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Report on Preliminary Dewatering Management Plan

Cockle Bay Park Redevelopment
241-249 Wheat Road, Darling Harbour, Sydney

Prepared for
DPT Operator Pty Ltd

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Report on Preliminary Dewatering Management Plan
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1. Introduction

This preliminary dewatering management plan has been prepared for the proposed Cockle Bay Park redevelopment at 241-249 Wheat Road, Darling Harbour, Sydney. The report was commissioned in by Paul Yousseph of TSA Management Pty Ltd and was undertaken in accordance with Douglas Partners' (DP) proposal 202546.02.P.001.Rev0 dated 30/03/2022.

It is understood that the proposed development of the site includes demolition of the existing Cockle Bay Wharf and pedestrian bridge and construction of a new building. The building will contain new retail along Cockle Bay with a high-rise tower set away from the water's edge, adjacent to Wheat Road. A land-bridge will be constructed over Wheat Road, Harbour Street and the Western Distributor to connect the waterfront to the existing commercial towers of Darling Park. It is understood that a bulk excavation to approximately 6 m depth will also be required towards the southern end of the proposed development to accommodate a large in-ground fire water tank.

This DMP is based on a previous investigation carried out by (Douglas Partners, 2021)), complemented by additional measurements of groundwater levels, in-situ permeability tests and numerical modelling to estimate seepage inflow rates and drawdown of groundwater levels associated with dewatering of the proposed excavation.

Reference has been made to the NSW Aquifer Interference Policy (AIP), (NSW Office of Water, 2012).

Details of the additional field work and numerical modelling undertaken are given in this report, together with comments relating to the AIP.

2. Previous Work

Information used to develop the conceptual groundwater model was obtained from the previous investigation reports prepared by DP.

- Douglas Partners Pty Ltd: "Report on Geotechnical Investigation: Cockle Bay Park Redevelopment, 241-249 Wheat Road, Sydney", dated 20 December 2021 (Ref: 202546.00.R.001);
- Douglas Partners Pty Ltd: "Report on Contamination Investigation: Cockle Bay Park Redevelopment, 241-249 Wheat Road, Sydney", dated 20 December 2021 (Ref: 202546.00.R.002);

This report should be read in conjunction with the previous investigation reports. The locations of groundwater monitoring wells installed and boreholes drilled as part of the aforementioned works are shown on Drawing 1 in Appendix B.

3. Site Description

Cockle Bay Park is located at 241-249 Wheat Road, Darling Harbour, currently occupied by the existing Cockle Bay Wharf precinct. The site comprises an irregular shaped area of about 21,000 m^2, the general layout of which is shown on Drawing 1 in Appendix B. The site is bound by Darling Harbour to the west, Pyrmont Bridge to the north and The Ribbon development to the south. The northern end of the site extends out to the east, across the Western Distributor, to the existing Darling Park Towers. The areas north, south, and west of the existing building are typically paved public walkways. Loading docks and back-of-house facilities are located on the eastern side of the building.

The existing Cockle Bay Wharf building is generally used for retail purposes. The existing developments surrounding the site are a combination of retail and commercial office spaces. The ground surface is relatively level to the east of the existing Cockle Bay Wharf precinct, with surface levels at or about Reduced Level (RL) 3 m relative to Australian Height Datum (AHD). The ground surface falls away into the harbour to the west of the existing precinct, with the bottom of the harbour at about RL -5 m AHD. The foreshore deck continues over the water to the west of the precinct, at about RL 2.2 m AHD.

An existing sheet pile sea wall is located beneath the site, running roughly north-south, with the western portion of the site supported on a suspended deck which extends out over Darling Harbour, the surface of which is at about RL 2.2 m AHD. It is noted that the depth of the existing sheet pile wall is not known.

4. Geotechnical and Hydrogeological Model

4.1 Subsurface Profile

The Sydney 1:100 000 Geological Series Sheet indicates the site spans across the boundary between Hawkesbury Sandstone (medium to coarse-grained sandstone with minor shale and laminate lenses) and Quaternary-aged alluvial and estuarine sediment (silty/peaty sand, silt, clay, common shell layers). The area south of Darling Harbour is mapped as having man-made fill placed over the Quaternary-aged sediments, resulting from historical land reclamation works. A review of mapping suggests that no geological structures such as major fault zones or dykes cross the site.

The subsurface conditions encountered across the site during investigations by DP generally agreed with the mapping. The general sequence of subsurface conditions can be summarised as follows:

FILL: Variably compacted road base, sands, gravelly sands, silty sands, clayey sands, sandy gravels, and sandy clay fill with building rubble (bricks, concrete fragments, timber, metal), sandstone gravel and cobbles.. In over-land borehole locations fill was typically encountered down to elevations between RL 1.3 m and RL -6.5 m AHD. Over the foreshore deck, fill was encountered from the 'seabed' to elevations of between RL -7 and RL -7.2 m AHD.

ALLUVIAL / ESTUARINE SEDIMENTS: Generally comprising very soft to firm clays, silty clays and sandy clays interbedded with very loose to loose sands, silty sands and clayey sands, with some apparently discontinuous firm to stiff and medium dense to dense bands. Typically encountered down to elevations between RL -6.5 m and RL -18.2 m AHD.

A thin layer of possible residual soil was encountered immediately above the sandstone bedrock in several locations, although the consistency of these soils was not dissimilar to the overlying sediments.

SANDSTONE BEDROCK: The top of sandstone bedrock was encountered between RL 1.3 m (in the northeast of the site) and RL -18.2 m AHD (over the harbour). A relatively thin weathered profile, comprised of pale grey, brown and red-brown, very low to low strength and low to medium strength sandstone, up to a maximum thickness of about 4.8 m, was present at the top of the bedrock profile in some locations.

Pale grey medium to high strength sandstone was encountered in all boreholes, at elevations ranging between RL 1.3 m and RL-20.9 m AHD. Low to medium and medium strength predominantly siltstone bands up to 0.6 m thick were encountered within the sandstone profile in several locations.

5. Proposed Development

The proposed scope of works includes the demolition of the existing Cockle Bay Wharf building and pedestrian bridge for the progression of a new proposed development. The existing Cockle Bay Wharf deck structure along the Harbour foreshore will be retained and used as a platform for the construction of the proposed podium structure. The proposed development includes several major components including a low rise podium structure on Cockle Bay Wharf, a 43 storey tower, and a land bridge spanning across the existing Western Distributor. Temporary excavations are required adjacent to existing Harbour Street for the construction of core rafts, lift pits, large ground floor set-downs and loading docks.

It is understood that a bulk excavation, roughly 10 m x 20 m in size, will be required towards the southern end of the proposed development to accommodate a large in-ground fire water deluge tank. The approximate location of the proposed excavation is shown outlined in pink on Drawing 1 in Appendix B The bulk excavation level is expected to reach approximately RL -3.9 m AHD. The deluge tank will be fully tanked upon completion, but the excavation will require temporary dewatering during construction.

To manage the groundwater inflow into the excavation during construction, it is understood that a secant pile cut-off wall socketed into rock is under consideration.

It is expected that sandstone bedrock will be encountered at elevations approximately ranging between -11 m AHD towards the southern end of the proposed excavation and -15 m AHD towards the northern end of the excavation (about 14 m to 18 m below existing surface levels). Boreholes in the vicinity of the proposed excavation (CW2, CW5 and W5) encountered slightly to highly weathered, slightly fractured to fractured sandstone in the upper 3 m to 4 m of the rock profile. The degree of weathering and fracturing typically decreases towards the south, with no sub-vertical defects encountered in CW5 or W5. Photographs of the upper portions of the cores recovered from these boreholes are shown below.

Figure 1: Upper Portion of Recovered Core from CW2. Surface Level 2.9 m AHD

Figure 2: Upper Portion of Recovered Core from CW5. Surface Level 2.8 m AHD

Figure 3 Upper Portion of Recovered Core from W5. Surface Level 2.5 m AHD

5.1 Groundwater

Six groundwater monitoring wells were installed during the previous investigation. Groundwater levels were manually measured periodically between August 2021 and April 2022. A summary of manual groundwater level measurements is provided in Table 1.

Table 1: Summary of Groundwater Measurements

Location	Observation	Elevation Range of Well Screen (m AHD)	Depth (m) [RL] (m AHD) Time (24h) 26 August 2021	Depth (m) [RL] (m AHD) Time (24h) 2-3 September 2022	Depth (m) [RL] (m AHD) Time (24h) 11 April 2022
CW2	Water Level	0.3 to -9.7	2.35 [0.55] 10:45	2.97 [-0.07] 13:45	3.3 [-0.4] 10:56
CW3	Water Level	0.4 to -12.1	2.4 [0.7] 11:35	2.81 [0.29] 11:40	2.4 [0.7] 13:05
CW5	Water Level	1.9 to -2.1	2.55 [0.25] 9:52	2.98 [-0.18] 9:00	2.9 [-0.1] 13:41

Location	Observation	Elevation Range of Well Screen (m AHD)	Depth (m) [RL] (m AHD) Time (24h) 26 August 2021	Depth (m) [RL] (m AHD) Time (24h) 2-3 September 2022	Depth (m) [RL] (m AHD) Time (24h) 11 April 2022
CW6	Water Level	2.2 to -4.1	2.5 [0.5] 12:05	2.89 [0.11] 12:30	-
CP2	Water Level	0.4 to -15.65	4.2 [-1.7] 14:15	4.39 [-1.89] 11:15	-
SS2	Water Level	-0.4 to -14.91	3.5 [0] 12:52	3.55 [-0.05] 8:45	-

Manually measured groundwater levels vary according to the time of day due to the influence of tidal fluctuations on the groundwater response in proximity to Darling Harbour. To observe the tidal response, ongoing continuous monitoring of groundwater levels in CW2 and CW5 using data loggers has been underway since 11 April 2022. The results were last downloaded on 31 May 2022. Plots of the monitoring results together with daily rainfall are included in Appendix B. A summary of the monitoring results is provided in Table 2.

Table 2: Summary of Continuous Groundwater Monitoring Results

Monitoring Well Location	Surface RL (m AHD)	Minimum Recorded Groundwater RL (m AHD)	Maximum Recorded Groundwater RL (m AHD)	Average Recorded Groundwater RL (m AHD)	Range (m)
CW2	2.9	-0.52	0.98	-0.08	1.50
CW5	2.8	-0.30	0.86	0.08	1.16

Observed groundwater levels indicate that the groundwater levels in proximity to Darling Harbour and the proposed excavation fluctuate between approximately -0.5 m AHD and 1 m AHD, strongly influenced by tidal fluctuations.

It is noted that groundwater levels are transient and may fluctuate over time in response to seasonal and climatic variations.

5.2 Permeability Testing

Rising head permeability testing was performed in CW2 and CW5 on 19 April 2022 to estimate the bulk permeability of the soil profile, within which the monitoring wells were screened, in the vicinity of the proposed excavation. The test involves lowering the water level in the standpipe and measuring the rate of recharge.

In this case, due to high observed recharge rates, lowering of the water level was achieved using a 'slug test' method. This involves lowering a solid volume into the well, letting the water level in the standpipe return to the standing water level, then quickly removing the volume to rapidly lower the water level and measuring the rate of recharge.

The test results obtained from CW2 were uninterpretable due to the very fast recharge rate and turbulence induced by the test method. The testing in CW5 yielded interpretable recharge curves. The results of the rising head tests are summarised in Table 3.

Table 3: Summary of Rising Head Permeability Test Results

Location and Test	Material	Hydraulic Conductivity (m/sec)	Hydraulic Conductivity (m/day)
CW5 – Test 1	Silty SAND and Sandy CLAY	2.3×10^{-4}	19.9
CW5 – Test 2		2.8×10^{-4}	24.2
CW5 – Test 3		2.9×10^{-4}	25.1
CW5 – Test 4		2.1×10^{-4}	18.1

5.3 Surface Water

The proposed excavation is in very close proximity to Darling Harbour. It is expected that the vast majority of the groundwater that will be encountered during excavation will come from Darling Harbour through the relatively short subsurface path to the proposed excavation. The availability of water with a hydraulic head approximately equal to the sea level in the harbour is expected to be very high.

It is noted that Darling Harbour is not mapped as a Groundwater Dependent Ecosystem (GDE).

6. Groundwater Modelling

6.1 Methodology

Numerical modelling was undertaken to assess the potential inflow rates into the proposed excavation during construction, and the extent of drawdown likely to be induced during construction. A 2-dimensional (2D) numerical groundwater model was developed for the site. The modelling was carried out using the 2D finite element hydrogeological software SEEP/W, developed by GEOSLOPE International Ltd.

6.2 Model Geometry

For the purpose of the analysis, DP selected one cross-section along an east-west alignment, through the centre of the basement footprint, approximately parallel to the shorter (north and south) basement edges. Details of the general basement shape and orientation were adapted from Architectus drawing 210721 – AS-A-SK1034, including preliminary comments by Enstruct.

