concrete : Standard Concrete : Concrete Strength Basis - Cylinder

Description	A	50MPa
Characteristic Compressive Strength	MPa	50
Mean Compressive Strength	MPa	59.7
Lower Characteristic Tensile Strength	MPa	4.24
Upper Characteristic Tensile Strength	MPa	7.64

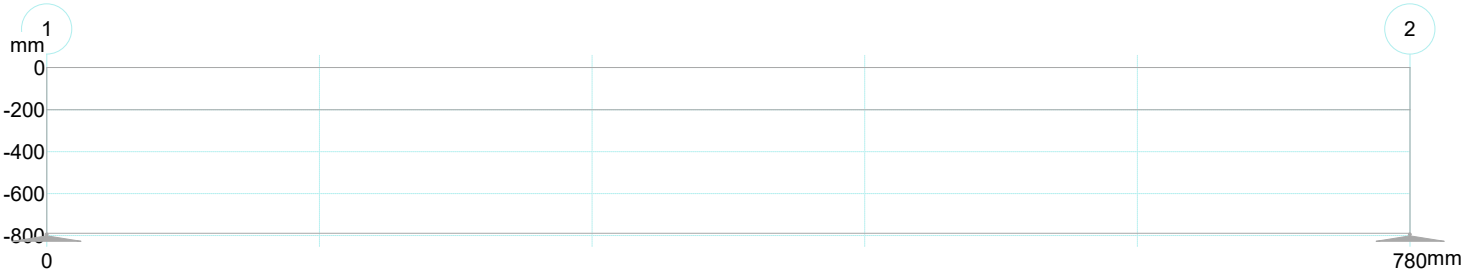
Concrete Density	kg/m3	2447
Design Concrete Modulus	MPa	34013.6
Mean Concrete Modulus	MPa	35820.8
Basic Shrinkage Strain	mm/mm	800
Shrinkage Multiplier	#.#	1
Basic Creep Factor	#.#	2.4
Creep Multiplier	#.#	1
Concrete Strain at Peak Stress	#.#	0.002
Squash Load Factor	#.#	0.9
Concrete Strain Limit	#.#	0.004
Strength Gain Rate	List	Normal
Maximum Aggregate Size	mm	20

Reinforcement Bar

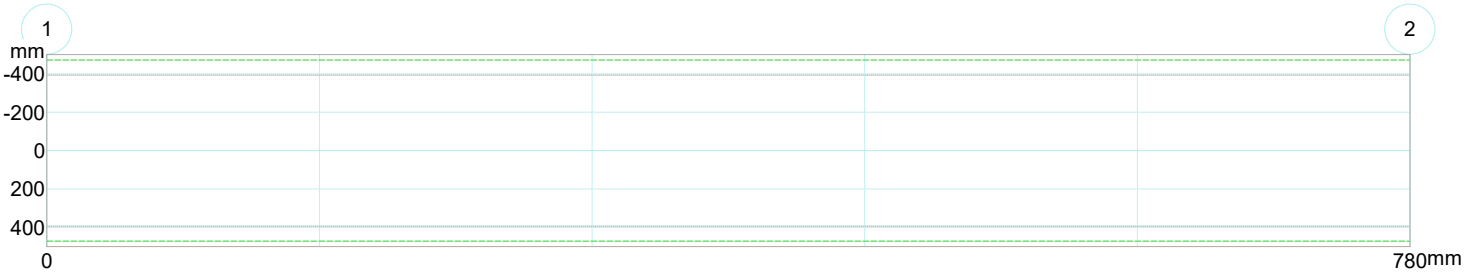
Designation	Type	Yield Stress	Elastic Modulus	Ductility	Peak Strain	Peak Stress	Design Strain Limit	Material Factor Flexure	Material Factor Shear	Material Capacity Reduction Factor - Flexure	Material Capacity Reduction Factor - Shear	Include as Flexural Reinforcement for Shear	Description
N	Deformed	500	2e5	N	0.05	540	90	-1	-1	-1	-1	Y	

Nominal Bar Size	Bar Diameter	Bar Area	Bar Inertia	Bar Weight	Stock Length
A	mm	mm2	mm4	kg/m	mm
10	10	78.5	491.07	0.62	12000
12	12	113	1018.29	0.89	12000
16	16	201	3218.29	1.58	12000
20	20	314	7857.14	2.47	12000
24	24	452	16292.6	3.55	12000
28	28	616	30184	4.83	12000
32	32	804	51492.6	6.31	12000
36	36	1020	82481.1	7.99	12000
40	40	1260	1.257e5	9.86	12000

Elevation view



Plan view



Warnings

Input

Warning:No Live Load Case defined for deflection calculations.

Output

No errors or warnings were found.

Bending Moments

Load Cases

Column Actions

Col No. 1		Self Weight	Initial Dead Load
Moment Above	kNm	-0	-0
Moment Below	kNm	-0	-0
Reaction	kN	6.47	440

Col No. 1		Self Weight	Initial Dead Load
Elastic Rotation	#.#	0	0
Elastic Axial Shortening	mm	0	0

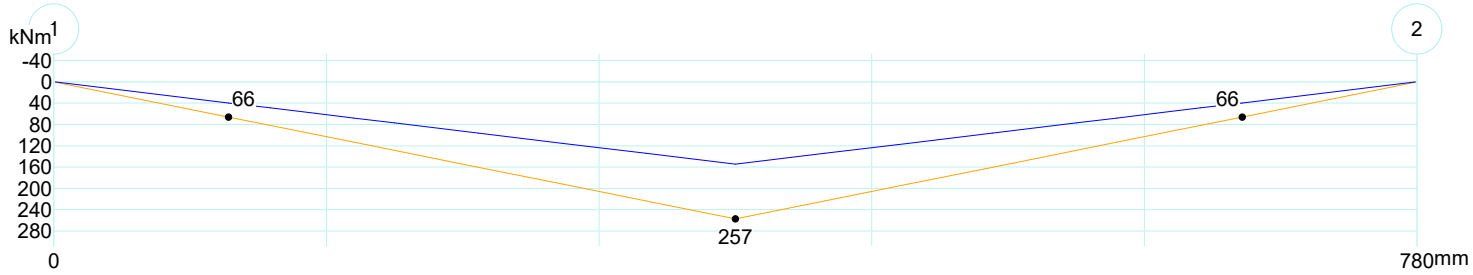
Col No. 2		Self Weight	Initial Dead Load
Moment Above	kNm	-0	-0
Moment Below	kNm	-0	-0
Reaction	kN	6.47	440
Elastic Rotation	#.#	0	0
Elastic Axial Shortening	mm	0	0

Load Combinations
Column Actions

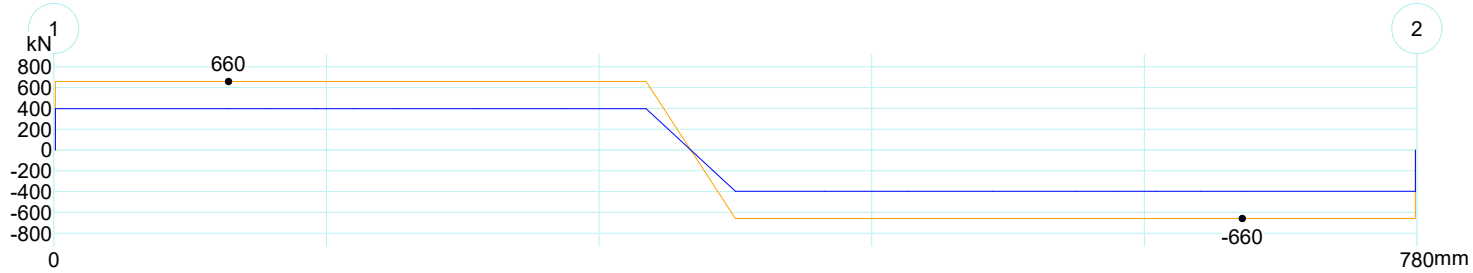
Col No. 1		Characteristic Service	Characteristic Service (Reversal)	Service	Service (Reversal)	Ultimate Flexure	Ultimate Flexure (Reversal)	Ultimate Shear	Ultimate Shear (Reversal)
Moment Above	kNm	0	0	0	0	0	0	0	0
Moment Below	kNm	0	0	0	0	0	0	0	0
Reaction	kN	446.47	446.47	446.47	446.47	660	660	396	660
Elastic Rotation	#.#	0	0	0	0	0	0	0	0
Elastic Axial Shortening	mm	0	0	0	0	0	0	0	0

Col No. 2		Characteristic Service	Characteristic Service (Reversal)	Service	Service (Reversal)	Ultimate Flexure	Ultimate Flexure (Reversal)	Ultimate Shear	Ultimate Shear (Reversal)
Moment Above	kNm	0	0	0	0	0	0	0	0
Moment Below	kNm	0	0	0	0	0	0	0	0
Reaction	kN	446.47	446.47	446.47	446.47	660	660	396	660
Elastic Rotation	#.#	0	0	0	0	0	0	0	0
Elastic Axial Shortening	mm	0	0	0	0	0	0	0	0