The subsurface materials were divided into two layers corresponding to the soil and rock units. The aquifer boundaries of the model were extended to Darling Harbour from the western excavation boundary, and approximately 15 m to the east from the eastern excavation boundary. The far-end boundary condition on the eastern side is considered appropriate given the proximity to Darling Harbour, measured groundwater levels, and lack of existing basements in immediate proximity to the proposed excavation.

The general model layout is shown in Drawing M1 in Appendix C.

6.3 Far End Boundary Conditions and Hydraulic Parameters

The constant head far-end boundary conditions were based on hydraulic heads measured on site in monitoring wells and average sea levels in Sydney (Darling Harbour). A constant hydraulic head of 0.5 m relative to AHD was adopted on both sides of the model.

Hydraulic parameters for the multi-layer model include horizontal (k_h) and vertical (k_v) hydraulic conductivities.

The hydraulic conductivity assigned to the soil profile was based on the results of the rising head permeability testing completed in CW5.

The permeability of the rock mass can vary significantly with changes in the secondary structural features (defects) such as joints, bedding planes, faults, etc. along which groundwater will flow preferentially. Changes in the clay or silt content within defect apertures, as well as the orientation and interconnection on defects will also cause changes in the rock mass permeability. The structure of the Hawkesbury Sandstone formation typically contains widely spaced horizontal bedding planes and two major sub-vertical joint sets (NNE striking, 3-10 m spacing, often persistent; and ESE striking, 2-3 m spacing, often discontinuous).

The hydraulic conductivity for the rock formation was selected to represent expected upper bound values based on DPs experience with other developments in the area and the observed quality of the rock mass with reference to published correlations (Pells, et al., 2018).

A greater than typical degree of fracturing (e.g. faulting, joint swarms) was not evident in the boreholes. However, it is possible that continuous sub-vertical joints not encountered in the boreholes may daylight at the soil-rock interface within the basement footprint which would allow for a significantly greater inflow through the rock profile compared to intact rock with no interconnectivity between bedding planes, regardless of the presence of a cut-off wall. To account for this uncertainty to a degree, ratios of vertical and horizontal hydraulic conductivity (k_v / k_h) between 0.33 and 0.66 in the rock have been considered in the model.

A low permeability appropriate for concrete was assigned to the cut-off wall itself. To represent the effect of non-verticality and poor overlap issues resulting in gaps in the secant pile wall, a case was considered with increased permeability of the wall by four orders of magnitude below 15 m depth. This is estimated approximately by assuming an average 20 mm wide gap below 15 m depth between each 0.9 m diameter pile.

The properties adopted in the model are summarised in Table 4.

Table 4: Summary of Material Parameters

Material	Saturated Horizontal Hydraulic Conductivity, k_h (m/sec) [m/day]	k_v / k_h	Material Model	Assumed Saturated Water Content	Assumed Residual Water Content
Fill & Alluvial / Estuarine Sediments	2×10^{-4} [17.3]	1.0	Unsaturated / saturated	0.15	0.045
Sandstone Bedrock	1×10^{-7} [8.6×10^{-3}]	0.33 to 0.66	Saturated	0.05	-
Cut-off Wall	1×10^{-10} [8.6×10^{-6}]	0.001	Unsaturated / saturated	0.05	0.02
Cut-off Wall below 15 m	1×10^{-6} [8.6×10^{-2}]	0.001	Saturated	0.1	-

The hydraulic conductivity curves for unsaturated material types were estimated using the Van Genuchten formulae, included as a built-in function in SEEP/W.

6.4 Basement Shoring and Dewatering

It is understood that during construction, inflows into the excavation will be controlled by a secant pile cut-off wall socketed a minimum of 2 m into sandstone bedrock. In the model, the secant pile wall extends only 1 m into the sandstone bedrock to reflect the likelihood of non-uniformity in the rock profile resulting in pile sockets starting near sudden changes in the rock level. The thickness of the wall has been assumed as 0.9 m, although it is noted that the analysis is not particularly sensitive to the wall thickness in the expected range of 0.45 m to 0.9 m.

It has been assumed in the model that seepage into the basement will be collected using a perimeter sump and pumped out of the basement. The subsoil drainage and sump were simulated with a horizontal boundary condition of zero pressure head at the bulk excavation level (-3.15 m AHD). The proposed excavation faces (secant pile walls) have been modelled as potential seepage faces (although of very low permeability) over the full height of the proposed excavation.

6.5 Groundwater Modelling Simulations

The model was run under transient conditions over a one year period to assess the dewatering flow rates during construction, and under steady state conditions for comparison.

7. Results

7.1 Groundwater Inflow

Groundwater inflow into the excavation along seepage face boundaries on the excavation faces, and along the base of the excavation, was evaluated using a mesh cross-section through the elements adjacent to the excavation. The predicated inflow rates represent the estimated total rate of groundwater flowing into the excavation, and the volume (per unit time) requiring extraction via the dewatering system in order to dewater the basement excavation during construction. The simulated results are summarised in Table 5 to Table 8. It is noted that the transient flow rates in the model rapidly approach the long term steady state condition (within 10 days), therefore the annualised inflow rates for the first year are very similar and only the steady state inflow rates are provided below. The modelled transient flow rates for the first 10 days are approximately 10-20% higher than the steady state flow rates.

Table 5: Simulated Inflow Results from Model with Sandstone k_v / k_h = 0.33 and Constant Shoring Wall Permeability

Time	Estimated Unfactored Dewatering Flow Rate		
	L/min	m^3/day	ML/year
Steady State	0.66	0.95	0.35

Table 6: Simulated Inflow Results from Model with Sandstone k_v / k_h = 0.66 and Constant Shoring Wall Permeability

Time	Estimated Unfactored Dewatering Flow Rate		
	L/min	m^3/day	ML/year
Steady State	1.02	1.47	0.54

Table 7: Simulated Inflow Results from Model with Sandstone k_v / k_h = 0.33 and Increased Shoring Wall Permeability below 15 m

Time	Estimated Unfactored Dewatering Flow Rate		
	L/min	m^3/day	ML/year
Steady State	47.1	67.8	24.7

Table 8: Simulated Inflow Results from Model with Sandstone k_v / k_h = 0.66 and Increased Shoring Wall Permeability below 15 m

Time	Estimated Unfactored Dewatering Flow Rate		
	L/min	m^3/day	ML/year
Steady State	47.4	68.2	24.9

The SEEP/W results are based on a two dimensional model, which assumes the excavation is much longer than it's width. In order to convert these predictions to more realistic values, the following expression proposed by Kavvadas et al (1992) was used to adjust the results to allow for the actual length to width ratio of the proposed basement.

$$\frac{q_o}{q} = 0.7 + 0.3\left(1 - \frac{B}{L}\right)$$

Where: q_o is the predicted 'realistic' inflow rate
q is the inflow rate from the 2D model
B is the width of the excavation
L is the length of the excavation

Assuming a basement width of 10 m and a length of 20 m, a reduction factor of 0.85 is calculated. By applying the reduction factor to the inflow calculated for the actual basement dimensions, the average predicted inflow rates are as summarised in Table 9.

Table 9: Summary of Factored Inflow Rates

Analysis Case	Factored Estimated Steady State Flow Rate (ML/year)
Sandstone k_v / k_h = 0.33 Wall Permeability Constant	0.29
Sandstone k_v / k_h = 0.66 Wall Permeability Constant	0.46
Sandstone k_v / k_h = 0.33 Wall Permeability Increases	21.0
Sandstone k_v / k_h = 0.66 Wall Permeability Increases	21.2

The results of the SEEP/W analyses were checked using established simplified analytical methods for calculating flow rates into excavations. It should be noted that the flow estimates are presented to a much higher precision than the likely accuracy of the assessment to provide an indication of the relative difference in flows between cases.

The predicted inflow rates indicate that the construction quality, specification of tight verticality tolerances, and appropriate choice of pile sizes and spacings will be very important to avoid gaps in the cut-off wall at depth.

Assuming good quality construction of the cut-off wall, predicted inflow rates are still very sensitive to the clay content in defect apertures and the degree of fracturing in the bedrock. The estimates provided are based on all available information, however the actual seepage rate will only be known once excavation is complete and may vary significantly to the predicted value. It is recommended that appropriate allowance and redundancy be included in the design and planning for changes in inflow rates.

7.2 Drawdown and Settlement

The magnitudes of the potential changes to the groundwater levels resulting from dewatering during construction were estimated by subtracting the predicted transient analysis groundwater levels from the original groundwater levels. The maximum estimated drawdowns have been calculated from the 'worst case', using k_v / k_h = 0.66 and an increased shoring wall permeability below 15 m. The calculated drawdowns at various distances from the excavation faces (east and west are the same) are summarised in Table 10. Due to the close proximity of the far-end boundary conditions (i.e. the proximity to Darling Harbour) and the effect of the cut-off wall, very small drawdowns are predicted.

Table 10: Estimated Drawdown at Excavation Faces

Location	Original Water Level (m AHD)	Final Water Level (m AHD)	Drawdown (m)
Immediately adjacent to excavation	0.5	-0.15	0.65
0.25 m away from excavation	0.5	0.4	0.1
3 m away from excavation	0.5	0.5	0

The estimated drawdowns beyond 0.3 m away from the excavation are negligible.

8. Aquifer Interference Policy Considerations

The NSW Aquifer Interference Policy (AIP) indicates that the term "aquifer" is commonly understood to mean a groundwater system that is sufficiently permeable to allow water to move within it, and which can yield productive volumes of groundwater. A groundwater system is defined as any type of saturated geological formation that can yield low or high volumes of water. However, for the purpose of the AIP, the term aquifer has the same meaning as groundwater system and includes low yielding and saline systems.

The site is underlain by a soil profile comprised of coastal alluvial / estuarine interbedded sands, silts and clays, overlying slightly fractured sandstone bedrock. The soil profile is of high permeability with potentially high yield, and is considered to be a 'highly productive groundwater source' as outlined in the AIP.

Table 1 in Section 3.2.1 of the AIP outlines minimal impact considerations. The AIP indicates that *"if predicted impacts are less than the Level 1 minimal impact considerations, then these impacts will be* *considered as acceptable"*. The following Level 1 minimal impact considerations are outlined for coastal sand groundwater sources:

- less than or equal to 10% cumulative variation in water table 40 m from any high priority groundwater dependent ecosystem (GDE), high priority culturally significant site, or less than a 2 m decline at any water supply work;
- a cumulative pressure head decline of not more than a 2 m at any water supply work; and
- any change in groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity.

NSW GDE mapping does not indicate the presence of any GDEs nearby to the site. The maximum estimated drawdowns associated with the proposed development do not exceed the 2 m limit outlined in the Level 1 minimal impact considerations.

9. Ambient Groundwater Conditions

As part of the original geotechnical and contamination investigation, groundwater samples were collected from six wells across the site on 2-3 September 2021. The field physical parameters measured during sampling are summarised in Table 11.

Table 11: Summary of Field Parameters

Well / Sample ID	Temp. (°C)	Dissolved Oxygen (ppm)	Turbidity (ntu)	Electrical Conductivity * (mS/cm)	pH	Redox (mV)
CW2	17.6	2.64	35	44.8	7.01	110
CW3	20.2	0.26	817	26.2	7.23	-170.9
CW5	17.9	0.77	2140	40.3	7.12	-47.7
CW6	19.3	0.68	3963	2.9	7.3	-133
CP2	19.7	1.04	680	22.0	6.51	-92.6
SS2	19.7	1.27	490	1.7	4.2	362

Notes: *Calculated from TDS result

Samples from each well were analysed at a National Association of Testing Authorities (NATA) accredited laboratory for a combination of the following common contaminants and additional potential contaminants of concern:

- Heavy metals, PAH, TRH, phenols, VOC, OCP, OPP, PCB, TBT, iron (total, ferric and ferrous), total suspended solids and oil and grease.

The results of the laboratory analyses are summarised in Appendix D. The laboratory certificates of analysis, together with the chain of custody and sample receipt information are provided in Appendix E.

For screening purposes, the laboratory results were compared against the Site Acceptance Criteria (SAC) developed as part of the previously prepared contamination investigation report (202546.00.R.002). The SAC groundwater investigation levels for aquatic ecosystems were derived from the assessment criteria provided in *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018), with levels for health screening for vapour intrusion and protection of recreational waters derived from NEPC (2013) and NHMRC (2008). Reference should be made to DPs contamination investigation report (Douglas Partners Pty Ltd, 2021) for further information on the SAC.

The results of VOC, BTEX, PAH, OPP, OCP, speciated phenols (including cresols) were all below the laboratory limits of reporting and SAC with the exception of:

- Chloroform in SS2 at a concentration of 2 µg/L. Within the SAC of 370 µg/L but above the limit of reporting; and
- Dieldrin (OCP) in SS2 at a concentration of 0.04 µg/L exceeding the 0.01 µg/L SAC (which is derived from the fresh water unknown reliability guideline.

It is noted that SS2 is located in the north-eastern corner of the site below the proposed land bridge and given its location on the upgradient site boundary may be derived from an up-gradient source. It is noted that chloroform and dieldrin were not detected in CW4 or CW6 suggesting the extent of such impacts are limited and do not extend to the proposed excavation zones and in that regard are unlikely to impact the dewatering of these features.