Ultimate Design
Flexure

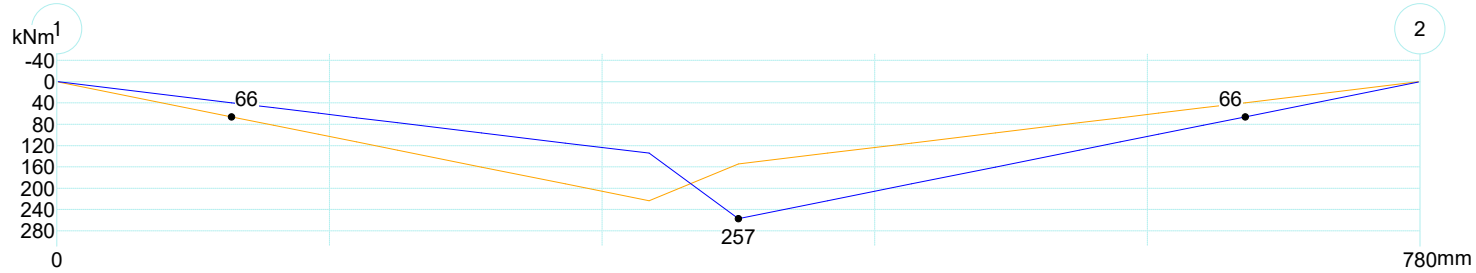


Moment Moment 1 Moment 2

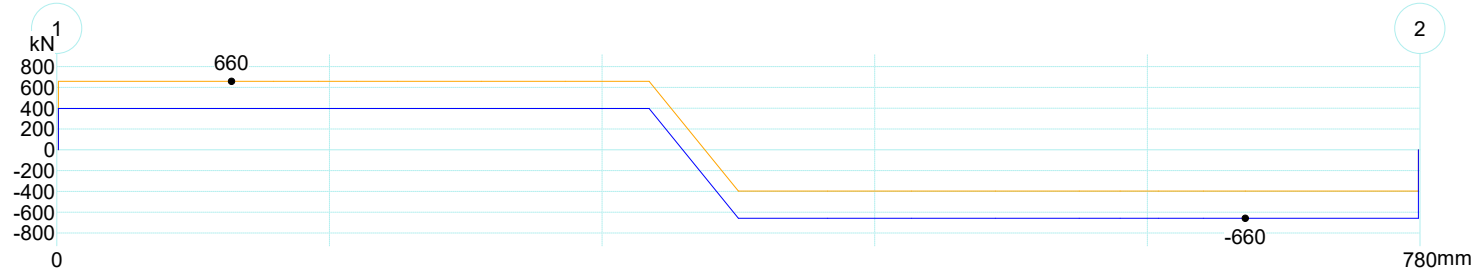


Shear Shear 1 Shear 2

Shear

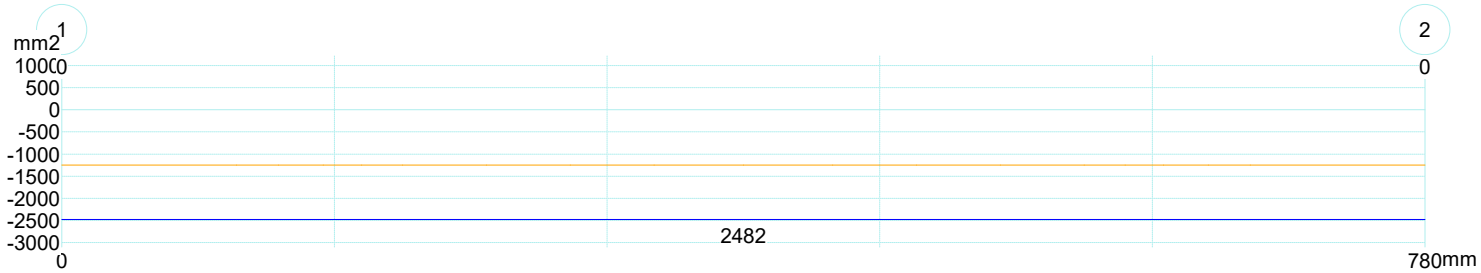


Moment Moment 1 Moment 2

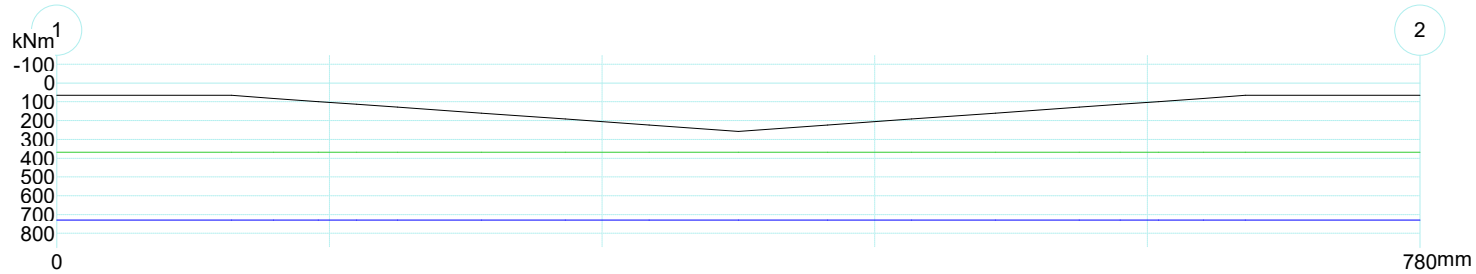