TRH was detected in two locations CW5 and CW6 as follows:

- C_{10}-C_{16} (77 µg/L and 52 µg/L respectively);
- C_{16}-C_{34} (350 µg/L in CW6);
- F2-napthalene (77 µg/L and 52 µg/L respectively); and
- C_{15}-C_{28} (140 µg/L and 370 µg/L).

It is noted there is no SAC for the above TRH fractions and organic carbon was noted in soil and in the absence of volatile hydrocarbons or PAH in groundwater the above TRH detections are not considered likely to be related to petroleum hydrocarbons. However, this may still require consideration for dewatering and groundwater disposal.

Oil and grease was below the laboratory limits of reporting in all samples. Total suspended solids ranged from 0.41 mg/L to 44 mg/L.

The results of heavy metals testing were within the SAC with the exception of:

- Copper at 12 µg/L in SS2 which exceeded the 95% ANZG (2018) marine water guideline (MWG) 1.3 µg/L;
- Lead at 38 g/L in SS2 which exceeded the 95% ANZG (2018) marine water guideline (MWG) 4.4 µg/L;
- Nickel at 9 µg/L in CP2 (and 8 µg/L in its replicate BD1), 9 µg/L in CW3 and 33 µg/L in SS2 which exceeded the 99% ANZG (2018) marine water guideline (MWG) 7 µg/L. However, nickel is not considered a high risk bioaccumulation and therefore exceedance of the 99% MWG is not considered significant. Nickel was within the 95% MWG of 70 µg/L;

- Zinc at 13 µg/L and 15 µg/L at CW2 and 77 µg/L at SS2 which exceeded the 99% ANZG (2018) marine water guideline (MWG) 7 µg/L and the 95% MWG (15 µg/L) in SS2. Zinc is not considered a high risk for bioaccumulation and therefore exceedances of the 99% MWG are not considered significant; and
- Total iron at 38 mg/L at CP2, 5.6 mg/L at CW3, 3.5 mg/L at CW5, 5.8 mg/L at CW6 and 0.4 mg/L at SS2 exceeded the recreational water quality guideline (which has also been suggested in ANZG as an interim groundwater quality guideline in the absence of an alternative) of 0.3 mg/L. Iron is typically naturally present at similar concentrations in groundwaters of Hawkesbury Sandstone.

Based on our experience in the area, the concentrations of metals in groundwater are considered likely to be attributed to the background concentrations that would be associated with uncontrolled fill within the harbour foreshore area and urban runoff. As stated above elevated iron levels are considered likely naturally occurring. However, this will require consideration for dewatering and discharge purposes.

Tributyl tin was below the limit of reporting in all samples indicating that groundwater is not impacted by TBT and indicating that the impacts of TBT in soil are likely limited to the near shore areas.

The primary contaminants of concern in relation to the dewatering and disposal of groundwater associated with the deluge tank construction are heavy metals, TSS and low levels of TRH.

It is also noted that given the tidal nature of the area the ambient groundwater conditions may be subject to change.

10. Groundwater Disposal and Council Requirements

All collected groundwater requiring disposal will need to be tested against the requirements of the receiving authority. For example, disposal to stormwater will require Council approval and be subject to their water quality requirements for discharge to stormwater.

Ongoing monitoring of groundwater quality will be required to check that the groundwater quality complies with the nominated criteria for disposal. Suggested monitoring and reporting requirements are given in Section 12.

Where groundwater does not comply with the above requirements some form of groundwater treatment will be required prior to disposal. The treatment system will need to be determined and adjusted based on the groundwater test results and may include a combination of filtration and settlement tanks with use of flocculants.

11. Potential Effects on Neighbouring Properties

An assessment of the potential effects of dewatering on neighbouring properties and groundwater dependent ecosystems has been summarised in Table 12.

Table 12: Summary of Potential Effects on Neighbouring Properties

Item	Comment
Proximity of Groundwater Dependent Ecosystems (GDEs)	No nearby GDEs
Water supply losses by neighbouring groundwater users	A review of registered bores within a 500 m radius of the surrounding site was undertaken. The search identified no extraction or monitoring bores within the search area.
Potential subsidence of neighbouring structures	Drawdown beyond 0.3 m from the proposed excavation is likely to be negligible, resulting in negligible subsidence of neighbouring structures / pavements.
Potential for saltwater intrusion due to water take during construction	Flow of water from Darling Harbour towards the excavation may result in intrusion of elevated concentrations of saltwater into the land side groundwater system, with commensurate increase in the aggressivity of groundwater to buried structural elements. Conductivity measurements from several of the harbourside monitoring wells indicate that some saltwater intrusion is already occurring in this area and the low predicted inflow rates associated with a well-constructed cut-off wall are unlikely to cause a significant change.

12. Monitoring and Reporting

The following monitoring and associated reporting are suggested during initial construction and should be undertaken during excavation and construction works on-site.

Item	Monitoring	Monitoring Frequency	Reporting
Assess effect of excavation on groundwater	Monitoring of groundwater levels in three monitoring wells outside the excavation footprint, during and following completion of construction. The locations will be subject to access and approvals and will be determined prior to construction. Existing wells could be used where possible.	Daily for the first two weeks then weekly. This can be relaxed to monthly once steady groundwater levels are established, during construction	Weekly then monthly during construction
Groundwater Quality Sampling and Testing	Sampling and testing of water from wells and the excavation, or at the point of discharge. Contaminant and physical properties tested to be	pH and turbidity to be measured daily for the first week and then weekly. Two rounds of groundwater sampling and testing initially. Subject to relatively	

Item	Monitoring	Monitoring Frequency	Reporting
	nominated by the authority accepting water but suggested to include: Heavy Metals and TRH pH & conductivity Total Suspended Solids Turbidity Dissolved Oxygen Levels	uniform results groundwater testing to be carried out fortnightly or as otherwise agreed with the authority accepting the water.	
Groundwater inflow rates	Groundwater inflow to be measured in collection tanks, of a pre-determined size or using a calibrated flow meter connected to the dewatering system.	Twice daily, or once collection point is filled (whichever is more frequent), for the first two weeks. After steady groundwater inflow rates are established then daily.	Weekly
Quantity of water disposed off-site (includes rainwater)	Calibrated Flowmeter connected to any pump-out system	Automatically	Weekly

13. Conclusions

The geotechnical investigation on the site has identified fill and alluvial / estuarine soils to significant depths, overlying Hawkesbury Sandstone bedrock in the vicinity of the proposed excavation. Groundwater has been observed at shallow depths within the soil profile and will be encountered by the proposed excavation. The proposed bulk excavation is expected to extend 3-4 m below the measured groundwater levels.

Groundwater modelling has been undertaken for the proposed basement assuming that a secant pile cut-off wall with a minimum 2 m socket into sandstone bedrock will be constructed prior to excavation.

The modelling results indicate that if the cut-off wall construction quality is high and good pile overlap is achieved over the full depth, predicted annualised groundwater inflow rates are less than 1 ML/year during construction, and given excavation and construction of the tanked basement would be expected to take, say, six months, the total predicted water take during construction is less than 0.5 ML.

Gaps in the wall at depth could result in significantly higher inflow rates, therefore the construction quality of the cut-off wall will be very important to control inflows. The maximum predicted flow rates, in the order of 21 ML/year, are based on what is expected to be a reasonably unlikely worst case construction quality scenario where there are gaps between every pile. With a suitable design, appropriate controls during construction and engagement of a contractor with demonstrated experience on similar projects, it is expected that the number of gaps in the wall should realistically be less than the assumption made in the analyses, resulting in a smaller water take closer to the values predicted for a well-sealed cut-off wall.

These predictions are estimates based on the information available. Actual flow rates may vary from these and will only be known once the excavation is underway and inflow rates can be measured.

Assuming good quality construction, the predicted groundwater take is small (less than 3 ML/year), and it is expected that the proposed excavation will be eligible for water access licence exemption.

14. References

Douglas Partners. (2021). *Geotechnical Investigation, Cockle Bay Park Redevelopment, 241-249 Wheat Road, Sydney, 202546.00.R.001.Rev1 dated 20 December 2021.*

Douglas Partners Pty Ltd. (2021). *Report on Contamination Investigation: Cockle Bay Park Redevelopment, 241-249 Wheat Road, Sydney, 202546.00.R.002.Rev2, dated 15 October 2021.*

NSW Office of Water. (2012). *NSW Aquifer Interference Policy.*

Pells, Mostyn, Bertuzzi, & Wong. (2018). *Classification of Sandstones and Shales in the Sydney Region: A Forty Year Review - draft.*

15. Limitations

Douglas Partners (DP) has prepared this report for this project at 247 Wheat Road, Darling Harbour, Sydney in accordance with DP's proposal 202546.02.P.001.Rev0 dated 30/03/2022 and acceptance received from TSA Management Pty Ltd. The work was carried out under the CBP Professional Services Agreement (513963472.3) dated 8 July 2021. This report is provided for the exclusive use of DPT Operator Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical and groundwater components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Douglas Partners Pty Ltd

Appendix A

About This Report

Introduction
These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

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

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

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

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

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports
The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

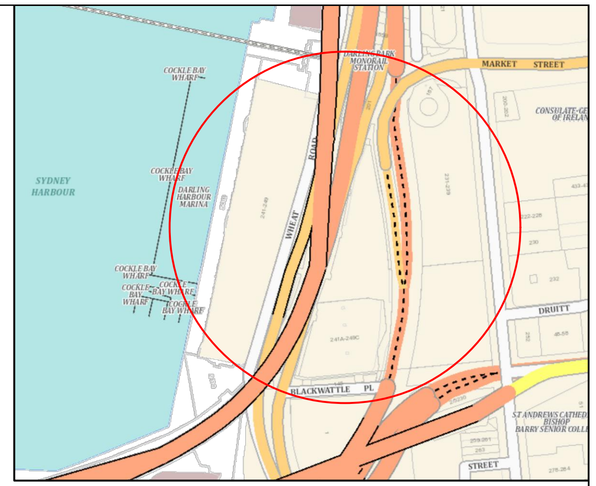
Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix B

Drawings



Locality Plan

NOTE:
1: Base image from MetroMap (Dated 15.04.2021)

0 10 20 30 40 50 75 100m

1:1000 @ A3

LEGEND

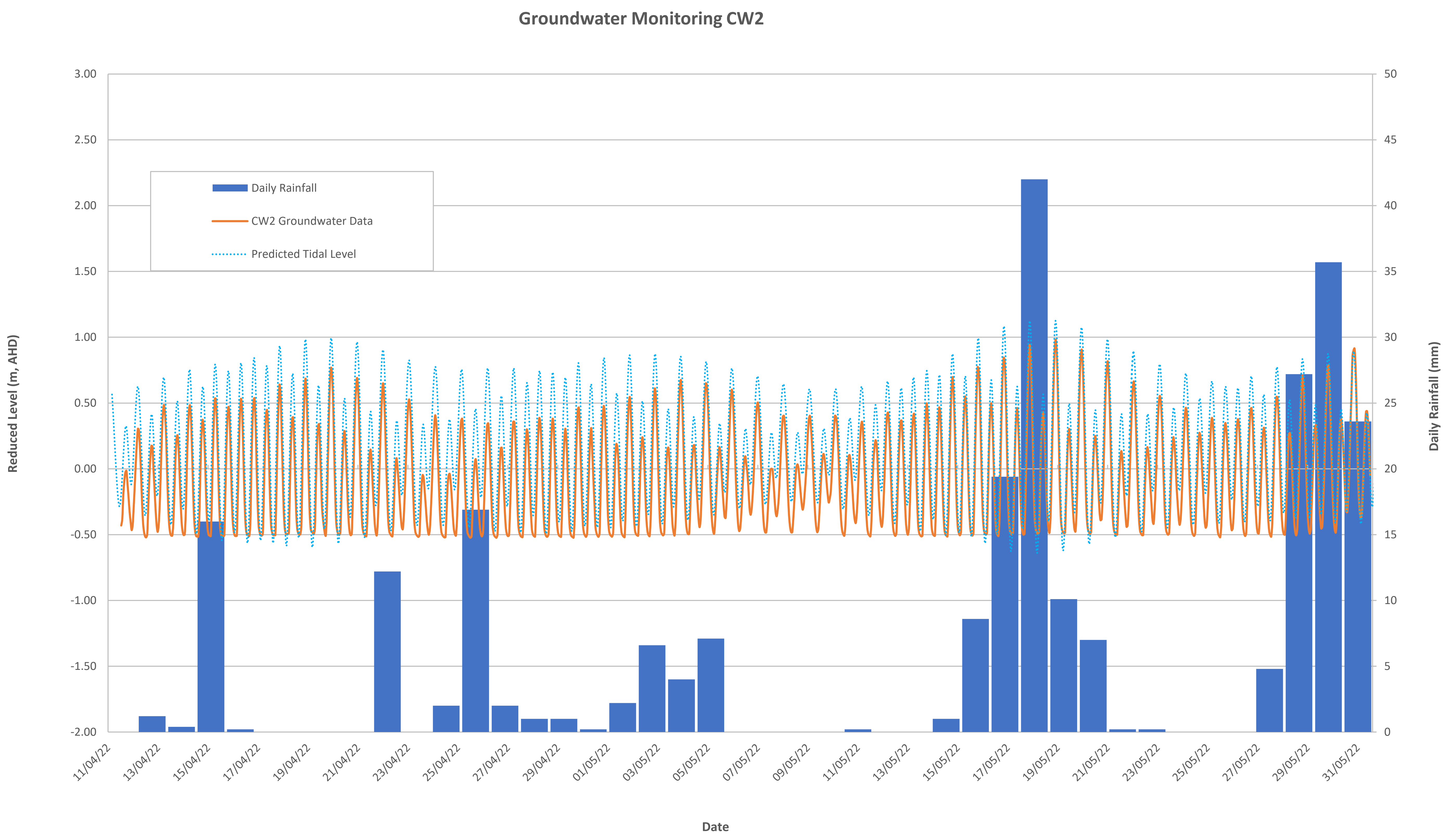
- Approximate Proposed Development Outline
- Approximate Tower Outline
- Approximate Proposed Bulk Excavation Outline
- Borehole Location, Current Investigation
- Borehole Location, Coffey, 1971
- Borehole Location, Coffey, 1985
- P Standpipe Piezometer
- Geological Cross Section

Douglas Partners
Geotechnics | Environment | Groundwater

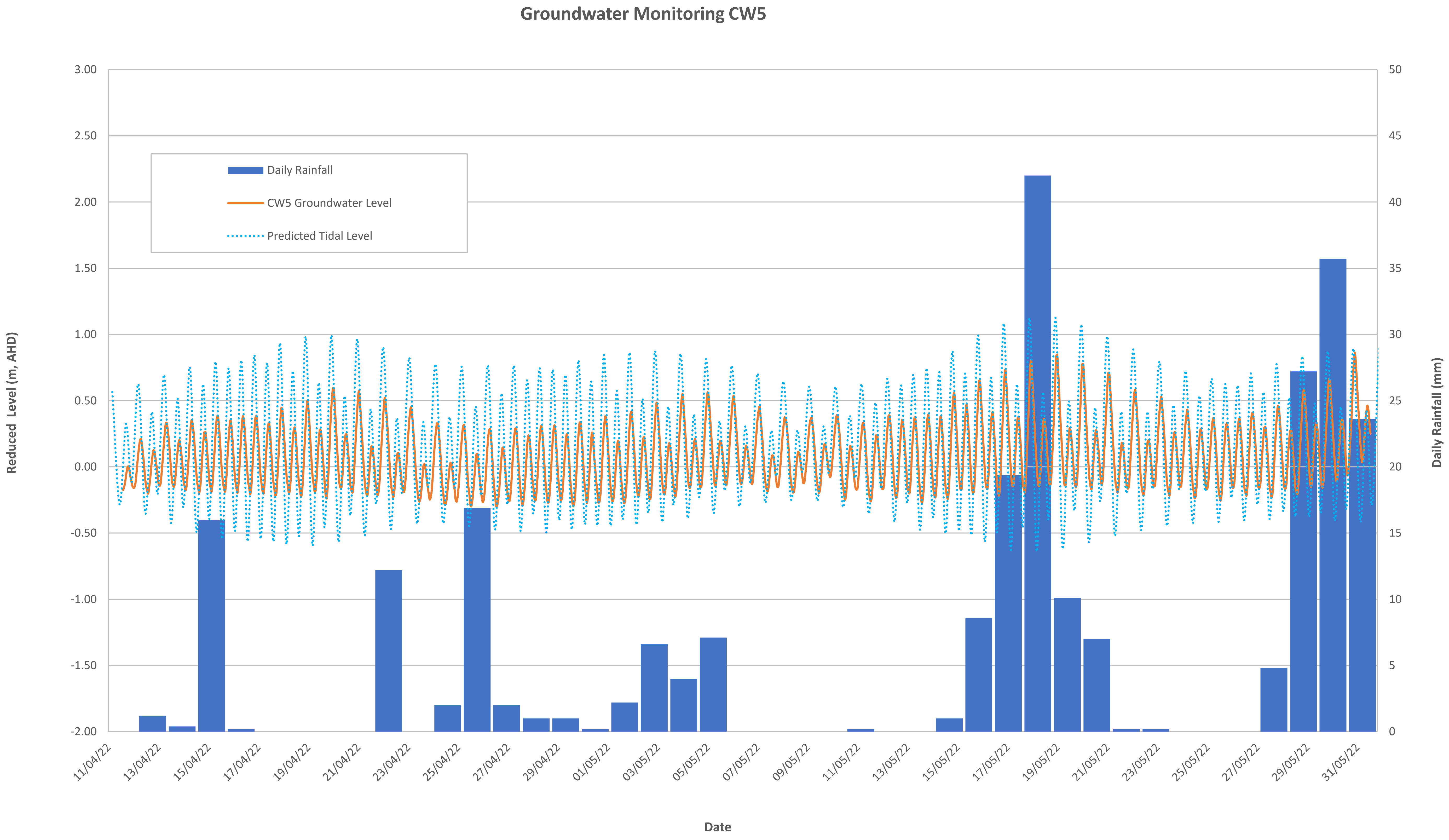
CLIENT: DPT Operator Pty Ltd		TITLE:	**Test Location Plan**
OFFICE: Sydney	DRAWN BY: MG		**Cockle Bay Park Redevelopment**
SCALE: 1:1000 @ A3	DATE: 12.10.2021		**241-249 Wheat Road, Sydney**

N

PROJECT No:	202546.00
DRAWING No:	1
REVISION:	2



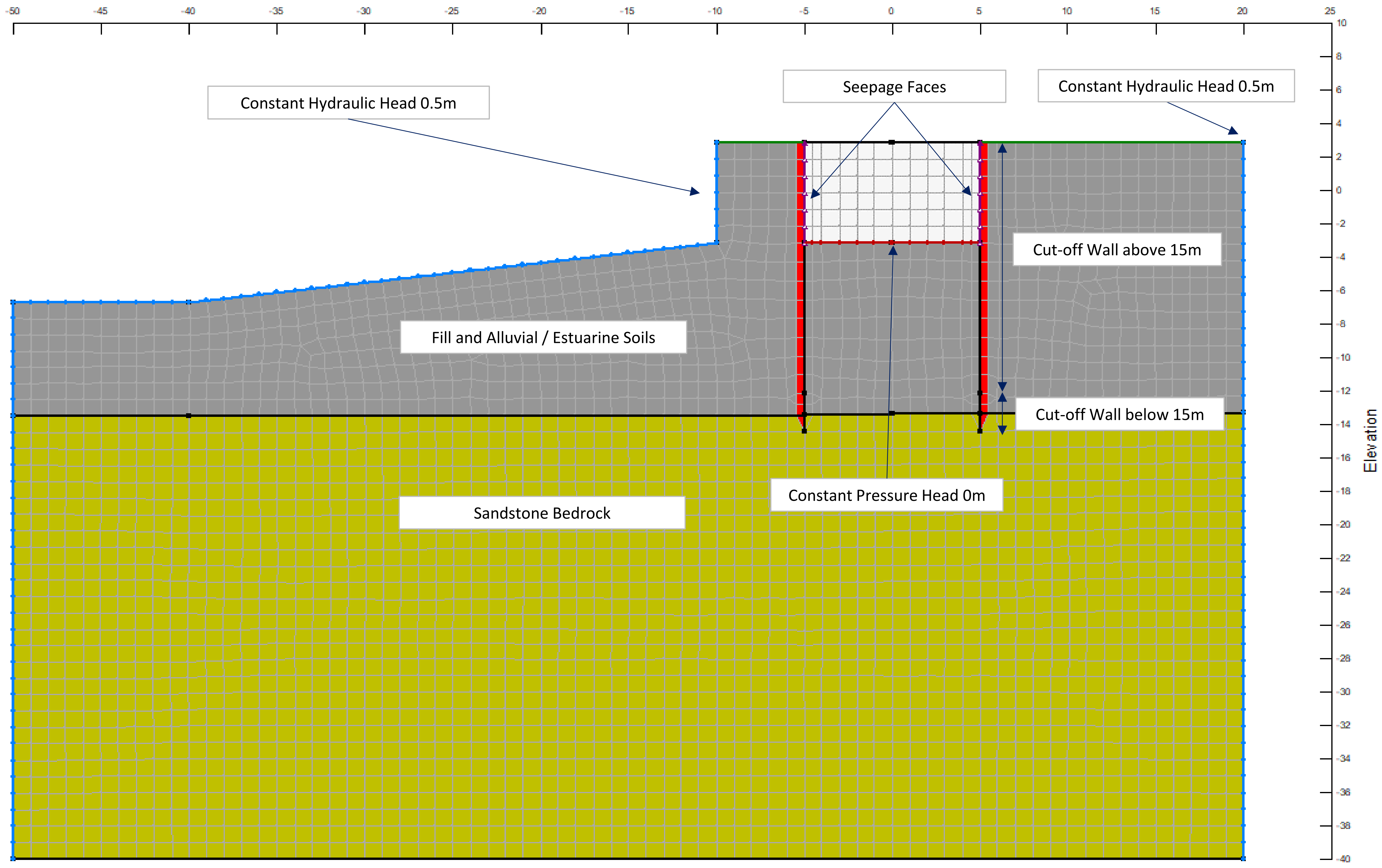
Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: DPT Operator Pty Ltd		TITLE: **Groundwater Monitoring Results - CW2**	PROJECT No: 202546.02
	OFFICE: Sydney	DRAWN BY: RMM	**Cockle Bay Park Redevelopment**	DRAWING No: -
	SCALE: As shown	DATE: 7 Jun 2022	**241-249 Wheat Road, Sydney**	REVISION: 0



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: DPT Operator Pty Ltd		TITLE:	Groundwater Monitoring Results - CW5	PROJECT No: 202546.02
	OFFICE: Sydney	DRAWN BY: RMM		Cockle Bay Park Redevelopment	DRAWING No: -
	SCALE: As shown	DATE: 7 Jun 2022		241-249 Wheat Road, Sydney	REVISION: 0

Appendix C

Model Outputs



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: DPT Operator Pty Ltd		TITLE: SEEP/W Model Layout	PROJECT No:	202546.02
	OFFICE: Sydney	DRAWN BY: RMM	Cockle Bay Park Redevelopment	DRAWING No:	M1
	SCALE: As shown	DATE: 7 Jun 2022	241-249 Wheat Road, Darling Harbour, Sydney	REVISION:	0