Shear Shear 1 Shear 2

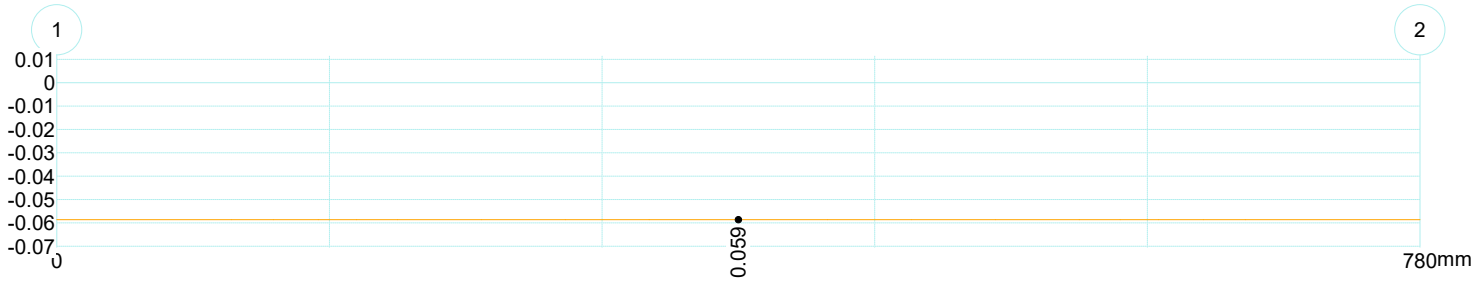
Flexural Design
Ultimate



Reinforcement Top Total Bottom Total Top Ultimate Bottom Ultimate Min Top Min Bot



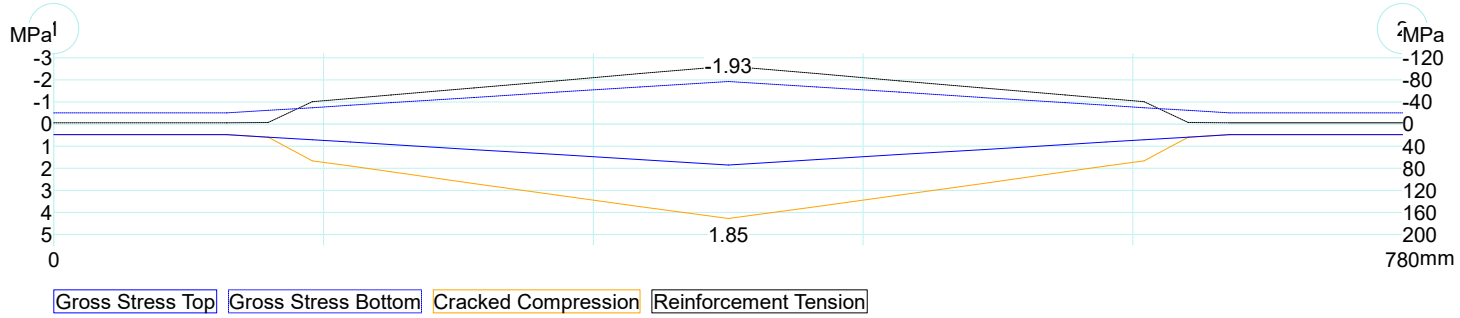
Capacity Minimum Ultimate Design Initial Final