Appendix D

Laboratory Result Summary

Chem_Group	ChemName	Units	EQL	ANZG (2018) Marine water (unknown reliability) toxicant DGVs	ANZG (2018) Marine water 95% toxicant DGVs	ANZG (2018) Marine water 99% toxicant DGVs	Recreational water quality and aesthetics	NEPM 2013 Table 1A(4) Rec HSL C GW for Vapour Intrusion, Sand 2-4m	NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand 2-4m								
									Field_ID	CP2	CW2	BD2	CW3	BD1	CW5	CW6	SS2
									LocCode	CP2	CW2	CW2	CW3	CW3	CW5	CW6	SS2
									WellCode								
									Sampled_Date-Time	3/09/2021	2/09/2021	2/09/2021	2/09/2021	2/09/2021	2/09/2021	2/09/2021	3/09/2021
Inorganics	Ferrous Iron	mg/L	0.05							44	0.18	-	6.6		2.4	5.1	0.41
	TSS	mg/L	5							730	90	-	2400		3800	14,000	470
Metals	Arsenic (Filtered)	mg/L	0.001				0.05			0.009	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001
	Cadmium (Filtered)	mg/L	0.0001		0.0055	**0.0007**	0.005			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003
	Chromium (III+VI) (Filtered)	mg/L	0.001				0.05			<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Copper (Filtered)	mg/L	0.001		0.0013	**0.0003**	1			<0.001	<0.001	<0.001	<0.001	0.004	<0.001	<0.001	**0.012**
	Ferric Iron	mg/L	0.05							<0.05	<0.05	-	<0.05	-	1.1	0.72	<0.05
	Iron (Filtered)	mg/L	0.01				0.3			38	0.01	0.02	5.6	-	3.5	5.8	0.4
	Lead (Filtered)	mg/L	0.001		0.0044	**0.0022**	0.05			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.038**
	Mercury (Filtered)	mg/L	0.00005		0.0004	**0.0001**	0.001			<0.00005	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005
	Nickel (Filtered)	mg/L	0.001		0.07	**0.007**	0.1			**0.009**	0.002	0.002	**0.009**	**0.008**	0.003	0.006	**0.033**
	Tin (Filtered)	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Tributyltin as SN	mg/L	0.000002		0.000006	**0.0000004**				<0.000002	<0.000002	-	<0.000002	-	<0.000002	<0.000002	<0.000002
	Zinc (Filtered)	mg/L	0.001		0.015	**0.007**	5			0.003	**0.013**	**0.015**	0.001	<0.005	0.002	0.001	**0.077**
TPH	C10-C16	mg/L	0.05							<0.05	<0.05	<0.05	<0.05	<0.02	0.077	0.052	<0.05
	C16-C34	mg/L	0.1							<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.35	<0.1
	C34-C40	mg/L	0.1							<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Oil and Grease	mg/L	5							<5	<5	-	<5		<5	<5	<5
	F2-NAPHTHALENE	mg/L	0.05					NL	NL	<0.05	<0.05	<0.05	<0.05	<0.1	0.077	0.052	<0.05
	C6 - C9	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	<0.2	<0.01	<0.01	<0.01
	C10 - C14	mg/L	0.05							<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	C15 - C28	mg/L	0.1							<0.1	<0.1	<0.1	<0.1	<0.1	0.14	0.37	<0.1
	C29-C36	mg/L	0.1							<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	C6-C10 less BTEX (F1)	mg/L	0.01					NL	6	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
	C6-C10	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
BTEX	Benzene	mg/L	0.001		0.7	**0.5**	0.01	NL	5	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Ethylbenzene	mg/L	0.001	0.005				NL	NL	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001
	Toluene	mg/L	0.001	0.18				NL	NL	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001
	Xylene (m & p)	mg/L	0.002							<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
	Xylene (o)	mg/L	0.001	0.35						<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001
MAH	1,2,4-trimethylbenzene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,3,5-trimethylbenzene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Isopropylbenzene	mg/L	0.001	0.03						<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	n-butylbenzene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	n-propylbenzene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	p-isopropyltoluene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	sec-butylbenzene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Styrene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	tert-butylbenzene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
Chlorinated Hydrocarbons	1,1,1,2-tetrachloroethane	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,1,1-trichloroethane	mg/L	0.001	0.27						<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,1,2,2-tetrachloroethane	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,1,2-trichloroethane	mg/L	0.001	0.33	1.9	**0.14**				<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,1-dichloroethane	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,1-dichloroethene	mg/L	0.001	0.7	0.7	**0.5**	0.0003			<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,1-dichloropropene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,2,3-trichloropropane	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,2-dibromo-3-chloropropane	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,2-dichloroethane	mg/L	0.001	1.9			0.01			<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,2-dichloropropane	mg/L	0.001	0.9						<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,3-dichloropropane	mg/L	0.001	1.1						<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	2,2-dichloropropane	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Bromochloromethane	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Bromodichloromethane	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Bromoform	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Carbon tetrachloride	mg/L	0.001	0.24			0.003			<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Chlorodibromomethane	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Chloroethane	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
	Chloroform	mg/L	0.001	0.37						<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	0.002
	Chloromethane	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
	cis-1,2-dichloroethene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	cis-1,3-dichloropropene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Dibromomethane	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Hexachlorobutadiene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Trichloroethene	mg/L	0.001		0.33	**0.2**	0.03			<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Tetrachloroethene	mg/L	0.001	0.07			0.01			<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	trans-1,2-dichloroethene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	trans-1,3-dichloropropene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Vinyl chloride	mg/L	0.01	0.1						<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
Halogenated Hydrocarbons	1,2-dibromoethane	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Bromomethane	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
	Dichlorodifluoromethane	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
	Trichlorofluoromethane	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
Halogenated Benzenes	1,2,3-trichlorobenzene	mg/L	0.001	0.003						<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,2,4-trichlorobenzene	mg/L	0.001		0.08	**0.02**				<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,2-dichlorobenzene	mg/L	0.001	0.16						<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,3-dichlorobenzene	mg/L	0.001	0.26						<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	1,4-dichlorobenzene	mg/L	0.001	0.06						<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	2-chlorotoluene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	4-chlorotoluene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Bromobenzene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Chlorobenzene	mg/L	0.001	0.055						<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
	Hexachlorobenzene	mg/L	0.000001	0.00005						<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
Solvents	Cyclohexane	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001
PAH/Phenols	2,4-dimethylphenol	mg/L	0.001	0.002						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	2,4-dinitrophenol	mg/L	0.02	0.045						<0.02	<0.02	<0.02	<0.02	<0.001	<0.02	<0.02	<0.02
	2-methylphenol	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	2-nitrophenol	mg/L	0.001	0.002						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	4,6-Dinitro-2-methylphenol	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01
	4-chloro-3-methylphenol	mg/L	0.005							<0.005	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005	<0.005
	4-nitrophenol	mg/L	0.02	0.058						<0.02	<0.02	<0.02	<0.02	<0.001	<0.02	<0.02	<0.02
	Acenaphthene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Acenaphthylene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Anthracene	mg/L	0.001	0.0001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Benzo(b,j+k)fluoranthene	µg/L	2							<2	<2	<2	<2	<0.001	<2	<2	<2
	Benz(a)anthracene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Benzo(a) pyrene	mg/L	0.001	0.0001			0.00001			<0.001	<0.001	<0.001	<0.001	<0.0005	<0.001	<0.001	<0.001
	Benzo(g,h,i)perylene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Chrysene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Dibenz(a,h)anthracene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Fluoranthene	mg/L	0.001	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Fluorene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Indeno(1,2,3-c,d)pyrene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Naphthalene	mg/L	0.001		0.07	**0.05**		NL	NL	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Phenanthrene	mg/L	0.001	0.0006						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Phenol	mg/L	0.001		0.4	**0.27**				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Pyrene	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Halogenated Phenols	2,3,4,6-tetrachlorophenol	mg/L	0.001	0.01			0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	2,4,5-trichlorophenol	mg/L	0.001	0.004			0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	2,4,6-trichlorophenol	mg/L	0.001	0.003			0.01			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	2,4-dichlorophenol	mg/L	0.001	0.12						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	2,6-dichlorophenol	mg/L	0.001	0.034						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	2-chlorophenol	mg/L	0.001	0.34						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	3/4-Methylphenol (m/p-cresol)	mg/L	0.002							<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
	Pentachlorophenol	mg/L	0.005		0.022	**0.011**	0.01			<0.005	<0.005	<0.005	<0.005	<0.002	<0.005	<0.005	<0.005
Polychlorinated Biphenyls	Arochlor 1016	mg/L	0.00001							<0.00001	<0.00001	-	<0.00001	-	<0.00001	<0.00001	<0.00001
	Arochlor 1221	mg/L	0.00001							<0.00001	<0.00001	-	<0.00001	-	<0.00001	<0.00001	<0.00001
	Arochlor 1232	mg/L	0.00001							<0.00001	<0.00001	-	<0.00001	-	<0.00001	<0.00001	<0.00001
	Arochlor 1242	mg/L	0.00001	0.0003						<0.00001	<0.00001	-	<0.00001	-	<0.00001	<0.00001	<0.00001
	Arochlor 1248	mg/L	0.00001							<0.00001	<0.00001	-	<0.00001	-	<0.00001	<0.00001	<0.00001
	Arochlor 1254	mg/L	0.00001	0.00001						<0.00001	<0.00001	-	<0.00001	-	<0.00001	<0.00001	<0.00001
	Arochlor 1260	mg/L	0.00001							<0.00001	<0.00001	-	<0.00001	-	<0.00001	<0.00001	<0.00001
Organochlorine Pesticides	4,4-DDE	mg/L	0.000001	0.0000005						<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	a-BHC	mg/L	0.000001							<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	Aldrin	mg/L	0.000001	0.000003			0.001			<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	b-BHC	mg/L	0.000001							<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	Chlordane (cis)	mg/L	0.000001							<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	Chlordane (trans)	mg/L	0.000001							<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	d-BHC	mg/L	0.000001							<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	DDD	mg/L	0.000001							<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	DDT	mg/L	0.000001	0.0000004			0.003			<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	Dieldrin	mg/L	0.000001	0.00001			0.001			<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	0.00004
	Endosulfan I	mg/L	0.000002							<0.000002	<0.000002	-	<0.000002	-	<0.000002	<0.000002	<0.000002
	Endosulfan II	mg/L	0.000002							<0.000002	<0.000002	-	<0.000002	-	<0.000002	<0.000002	<0.000002
	Endosulfan sulphate	mg/L	0.000001							<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	Endrin	mg/L	0.000001		0.000008	**0.000004**	0.001			<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	Endrin aldehyde	mg/L	0.000001							<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	g-BHC (Lindane)	mg/L	0.000001	0.000007			0.01			<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	Heptachlor	mg/L	0.000001	0.0000004			0.003			<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	Heptachlor epoxide	mg/L	0.000001							<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
	Methoxychlor	mg/L	0.000001	0.000004						<0.000001	<0.000001	-	<0.000001	-	<0.000001	<0.000001	<0.000001
Organophosphorous Pesticides	Azinophos methyl	mg/L	0.00002	0.00001			0.01			<0.00002	<0.00002	-	<0.00002	-	<0.00002	<0.00002	<0.00002
	Bromophos-ethyl	mg/L	0.0002				0.02			<0.0002	<0.0002	-	<0.0002	-	<0.0002	<0.0002	<0.0002
	Chlorpyrifos	mg/L	0.000009		0.000009	**0.0000005**	0.002			<0.000009	<0.000009	-	<0.000009	-	<0.000009	<0.000009	<0.000009
	Chlorpyrifos-methyl	mg/L	0.0002							<0.0002	<0.0002	-	<0.0002	-	<0.0002	<0.0002	<0.0002
	Diazinon	mg/L	0.00001	0.00001			0.01			<0.00001	<0.00001	-	<0.00001	-	<0.00001	<0.00001	<0.00001
	Dichlorvos	mg/L	0.0002				0.02			<0.0002	<0.0002	-	<0.0002	-	<0.0002	<0.0002	<0.0002
	Dimethoate	mg/L	0.00015	0.00015			0.1			<0.00015	<0.00015	-	<0.00015	-	<0.00015	<0.00015	<0.00015
	Ethion	mg/L	0.0002				0.006			<0.0002	<0.0002	-	<0.0002	-	<0.0002	<0.0002	<0.0002
	Fenitrothion	mg/L	0.0002	0.000001			0.02			<0.0002	<0.0002	-	<0.0002	-	<0.0002	<0.0002	<0.0002
	Malathion	mg/L	0.00005	0.00005			0.1			<0.00005	<0.00005	-	<0.00005	-	<0.00005	<0.00005	<0.00005
	Methyl parathion	mg/L	0.0002				0.006			<0.0002	<0.0002	-	<0.0002	-	<0.0002	<0.0002	<0.0002
	Ronnel	mg/L	0.0002				0.06			<0.0002	<0.0002	-	<0.0002	-	<0.0002	<0.0002	<0.0002
Pesticides	Parathion	mg/L	0.000004	0.000004			0.03			<0.000004	<0.000004	-	<0.000004	-	<0.000004	<0.000004	<0.000004

Appendix E

Laboratory Certificates

Envirolab Services Pty Ltd
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12 Ashley St Chatswood NSW 2067
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customerservice@envirolab.com.au
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CERTIFICATE OF ANALYSIS 277283

Client Details

Client	Douglas Partners Pty Ltd
Attention	Rhys McMillan
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**202546.00, Cockle Bay**
Number of Samples	10 Water
Date samples received	03/09/2021
Date completed instructions received	06/09/2021

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	13/09/2021
Date of Issue	13/09/2021

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

Results Approved By
Dragana Tomas, Senior Chemist
Greta Petzold, Senior Report Coordinator
Hannah Nguyen, Metals Supervisor
Priya Samarawickrama, Senior Chemist
Steven Luong, Organics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

VOCs in water						
Our Reference		277283-1	277283-2	277283-3	277283-4	277283-5
Your Reference	UNITS	SS2	CP2	CW2	CW3	CW5
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	07/09/2021	07/09/2021	07/09/2021	07/09/2021	07/09/2021
Date analysed	-	07/09/2021	07/09/2021	07/09/2021	07/09/2021	07/09/2021
Dichlorodifluoromethane	µg/L	<10	<10	<10	<10	<10
Chloromethane	µg/L	<10	<10	<10	<10	<10
Vinyl Chloride	µg/L	<10	<10	<10	<10	<10
Bromomethane	µg/L	<10	<10	<10	<10	<10
Chloroethane	µg/L	<10	<10	<10	<10	<10
Trichlorofluoromethane	µg/L	<10	<10	<10	<10	<10
1,1-Dichloroethene	µg/L	<1	<1	<1	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1	<1	<1	<1
1,1-dichloroethane	µg/L	<1	<1	<1	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1	<1	<1	<1
Bromochloromethane	µg/L	<1	<1	<1	<1	<1
Chloroform	µg/L	2	<1	<1	<1	<1
2,2-dichloropropane	µg/L	<1	<1	<1	<1	<1
1,2-dichloroethane	µg/L	<1	<1	<1	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1	<1	<1	<1
1,1-dichloropropene	µg/L	<1	<1	<1	<1	<1
Cyclohexane	µg/L	<1	<1	<1	<1	<1
Carbon tetrachloride	µg/L	<1	<1	<1	<1	<1
Benzene	µg/L	<1	<1	<1	<1	<1
Dibromomethane	µg/L	<1	<1	<1	<1	<1
1,2-dichloropropane	µg/L	<1	<1	<1	<1	<1
Trichloroethene	µg/L	<1	<1	<1	<1	<1
Bromodichloromethane	µg/L	<1	<1	<1	<1	<1
trans-1,3-dichloropropene	µg/L	<1	<1	<1	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1	<1	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
1,3-dichloropropane	µg/L	<1	<1	<1	<1	<1
Dibromochloromethane	µg/L	<1	<1	<1	<1	<1
1,2-dibromoethane	µg/L	<1	<1	<1	<1	<1
Tetrachloroethene	µg/L	<1	<1	<1	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1	<1	<1	<1
Chlorobenzene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
Bromoform	µg/L	<1	<1	<1	<1	<1

VOCs in water						
Our Reference		277283-1	277283-2	277283-3	277283-4	277283-5
Your Reference	UNITS	SS2	CP2	CW2	CW3	CW5
Type of sample		Water	Water	Water	Water	Water
m+p-xylene	µg/L	<2	<2	<2	<2	<2
Styrene	µg/L	<1	<1	<1	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1	<1	<1	<1
o-xylene	µg/L	<1	<1	<1	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1	<1	<1	<1
Isopropylbenzene	µg/L	<1	<1	<1	<1	<1
Bromobenzene	µg/L	<1	<1	<1	<1	<1
n-propyl benzene	µg/L	<1	<1	<1	<1	<1
2-chlorotoluene	µg/L	<1	<1	<1	<1	<1
4-chlorotoluene	µg/L	<1	<1	<1	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1	<1	<1	<1
Tert-butyl benzene	µg/L	<1	<1	<1	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1	<1	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1	<1	<1	<1
Sec-butyl benzene	µg/L	<1	<1	<1	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1	<1	<1	<1
4-isopropyl toluene	µg/L	<1	<1	<1	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1	<1	<1	<1
n-butyl benzene	µg/L	<1	<1	<1	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1	<1	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1	<1	<1	<1
Hexachlorobutadiene	µg/L	<1	<1	<1	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	100	100	100	99	99
Surrogate toluene-d8	%	88	87	87	87	87
Surrogate 4-BFB	%	97	98	95	96	96

VOCs in water				
Our Reference		277283-6	277283-7	277283-10
Your Reference	UNITS	CW6	BD2	rinsate
Type of sample		Water	Water	Water
Date extracted	-	07/09/2021	07/09/2021	07/09/2021
Date analysed	-	07/09/2021	07/09/2021	07/09/2021
Dichlorodifluoromethane	µg/L	<10	<10	<10
Chloromethane	µg/L	<10	<10	<10
Vinyl Chloride	µg/L	<10	<10	<10
Bromomethane	µg/L	<10	<10	<10
Chloroethane	µg/L	<10	<10	<10
Trichlorofluoromethane	µg/L	<10	<10	<10
1,1-Dichloroethene	µg/L	<1	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1	<1
1,1-dichloroethane	µg/L	<1	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1	<1
Bromochloromethane	µg/L	<1	<1	<1
Chloroform	µg/L	<1	<1	<1
2,2-dichloropropane	µg/L	<1	<1	<1
1,2-dichloroethane	µg/L	<1	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1	<1
1,1-dichloropropene	µg/L	<1	<1	<1
Cyclohexane	µg/L	<1	<1	<1
Carbon tetrachloride	µg/L	<1	<1	<1
Benzene	µg/L	<1	<1	<1
Dibromomethane	µg/L	<1	<1	<1
1,2-dichloropropane	µg/L	<1	<1	<1
Trichloroethene	µg/L	<1	<1	<1
Bromodichloromethane	µg/L	<1	<1	<1
trans-1,3-dichloropropene	µg/L	<1	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1	<1
Toluene	µg/L	<1	<1	<1
1,3-dichloropropane	µg/L	<1	<1	<1
Dibromochloromethane	µg/L	<1	<1	<1
1,2-dibromoethane	µg/L	<1	<1	<1
Tetrachloroethene	µg/L	<1	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1	<1
Chlorobenzene	µg/L	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1
Bromoform	µg/L	<1	<1	<1

VOCs in water				
Our Reference		277283-6	277283-7	277283-10
Your Reference	UNITS	CW6	BD2	rinsate
Type of sample		Water	Water	Water
m+p-xylene	µg/L	<2	<2	<2
Styrene	µg/L	<1	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1	<1
o-xylene	µg/L	<1	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1	<1
Isopropylbenzene	µg/L	<1	<1	<1
Bromobenzene	µg/L	<1	<1	<1
n-propyl benzene	µg/L	<1	<1	<1
2-chlorotoluene	µg/L	<1	<1	<1
4-chlorotoluene	µg/L	<1	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1	<1
Tert-butyl benzene	µg/L	<1	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1	<1
Sec-butyl benzene	µg/L	<1	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1	<1
4-isopropyl toluene	µg/L	<1	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1	<1
n-butyl benzene	µg/L	<1	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1	<1
Hexachlorobutadiene	µg/L	<1	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1	<1
Surrogate Dibromofluoromethane	%	100	99	99
Surrogate toluene-d8	%	87	87	87
Surrogate 4-BFB	%	97	95	96

vTRH(C6-C10)/BTEXN in Water						
Our Reference		277283-1	277283-2	277283-3	277283-4	277283-5
Your Reference	UNITS	SS2	CP2	CW2	CW3	CW5
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	07/09/2021	07/09/2021	07/09/2021	07/09/2021	07/09/2021
Date analysed	-	07/09/2021	07/09/2021	07/09/2021	07/09/2021	07/09/2021
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	%	100	100	100	99	99
Surrogate toluene-d8	%	88	87	87	87	87
Surrogate 4-BFB	%	97	98	95	96	96

vTRH(C6-C10)/BTEXN in Water						
Our Reference		277283-6	277283-7	277283-8	277283-9	277283-10
Your Reference	UNITS	CW6	BD2	spike	blank	rinsate
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	07/09/2021	07/09/2021	07/09/2021	07/09/2021	07/09/2021
Date analysed	-	07/09/2021	07/09/2021	07/09/2021	07/09/2021	07/09/2021
TRH C_6 - C_9	μg/L	<10	<10	[NA]	[NA]	<10
TRH C_6 - C_{10}	μg/L	<10	<10	[NA]	[NA]	<10
TRH C_6 - C_{10} less BTEX (F1)	μg/L	<10	<10	[NA]	[NA]	<10
Benzene	μg/L	<1	<1	99%	<1	<1
Toluene	μg/L	<1	<1	98%	<1	<1
Ethylbenzene	μg/L	<1	<1	110%	<1	<1
m+p-xylene	μg/L	<2	<2	110%	<2	<2
o-xylene	μg/L	<1	<1	105%	<1	<1
Naphthalene	μg/L	<1	<1	[NT]	<1	<1
Surrogate Dibromofluoromethane	%	100	99	100	99	99
Surrogate toluene-d8	%	87	87	90	87	87
Surrogate 4-BFB	%	97	95	93	95	96

svTRH (C10-C40) in Water						
Our Reference		277283-1	277283-2	277283-3	277283-4	277283-5
Your Reference	UNITS	SS2	CP2	CW2	CW3	CW5
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	09/09/2021	09/09/2021	09/09/2021	09/09/2021	09/09/2021
Date analysed	-	11/09/2021	11/09/2021	11/09/2021	11/09/2021	11/09/2021
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100	140
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50	<50	<50	140
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50	77
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50	77
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	80
Surrogate o-Terphenyl	%	97	80	77	76	74

svTRH (C10-C40) in Water				
Our Reference		277283-6	277283-7	277283-10
Your Reference	UNITS	CW6	BD2	rinsate
Type of sample		Water	Water	Water
Date extracted	-	09/09/2021	09/09/2021	09/09/2021
Date analysed	-	11/09/2021	11/09/2021	11/09/2021
TRH C_{10} - C_{14}	µg/L	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	370	<100	270
TRH C_{29} - C_{36}	µg/L	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	370	<50	270
TRH >C_{10} - C_{16}	µg/L	52	<50	250
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	52	<50	250
TRH >C_{16} - C_{34}	µg/L	350	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	400	<50	250
Surrogate o-Terphenyl	%	63	86	85

PAHs in Water						
Our Reference		277283-1	277283-2	277283-3	277283-4	277283-5
Your Reference	UNITS	SS2	CP2	CW2	CW3	CW5
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	09/09/2021	09/09/2021	09/09/2021	09/09/2021	09/09/2021
Date analysed	-	10/09/2021	10/09/2021	10/09/2021	10/09/2021	10/09/2021
Naphthalene	µg/L	<1	<1	<1	<1	<1
Acenaphthylene	µg/L	<1	<1	<1	<1	<1
Acenaphthene	µg/L	<1	<1	<1	<1	<1
Fluorene	µg/L	<1	<1	<1	<1	<1
Phenanthrene	µg/L	<1	<1	<1	<1	<1
Anthracene	µg/L	<1	<1	<1	<1	<1
Fluoranthene	µg/L	<1	<1	<1	<1	<1
Pyrene	µg/L	<1	<1	<1	<1	<1
Benzo(a)anthracene	µg/L	<1	<1	<1	<1	<1
Chrysene	µg/L	<1	<1	<1	<1	<1
Benzo(b,j+k)fluoranthene	µg/L	<2	<2	<2	<2	<2
Benzo(a)pyrene	µg/L	<1	<1	<1	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1	<1	<1	<1	<1
Dibenzo(a,h)anthracene	µg/L	<1	<1	<1	<1	<1
Benzo(g,h,i)perylene	µg/L	<1	<1	<1	<1	<1
Benzo(a)pyrene TEQ	µg/L	<5	<5	<5	<5	<5
Total +ve PAH's	µg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	107	90	90	85	92

PAHs in Water				
Our Reference		277283-6	277283-7	277283-10
Your Reference	UNITS	CW6	BD2	rinsate
Type of sample		Water	Water	Water
Date extracted	-	09/09/2021	09/09/2021	09/09/2021
Date analysed	-	10/09/2021	10/09/2021	10/09/2021
Naphthalene	µg/L	<1	<1	<1
Acenaphthylene	µg/L	<1	<1	<1
Acenaphthene	µg/L	<1	<1	<1
Fluorene	µg/L	<1	<1	<1
Phenanthrene	µg/L	<1	<1	<1
Anthracene	µg/L	<1	<1	<1
Fluoranthene	µg/L	<1	<1	<1
Pyrene	µg/L	<1	<1	<1
Benzo(a)anthracene	µg/L	<1	<1	<1
Chrysene	µg/L	<1	<1	<1
Benzo(b,j+k)fluoranthene	µg/L	<2	<2	<2
Benzo(a)pyrene	µg/L	<1	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1	<1	<1
Dibenzo(a,h)anthracene	µg/L	<1	<1	<1
Benzo(g,h,i)perylene	µg/L	<1	<1	<1
Benzo(a)pyrene TEQ	µg/L	<5	<5	<5
Total +ve PAH's	µg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	89	99	103

OCPs in Water - Trace Level						
Our Reference		277283-1	277283-2	277283-3	277283-4	277283-5
Your Reference	UNITS	SS2	CP2	CW2	CW3	CW5
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	09/09/2021	09/09/2021	09/09/2021	09/09/2021	09/09/2021
Date analysed	-	10/09/2021	10/09/2021	10/09/2021	10/09/2021	10/09/2021
alpha-BHC	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
HCB	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
beta-BHC	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
gamma-BHC	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Heptachlor	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
delta-BHC	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Aldrin	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Heptachlor Epoxide	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
gamma-Chlordane	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
alpha-Chlordane	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Endosulfan I	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
pp-DDE	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Dieldrin	µg/L	0.040	<0.001	<0.001	<0.001	<0.001
Endrin	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Endosulfan II	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
pp-DDD	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Endrin Aldehyde	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
pp-DDT	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Endosulfan Sulphate	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Methoxychlor	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Surrogate TCMX	%	62	94	61	66	95

OCPs in Water - Trace Level		
Our Reference		277283-6
Your Reference	UNITS	CW6
Type of sample		Water
Date extracted	-	09/09/2021
Date analysed	-	10/09/2021
alpha-BHC	µg/L	<0.001
HCB	µg/L	<0.001
beta-BHC	µg/L	<0.001
gamma-BHC	µg/L	<0.001
Heptachlor	µg/L	<0.001
delta-BHC	µg/L	<0.001
Aldrin	µg/L	<0.001
Heptachlor Epoxide	µg/L	<0.001
gamma-Chlordane	µg/L	<0.001
alpha-Chlordane	µg/L	<0.001
Endosulfan I	µg/L	<0.002
pp-DDE	µg/L	<0.001
Dieldrin	µg/L	<0.001
Endrin	µg/L	<0.001
Endosulfan II	µg/L	<0.002
pp-DDD	µg/L	<0.001
Endrin Aldehyde	µg/L	<0.001
pp-DDT	µg/L	<0.001
Endosulfan Sulphate	µg/L	<0.001
Methoxychlor	µg/L	<0.001
Surrogate TCMX	%	82