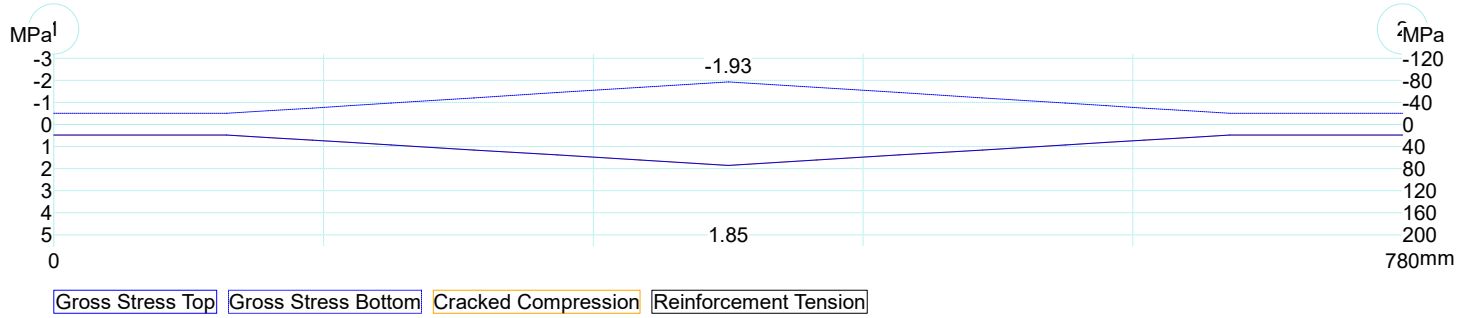
Neutral Axis Depth Initial Final

Service

Maximum Moment Condition

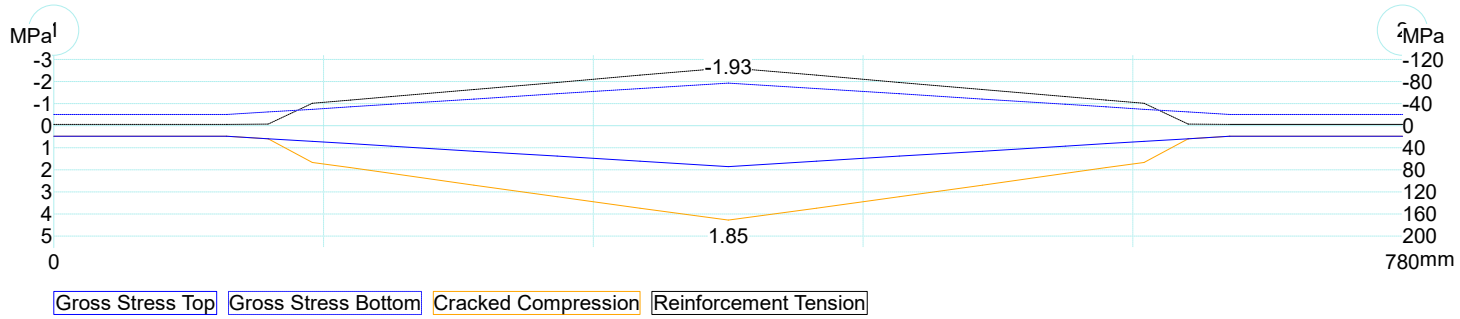


Reversal Moment Condition

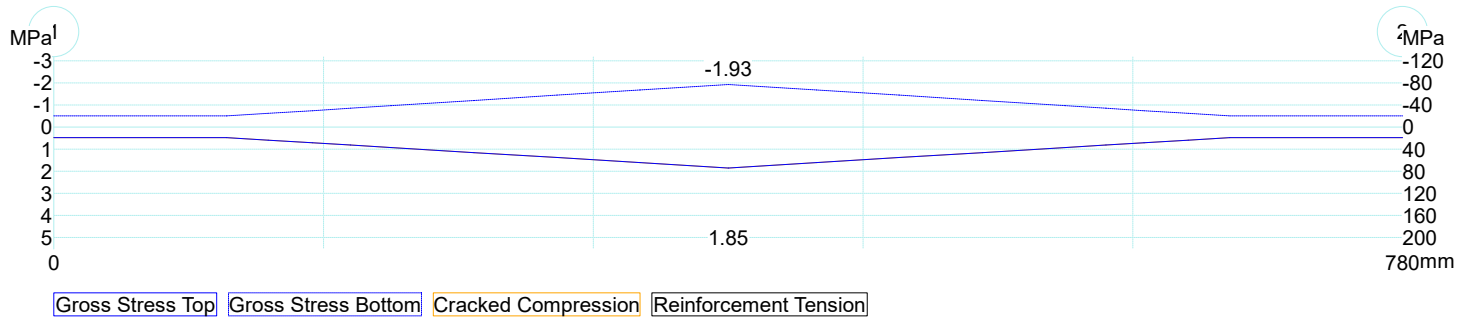


Permanent

Maximum Moment Condition

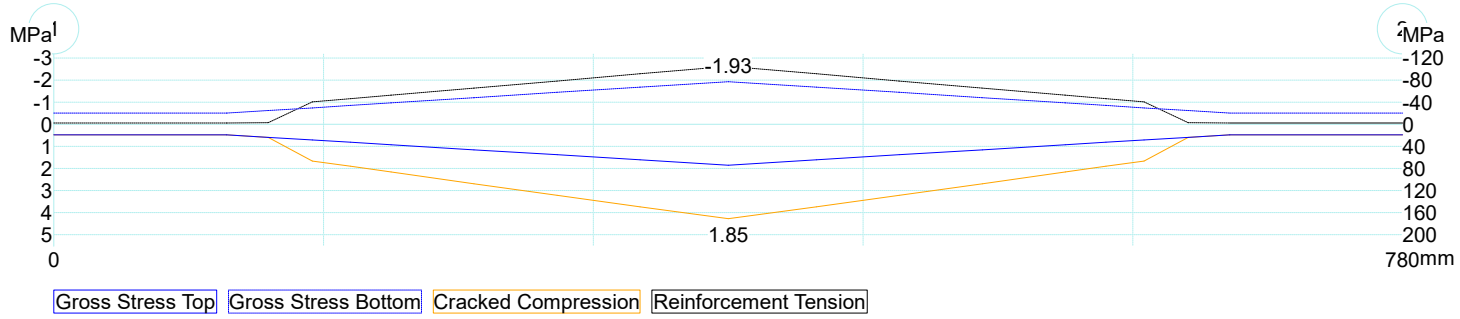


Reversal Moment Condition

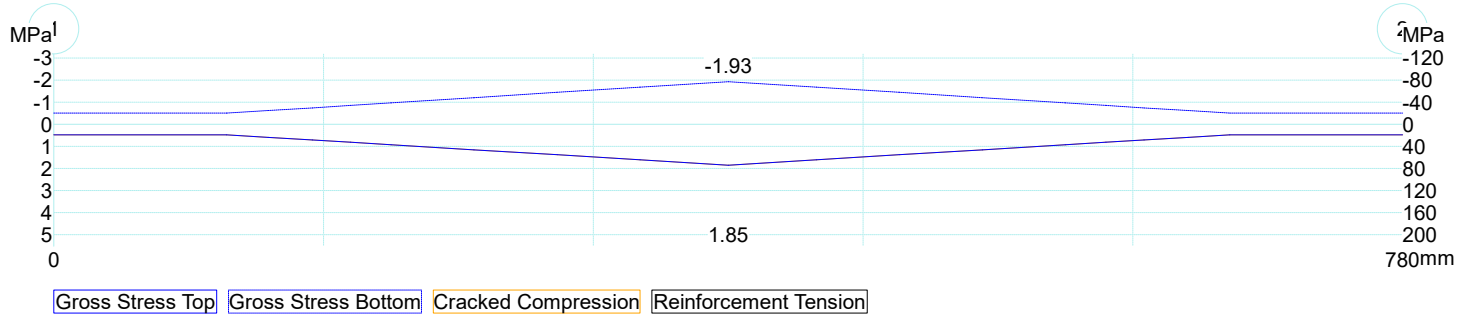


Characteristic Service

Maximum Moment Condition



Reversal Moment Condition



Shear Design
Beam
Span 1

Locat	V*	Mv*	Pv	d	Ast	bv	phi Vu	ks phi Vu	Phi Vumax	phi VuMin	phi Vus	Theta	Asv/sSpacing of Sets				
														2 legs N16	4 legs N16	6 legs N16	Min legs N16
mm	kN	kNm	kN	mm	mm2	mm	kN	kN	kN	kN	kN	#.#	mm2/mm	mm	mm	mm	mm
100	660	66	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
124	660	81.84	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
149.6	660	98.74	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
171.6	660	113.26	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
195	660	128.7	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
243	660	160.38	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
291	660	192.06	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
339	660	223.74	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
390	-660	257.4	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
441	-660	223.74	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
489	-660	192.06	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
537	-660	160.38	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
585	-660	128.7	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
608.4	-660	113.26	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
630.4	-660	98.74	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
656	-660	81.84	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300
680	-660	66	0	637.2	2482.2	788	275.55	0	4231.37	625.42	304.26	38.3063	1.01	300	300	300	300

Minimum Legs	Shear Comments
#	A
3	
3	
3	
3	
3	
3	
3	
3	
3	
3	
3	
3	
3	
3	
3	
3	
3	

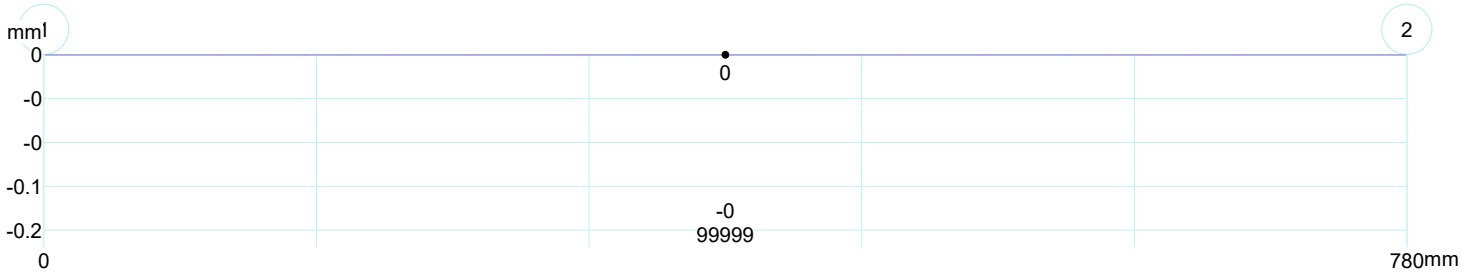
Punching
Column Head Critical Section

Column No.	Bh	a	at	u	d	fcv	P/A	Asw/s min	V*	Mv*	phi Vuo	phi Vu	phi VuMin	phi Vumax	side beam	Moment Transfer	Asw/s reqd	result
A	#.#	mm	mm	mm	mm	MPa	MPa	mm2/mm	kN	kNm	kN	kN	kN	kN	A	A	mm2/mm	A
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	Check Not Carried Out!
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	Check Not Carried Out!