OP in water Trace ANZECCF/ADWG						
Our Reference		277283-1	277283-2	277283-3	277283-4	277283-5
Your Reference	UNITS	SS2	CP2	CW2	CW3	CW5
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	09/09/2021	09/09/2021	09/09/2021	09/09/2021	09/09/2021
Date analysed	-	10/09/2021	10/09/2021	10/09/2021	10/09/2021	10/09/2021
Dichlorovos	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Dimethoate	µg/L	<0.15	<0.15	<0.15	<0.15	<0.15
Diazinon	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorpyriphos-methyl	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Methyl Parathion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Malathion	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorpyriphos	µg/L	<0.009	<0.009	<0.009	<0.009	<0.009
Parathion	µg/L	<0.004	<0.004	<0.004	<0.004	<0.004
Bromophos ethyl	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Surrogate TCMX	%	62	94	61	66	95

OP in water Trace ANZECCF/ADWG		
Our Reference		277283-6
Your Reference	UNITS	CW6
Type of sample		Water
Date extracted	-	09/09/2021
Date analysed	-	10/09/2021
Dichlorovos	µg/L	<0.2
Dimethoate	µg/L	<0.15
Diazinon	µg/L	<0.01
Chlorpyriphos-methyl	µg/L	<0.2
Methyl Parathion	µg/L	<0.2
Ronnel	µg/L	<0.2
Fenitrothion	µg/L	<0.2
Malathion	µg/L	<0.05
Chlorpyriphos	µg/L	<0.009
Parathion	µg/L	<0.004
Bromophos ethyl	µg/L	<0.2
Ethion	µg/L	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.02
Surrogate TCMX	%	82

PCBs in Water - Trace Level						
Our Reference		277283-1	277283-2	277283-3	277283-4	277283-5
Your Reference	UNITS	SS2	CP2	CW2	CW3	CW5
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	09/09/2021	09/09/2021	09/09/2021	09/09/2021	09/09/2021
Date analysed	-	10/09/2021	10/09/2021	10/09/2021	10/09/2021	10/09/2021
Aroclor 1016	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Aroclor 1221	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Aroclor 1232	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Aroclor 1242	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Aroclor 1248	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Aroclor 1254	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Aroclor 1260	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Surrogate TCMX	%	62	94	61	66	95

PCBs in Water - Trace Level		
Our Reference		277283-6
Your Reference	UNITS	CW6
Type of sample		Water
Date extracted	-	09/09/2021
Date analysed	-	10/09/2021
Aroclor 1016	µg/L	<0.01
Aroclor 1221	µg/L	<0.01
Aroclor 1232	µg/L	<0.01
Aroclor 1242	µg/L	<0.01
Aroclor 1248	µg/L	<0.01
Aroclor 1254	µg/L	<0.01
Aroclor 1260	µg/L	<0.01
Surrogate TCMX	%	82

Speciated Phenols in water						
Our Reference		277283-1	277283-2	277283-3	277283-4	277283-5
Your Reference	UNITS	SS2	CP2	CW2	CW3	CW5
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	09/09/2021	09/09/2021	09/09/2021	09/09/2021	09/09/2021
Date analysed	-	10/09/2021	10/09/2021	10/09/2021	10/09/2021	10/09/2021
Phenol	µg/L	<1	<1	<1	<1	<1
2-Chlorophenol	µg/L	<1	<1	<1	<1	<1
4-Chloro-3-Methylphenol	µg/L	<5	<5	<5	<5	<5
2-Methylphenol (0-Cresol)	µg/L	<1	<1	<1	<1	<1
3/4-Methylphenol (m/p-Cresol)	µg/L	<2	<2	<2	<2	<2
2-Nitrophenol	µg/L	<1	<1	<1	<1	<1
2,4-Dimethylphenol	µg/L	<1	<1	<1	<1	<1
2,4-Dichlorophenol	µg/L	<1	<1	<1	<1	<1
2,6-Dichlorophenol	µg/L	<1	<1	<1	<1	<1
2,4,5-Trichlorophenol	µg/L	<1	<1	<1	<1	<1
2,4,6-Trichlorophenol	µg/L	<1	<1	<1	<1	<1
2,4-Dinitrophenol	µg/L	<20	<20	<20	<20	<20
4-Nitrophenol	µg/L	<20	<20	<20	<20	<20
2346-Tetrachlorophenol	µg/L	<1	<1	<1	<1	<1
2-methyl-4,6-Dinitrophenol	µg/L	<10	<10	<10	<10	<10
Pentachlorophenol	µg/L	<5	<5	<5	<5	<5
Surrogate 2-fluorophenol	%	16	18	22	20	19
Surrogate Phenol-d_6	%	9.0	12	14	11	12
Surrogate 2,4,6-Tribromophenol	%	37	25	35	36	34
Surrogate *p*-Terphenyl-d_{14}	%	77	63	76	90	62

Speciated Phenols in water				
Our Reference		277283-6	277283-7	277283-10
Your Reference	UNITS	CW6	BD2	rinsate
Type of sample		Water	Water	Water
Date extracted	-	09/09/2021	09/09/2021	09/09/2021
Date analysed	-	10/09/2021	10/09/2021	10/09/2021
Phenol	µg/L	<1	<1	<1
2-Chlorophenol	µg/L	<1	<1	<1
4-Chloro-3-Methylphenol	µg/L	<5	<5	<5
2-Methylphenol (0-Cresol)	µg/L	<1	<1	<1
3/4-Methylphenol (m/p-Cresol)	µg/L	<2	<2	<2
2-Nitrophenol	µg/L	<1	<1	<1
2,4-Dimethylphenol	µg/L	<1	<1	<1
2,4-Dichlorophenol	µg/L	<1	<1	<1
2,6-Dichlorophenol	µg/L	<1	<1	<1
2,4,5-Trichlorophenol	µg/L	<1	<1	<1
2,4,6-Trichlorophenol	µg/L	<1	<1	<1
2,4-Dinitrophenol	µg/L	<20	<20	<20
4-Nitrophenol	µg/L	<20	<20	<20
2346-Tetrachlorophenol	µg/L	<1	<1	<1
2-methyl-4,6-Dinitrophenol	µg/L	<10	<10	<10
Pentachlorophenol	µg/L	<5	<5	<5
Surrogate 2-fluorophenol	%	13	60	52
Surrogate Phenol-d_6	%	7.0	55	44
Surrogate 2,4,6-Tribromophenol	%	30	95	102
Surrogate *p*-Terphenyl-d_{14}	%	62	99	103

HM in water - dissolved						
Our Reference		277283-1	277283-2	277283-3	277283-4	277283-5
Your Reference	UNITS	SS2	CP2	CW2	CW3	CW5
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	07/09/2021	07/09/2021	07/09/2021	07/09/2021	07/09/2021
Date analysed	-	07/09/2021	07/09/2021	07/09/2021	07/09/2021	07/09/2021
Arsenic-Dissolved	µg/L	<1	9	<1	<1	3
Cadmium-Dissolved	µg/L	0.3	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	1	<1	<1
Copper-Dissolved	µg/L	12	<1	<1	<1	<1
Lead-Dissolved	µg/L	38	<1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	33	9	2	9	3
Zinc-Dissolved	µg/L	77	3	13	1	2
Tin-Dissolved	µg/L	<1	<1	<1	<1	<1
Iron-Dissolved	µg/L	400	38,000	10	5,600	3,500

HM in water - dissolved				
Our Reference		277283-6	277283-7	277283-10
Your Reference	UNITS	CW6	BD2	rinsate
Type of sample		Water	Water	Water
Date prepared	-	07/09/2021	07/09/2021	07/09/2021
Date analysed	-	07/09/2021	07/09/2021	07/09/2021
Arsenic-Dissolved	µg/L	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1
Lead-Dissolved	µg/L	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	6	2	<1
Zinc-Dissolved	µg/L	1	15	<1
Tin-Dissolved	µg/L	<1	<1	<1
Iron-Dissolved	µg/L	5,800	20	<10

Miscellaneous Inorganics						
Our Reference		277283-1	277283-2	277283-3	277283-4	277283-5
Your Reference	UNITS	SS2	CP2	CW2	CW3	CW5
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	06/09/2021	06/09/2021	06/09/2021	06/09/2021	06/09/2021
Date analysed	-	06/09/2021	06/09/2021	06/09/2021	06/09/2021	06/09/2021
Ferrous Iron	mg/L	0.41	44	0.18	6.6	2.4
Ferric Iron (by calculation)	mg/L	<0.05	<0.05	<0.05	<0.05	1.1
Total Suspended Solids	mg/L	470	730	90	2,400	3,800
Oil & Grease (LLE)	mg/L	<5	<5	<5	<5	<5

Miscellaneous Inorganics		
Our Reference		277283-6
Your Reference	UNITS	CW6
Type of sample		Water
Date prepared	-	06/09/2021
Date analysed	-	06/09/2021
Ferrous Iron	mg/L	5.1
Ferric Iron (by calculation)	mg/L	0.72
Total Suspended Solids	mg/L	14,000
Oil & Grease (LLE)	mg/L	<5

Tributyl Tin in Water						
Our Reference		277283-1	277283-2	277283-3	277283-4	277283-5
Your Reference	UNITS	SS2	CP2	CW2	CW3	CW5
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	08/09/2021	08/09/2021	08/09/2021	08/09/2021	08/09/2021
Date analysed	-	10/09/2021	10/09/2021	10/09/2021	10/09/2021	10/09/2021
Tributyltin as Sn	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Surrogate Triphenyltin	%	86	85	87	90	87

Tributyl Tin in Water		
Our Reference		277283-6
Your Reference	UNITS	CW6
Type of sample		Water
Date extracted	-	08/09/2021
Date analysed	-	10/09/2021
Tributyltin as Sn	µg/L	<0.002
Surrogate Triphenyltin	%	85

Method ID	Methodology Summary
Ext-054	Analysed by MPL Envirolab
Inorg-003	Oil & Grease - determine gravimetrically following extraction with Hexane, in accordance with APHA latest edition, 5520-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-076	Ferrous Iron is determined colourimetrically by discrete analyser. Waters samples are filtered on receipt prior to analysis.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.
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-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
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: VOCs in water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			07/09/2021	1	07/09/2021	08/09/2021		07/09/2021	[NT]
Date analysed	-			07/09/2021	1	07/09/2021	08/09/2021		07/09/2021	[NT]
Dichlorodifluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Bromomethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloroethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chloroform	µg/L	1	Org-023	<1	1	2	2	0	104	[NT]
2,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	109	[NT]
1,1,1-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	94	[NT]
1,1-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Cyclohexane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Dibromomethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	90	[NT]
Bromodichloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	95	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	86	[NT]
1,2-dibromoethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	87	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromoform	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	[NT]	[NT]
Styrene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-trichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	100	1	100	98	2	101	[NT]
Surrogate toluene-d8	%		Org-023	87	1	88	88	0	89	[NT]
Surrogate 4-BFB	%		Org-023	96	1	97	94	3	95	[NT]

QUALITY CONTROL: VOCs in water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	10	07/09/2021	08/09/2021		[NT]	[NT]
Date analysed	-			[NT]	10	07/09/2021	08/09/2021		[NT]	[NT]
Dichlorodifluoromethane	µg/L	10	Org-023	[NT]	10	<10	<10	0	[NT]	[NT]
Chloromethane	µg/L	10	Org-023	[NT]	10	<10	<10	0	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-023	[NT]	10	<10	<10	0	[NT]	[NT]
Bromomethane	µg/L	10	Org-023	[NT]	10	<10	<10	0	[NT]	[NT]
Chloroethane	µg/L	10	Org-023	[NT]	10	<10	<10	0	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-023	[NT]	10	<10	<10	0	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Chloroform	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
2,2-dichloropropane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,1,1-trichloroethane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,1-dichloropropene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Cyclohexane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Dibromomethane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Trichloroethene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Bromodichloromethane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,3-dichloropropane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,2-dibromoethane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Bromoform	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	[NT]	10	<2	<2	0	[NT]	[NT]
Styrene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
o-xylene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,2,3-trichloropropane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Bromobenzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	[NT]	10	99	98	1	[NT]	[NT]
Surrogate toluene-d8	%		Org-023	[NT]	10	87	86	1	[NT]	[NT]
Surrogate 4-BFB	%		Org-023	[NT]	10	96	94	2	[NT]	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			07/09/2021	1	07/09/2021	08/09/2021		07/09/2021	[NT]
Date analysed	-			07/09/2021	1	07/09/2021	08/09/2021		07/09/2021	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	1	<10	<10	0	98	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	1	<10	<10	0	98	[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	91	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	100	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	102	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	98	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	100	1	100	98	2	101	[NT]
Surrogate toluene-d8	%		Org-023	87	1	88	88	0	89	[NT]
Surrogate 4-BFB	%		Org-023	96	1	97	94	3	95	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	10	07/09/2021	08/09/2021		[NT]	[NT]
Date analysed	-			[NT]	10	07/09/2021	08/09/2021		[NT]	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	[NT]	10	<10	<10	0	[NT]	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	[NT]	10	<10	<10	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	[NT]	10	<2	<2	0	[NT]	[NT]
o-xylene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Naphthalene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	[NT]	10	99	98	1	[NT]	[NT]
Surrogate toluene-d8	%		Org-023	[NT]	10	87	86	1	[NT]	[NT]
Surrogate 4-BFB	%		Org-023	[NT]	10	96	94	2	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			09/09/2021	7	09/09/2021	09/09/2021		09/09/2021	[NT]
Date analysed	-			11/09/2021	7	11/09/2021	11/09/2021		11/09/2021	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	7	<50	<50	0	111	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	7	<100	<100	0	121	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	7	<100	<100	0	93	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	7	<50	<50	0	111	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	7	<100	<100	0	121	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	7	<100	<100	0	93	[NT]
Surrogate o-Terphenyl	%		Org-020	96	7	86	99	14	105	[NT]