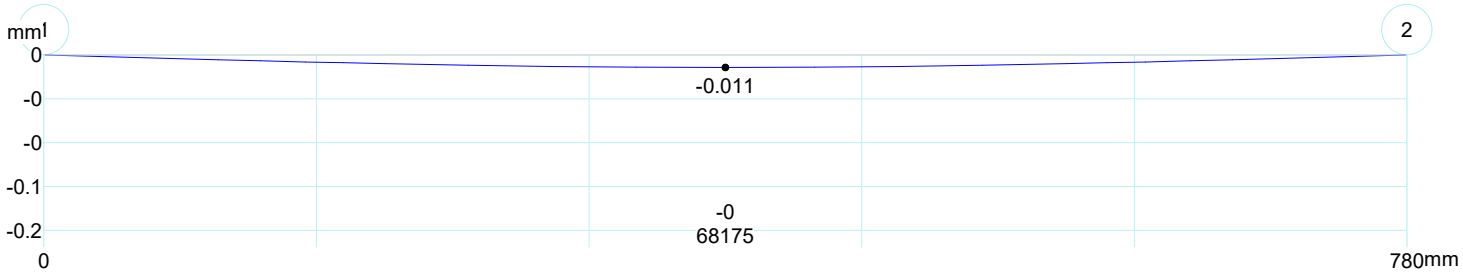
Deflections

All Spans Loaded

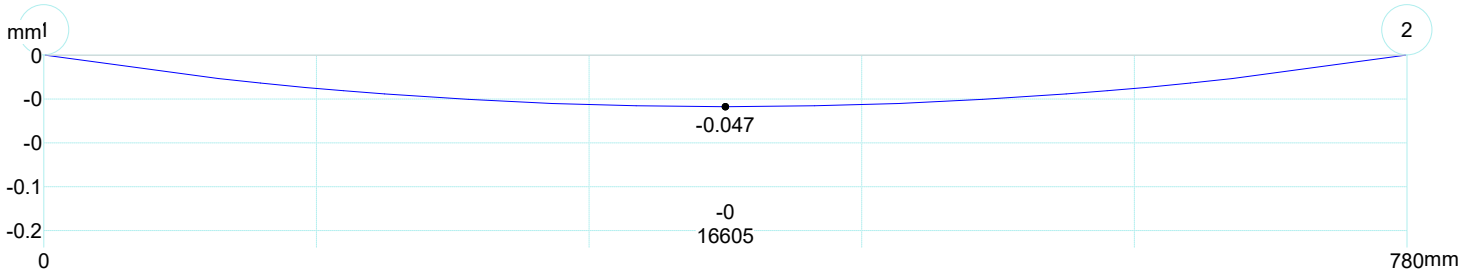
Transfer



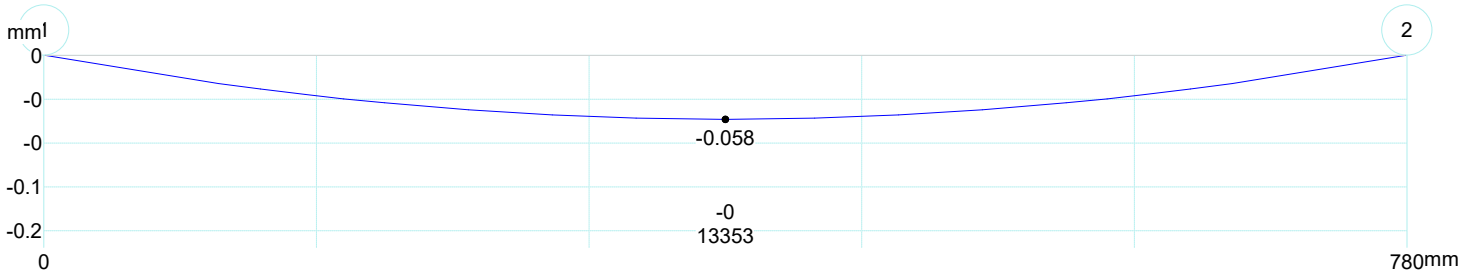
Short Term



Incremental



Total Long Term



Detailed Reinforcement

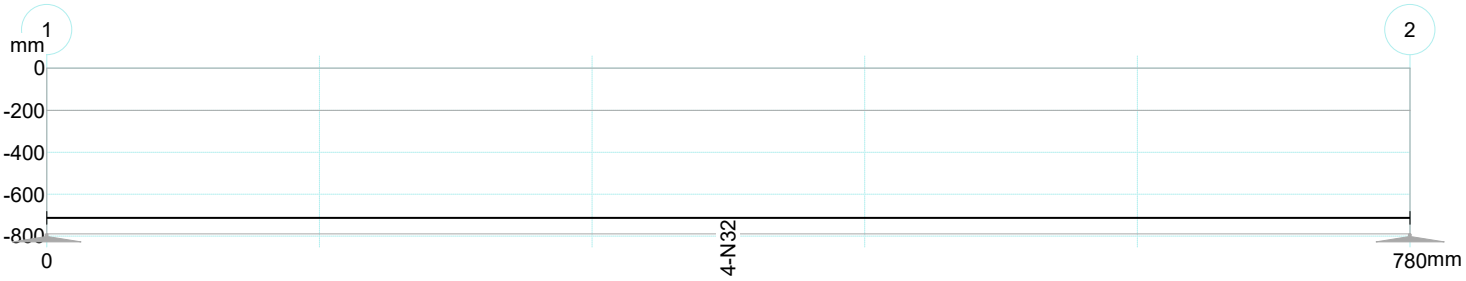
Span 1

	Top Reinforcement						Bottom Reinforcement					
Locat	Max Size	Max Space	Area	Depth	Section Width	Rebar Reqd	Max Size	Max Space	Area	Depth	Section Width	Rebar Reqd
mm	mm	mm	mm2	mm	mm	A	mm	mm	mm2	mm	mm	A
100	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
124	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
149.6	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
171.6	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
195	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
243	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
291	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
339	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
390	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
441	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
489	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
537	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
585	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
608.4	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
630.4	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
656	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7
680	0	0	0	74	944	No Steel Added	40	300	2482.2	708	788	4 N32 @ 219.7

Shear Reinforcement						
	Spacing of Sets					
Area	2 legs N16	4 legs N16	6 legs N16	Min legs N16	Minimum Legs	Shear Comments
mm2/mm	mm	mm	mm	mm	#	A
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	
1.01	300	300	300	300	3	

Design Comments:-
- - Span 1 - Required Bar Size is smaller than the Preferred Bar Size. Maintaining the same cover will require slightly less reinforcement than calculated.
- Span - 1 - Reinforcement added at left span contraflexure point for Offset of Bending Moment Diagram for Shear - 875.09mm2
- Span - 1 - Reinforcement added at right span contraflexure point for Offset of Bending Moment Diagram for Shear - 875.09mm2

Reinforcement Layout



- - Span 1 - Required Bar Size is smaller than the Preferred Bar Size. Maintaining the same cover will require slightly less reinforcement than calculated.

Design Comments:-
- Span - 1 - Reinforcement added at left span contraflexure point for Offset of Bending Moment Diagram for Shear - 875.09mm2
- Span - 1 - Reinforcement added at right span contraflexure point for Offset of Bending Moment Diagram for Shear - 875.09mm2