QUALITY CONTROL: PAHs in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			09/09/2021	7	09/09/2021	09/09/2021		09/09/2021	[NT]
Date analysed	-			10/09/2021	7	10/09/2021	10/09/2021		10/09/2021	[NT]
Naphthalene	µg/L	1	Org-022/025	<1	7	<1	<1	0	115	[NT]
Acenaphthylene	µg/L	1	Org-022/025	<1	7	<1	<1	0	[NT]	[NT]
Acenaphthene	µg/L	1	Org-022/025	<1	7	<1	<1	0	90	[NT]
Fluorene	µg/L	1	Org-022/025	<1	7	<1	<1	0	93	[NT]
Phenanthrene	µg/L	1	Org-022/025	<1	7	<1	<1	0	116	[NT]
Anthracene	µg/L	1	Org-022/025	<1	7	<1	<1	0	[NT]	[NT]
Fluoranthene	µg/L	1	Org-022/025	<1	7	<1	<1	0	93	[NT]
Pyrene	µg/L	1	Org-022/025	<1	7	<1	<1	0	102	[NT]
Benzo(a)anthracene	µg/L	1	Org-022/025	<1	7	<1	<1	0	[NT]	[NT]
Chrysene	µg/L	1	Org-022/025	<1	7	<1	<1	0	106	[NT]
Benzo(b,j+k)fluoranthene	µg/L	2	Org-022/025	<2	7	<2	<2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	1	Org-022/025	<1	7	<1	<1	0	83	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-022/025	<1	7	<1	<1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	1	Org-022/025	<1	7	<1	<1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	1	Org-022/025	<1	7	<1	<1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	87	7	99	103	4	89	[NT]

QUALITY CONTROL: OCPs in Water - Trace Level					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			09/09/2021	[NT]	[NT]	[NT]	[NT]	09/09/2021	[NT]
Date analysed	-			10/09/2021	[NT]	[NT]	[NT]	[NT]	10/09/2021	[NT]
alpha-BHC	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	129	[NT]
HCB	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	128	[NT]
gamma-BHC	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	122	[NT]
delta-BHC	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	132	[NT]
Heptachlor Epoxide	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	132	[NT]
gamma-Chlordane	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-Chlordane	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	µg/L	0.002	Org-022/025	<0.002	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	127	[NT]
Dieldrin	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	117	[NT]
Endrin	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	135	[NT]
Endosulfan II	µg/L	0.002	Org-022/025	<0.002	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	127	[NT]
Endrin Aldehyde	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	122	[NT]
Methoxychlor	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	96	[NT]	[NT]	[NT]	[NT]	72	[NT]

QUALITY CONTROL: OP in water Trace ANZECCF/ADWG					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			09/09/2021	[NT]	[NT]	[NT]	[NT]	09/09/2021	[NT]
Date analysed	-			10/09/2021	[NT]	[NT]	[NT]	[NT]	10/09/2021	[NT]
Dichlorovos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	114	[NT]
Dimethoate	µg/L	0.15	Org-022/025	<0.15	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Methyl Parathion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	121	[NT]
Fenitrothion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	104	[NT]
Malathion	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	127	[NT]
Chlorpyriphos	µg/L	0.009	Org-022/025	<0.009	[NT]	[NT]	[NT]	[NT]	132	[NT]
Parathion	µg/L	0.004	Org-022/025	<0.004	[NT]	[NT]	[NT]	[NT]	98	[NT]
Bromophos ethyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	106	[NT]
Azinphos-methyl (Guthion)	µg/L	0.02	Org-022/025	<0.02	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	96	[NT]	[NT]	[NT]	[NT]	72	[NT]

QUALITY CONTROL: PCBs in Water - Trace Level					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			09/09/2021	[NT]	[NT]	[NT]	[NT]	09/09/2021	[NT]
Date analysed	-			10/09/2021	[NT]	[NT]	[NT]	[NT]	10/09/2021	[NT]
Aroclor 1016	µg/L	0.01	Org-021	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	µg/L	0.01	Org-021	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	µg/L	0.01	Org-021	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	µg/L	0.01	Org-021	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	µg/L	0.01	Org-021	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	µg/L	0.01	Org-021	<0.01	[NT]	[NT]	[NT]	[NT]	120	[NT]
Aroclor 1260	µg/L	0.01	Org-021	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-021	96	[NT]	[NT]	[NT]	[NT]	72	[NT]

QUALITY CONTROL: Speciated Phenols in water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	277283-7
Date extracted	-			09/09/2021	7	09/09/2021	09/09/2021		09/09/2021	09/09/2021
Date analysed	-			10/09/2021	7	10/09/2021	10/09/2021		10/09/2021	10/09/2021
Phenol	µg/L	1	Org-022/025	<1	7	<1	<1	0	60	90
2-Chlorophenol	µg/L	1	Org-022/025	<1	7	<1	<1	0	126	109
4-Chloro-3-Methylphenol	µg/L	5	Org-022/025	<5	7	<5	<5	0	[NT]	[NT]
2-Methylphenol (0-Cresol)	µg/L	1	Org-022/025	<1	7	<1	<1	0	52	72
3/4-Methylphenol (m/p-Cresol)	µg/L	2	Org-022/025	<2	7	<2	<2	0	[NT]	[NT]
2-Nitrophenol	µg/L	1	Org-022/025	<1	7	<1	<1	0	[NT]	[NT]
2,4-Dimethylphenol	µg/L	1	Org-022/025	<1	7	<1	<1	0	[NT]	[NT]
2,4-Dichlorophenol	µg/L	1	Org-022/025	<1	7	<1	<1	0	[NT]	[NT]
2,6-Dichlorophenol	µg/L	1	Org-022/025	<1	7	<1	<1	0	106	115
2,4,5-Trichlorophenol	µg/L	1	Org-022/025	<1	7	<1	<1	0	[NT]	[NT]
2,4,6-Trichlorophenol	µg/L	1	Org-022/025	<1	7	<1	<1	0	[NT]	[NT]
2,4-Dinitrophenol	µg/L	20	Org-022/025	<20	7	<20	<20	0	[NT]	[NT]
4-Nitrophenol	µg/L	20	Org-022/025	<20	7	<20	<20	0	75	102
2346-Tetrachlorophenol	µg/L	1	Org-022/025	<1	7	<1	<1	0	[NT]	[NT]
2-methyl-4,6-Dinitrophenol	µg/L	10	Org-022/025	<10	7	<10	<10	0	[NT]	[NT]
Pentachlorophenol	µg/L	5	Org-022/025	<5	7	<5	<5	0	117	99
Surrogate 2-fluorophenol	%		Org-022/025	53	7	60	63	5	47	68
Surrogate Phenol-d_6	%		Org-022/025	42	7	55	55	0	38	60
Surrogate 2,4,6-Tribromophenol	%		Org-022/025	105	7	95	102	7	94	107
Surrogate *p*-Terphenyl-d_{14}	%		Org-022/025	107	7	99	103	4	90	107

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	277283-2
Date prepared	-			07/09/2021	1	07/09/2021	07/09/2021		07/09/2021	07/09/2021
Date analysed	-			07/09/2021	1	07/09/2021	07/09/2021		07/09/2021	07/09/2021
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	93	86
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	0.3	0.3	0	94	88
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	92	86
Copper-Dissolved	µg/L	1	Metals-022	<1	1	12	11	9	91	78
Lead-Dissolved	µg/L	1	Metals-022	<1	1	38	36	5	93	83
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	114	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	33	32	3	91	78
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	77	74	4	93	81
Tin-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	93	89
Iron-Dissolved	µg/L	10	Metals-022	<10	1	400	380	5	93	#

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			06/09/2021	1	06/09/2021	06/09/2021		06/09/2021	[NT]
Date analysed	-			06/09/2021	1	06/09/2021	06/09/2021		06/09/2021	[NT]
Ferrous Iron	mg/L	0.05	Inorg-076	<0.05	1	0.41	0.41	0	102	[NT]
Ferric Iron (by calculation)	mg/L	0.05		<0.05	1	<0.05	<0.05	0	[NT]	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	470	460	2	97	[NT]
Oil & Grease (LLE)	mg/L	5	Inorg-003	<5	1	<5	[NT]		94	[NT]

QUALITY CONTROL: Tributyl Tin in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			08/09/2021	1	08/09/2021	08/09/2021		08/09/2021	[NT]
Date analysed	-			10/09/2021	1	10/09/2021	10/09/2021		10/09/2021	[NT]
Tributyltin as Sn	µg/L	0.002	Ext-054	<0.002	1	<0.002	<0.002	0	111	[NT]
Surrogate Triphenyltin	%		Ext-054	88	1	86	86	0	86	[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.

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

8 HM in water - dissolved - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Fe2+ is slightly higher than iron dissolved for sample #1-->4.This may be due to preservation technique is different between the two methods.

Tributyltin as Sn analysed by MPL Laboratories. Report No. 268473

TRH Water(C10-C40) NEPM - The positive result in the rinsate sample is due to a single peak with no hydrocarbon profile that is consistent with the use of plastic containers.

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No: 202546.00	**Suburb:** Cockle Bay		**To:** *Envirolab Services*
Project Manager: Rhys McMillan	**Order Number:**	**Sampler:**	*12 Ashley St, Chatswood NSW 2067*
Email: Rhys.McMillan@douglaspartners.com.au / kurt.plambeck@douglaspartners.com.au			**Attn:** *Sample Receipt*
Turnaround time: ☐ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day			**Contact:** *(02) 9910 6200 samplereceipt@envirolab.com.au*
Prior Storage: ☐ Fridge ☐ Freezer ☐ Shelf	**Do samples contain 'potential' HBM?** ☐ No ☐ Yes (If YES, then handle, transport and store in accordance with FPM HAZID)		

Lab ID	Sample ID: Location / Other ID	Depth From	Depth To	Date Sampled	Sample Type: S - soil W - water	Container Type: G - glass P - plastic	Analytes: 9 metals(incl Sn)	PAH, TRH, BTEX	speciated phenols	VOC	OCP, OPP, PCB	TBT	iron (total, feric and ferrous)	TSS	oil and grease	BTEX		Notes/ Preservation/ Additional Requirements
1	SS2						X	X	X	X	X	X	X	X	X			Envirolab Services 12 Ashley St Chatswood NSW 2067 Ph: (02) 9910 6200 Job No: 277283.
2	CP2						X	X	X	X	X	X	X	X	X			Date Received: 03/09/21 Time Received: 1645
3	CW2						X	X	X	X	X	X	X	X	X			Received By: CH Temp: Cool/Ambient
4	CW3						X	X	X	X	X	X	X	X	X			Cooling: Ice/Icepack
5	CW5						X	X	X	X	X	X	X	X	X			Security: Intact/Broken/None
6	CW6						X	X	X	X	X	X	X	X	X			
—	BD1/						X	X	X	X								inter
7	BD2/						X	X	X	X								intra
8	spike															X		
9	blank															X		
10	rinsate						X	X	X	X								

Metals to analyse:		**LAB RECEIPT**
Number of samples in container:	**Transported to laboratory by:**	**Lab Ref. No:** 277283
Send results to: Douglas Partners Pty Ltd		**Received by:** Christine
Address: 96 Hermitage Road, West Ryde NSW 2114	**Phone:** (02) 9809 0666	**Date & Time:** 03/09/21 1645
Relinquished by:	**Date:** **Signed:**	**Signed:** [signature]

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	Douglas Partners Pty Ltd
Attention	Rhys McMillan

Sample Login Details	
Your reference	202546.00, Cockle Bay
Envirolab Reference	277283
Date Sample Received	03/09/2021
Date Instructions Received	06/09/2021
Date Results Expected to be Reported	13/09/2021

Sample Condition	
Samples received in appropriate condition for analysis	Broken Sample
No. of Samples Provided	10 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	5
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

One of the vials of CW6 broken in transit

Please contact the laboratory within 24 hours if you wish to cancel the aforementioned testing. Otherwise testing will proceed as per the COC and hence invoice accordingly.

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	VOCs in water	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHsin Water	OCPs in Water - Trace Level	OP in water Trace ANZECCF/ADWG	PCBs in Water - Trace Level	Speciated Phenols in water	HM in water - dissolved	Ferrous Iron	Ferric Iron (by calculation)	Total Suspended Solids	Oil & Grease (LLE)	Tributyl Tin in Water
SS2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CP2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CW2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CW3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CW5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CW6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BD2	✓	✓	✓	✓	✓	✓	✓	✓	✓					
spike		✓												
blank		✓												
rinsate	✓	✓	✓	✓				✓	✓					

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.